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November 8, 2007

Mr. Andrew Boettcher
Hydrogeologist
Wisconsin DNR
Milwaukee Service Center
2300 N. Dr. Martin Luther King Jr. Drive
Milwaukee, WI 53212-0436

Code 35

Re: AFCEE Contract No. F41624-03-D-8597 / T.O. 260

Final Work Plan for Phase II Site Investigation and Tank Cleaning
General Mitchell ARS
Milwaukee, WI
October 2007

RECEIVED
NOV 12 2007
By US

Dear Mr. Boettcher:

Accompanying this letter is one copy of the following document:

- Final Work Plan
  Phase II Site Investigation and Tank Cleaning
  440th Air Lift Wing
  General Mitchell International Airport
  Air Reserve Station, Wisconsin

The Work Plan includes the Sampling and Analysis Plan in Appendix A and the Health and Safety Plan in Appendix B. The SAP consists of the Field Sampling Plan and Quality Assurance Project Plan. A copy is being provided to you as a courtesy. If you have any questions or comments on the Work Plan, please contact me at (312) 777-5432.

Sincerely,

Greg McGovern

Greg McGovern
Project Manager

Enclosures: Documents as noted
Recipient List

241176980
02-41-000602

AIR FORCE RESERVE COMMAND

Code 35

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FINAL

WORK PLAN

Prepared for:

Phase II Site Investigation and Tank Cleaning
440th Air Lift Wing
General Mitchell International Airport
Air Reserve Station, Wisconsin

Prepared by:

Earth Tech, Inc.
Chicago, Illinois

Contract No. F41624-03-D-8597
Delivery Order No. 260

Revision 0, October 31, 2007

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List of Acronyms

AFCEE	Air Force Center for Engineering and the Environment
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
ARS	Air Reserve Station
AST	Above ground storage tank
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DBCRA	Defense Base Closure and Realignment Act
DOD	Department of Defense
DQO	Data quality objective
EBS	Environmental Baseline Survey
ECP	Environmental Condition of Property
ERP	Environmental Restoration Program
F	Fahrenheit
FOSL	Finding of Suitability to Lease
FSP	Field Sampling Plan
GMIAP	General Mitchell International Airport
GPS	Global Positioning System
OWS	Oil water separator
POL	Petroleum, Oil, and Lubricants
QAPP	Quality Assurance Project Plan
RBC	Risk-based concentration
TEM	Time domain electromagnetic
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
WDNR	Wisconsin Department of Natural Resources

1.0 INTRODUCTION

1.1 The U.S. Air Force Environmental Restoration and Base Realignment Program

This Work Plan has been prepared to provide the protocol to conduct Phase II site investigation activities at the 440th Air Lift Wing (440th) Air Reserve Station (ARS) located at General Mitchell International Airport (GMIAP), Milwaukee, Wisconsin. Phase II site investigation activities are being initiated at the ARS based on the results of the Environmental Baseline Survey (EBS) completed in April 2007, which indicated several areas of the base where there was a potential for a release of hazardous substances, petroleum products, and their derivatives over the installation's history. Pursuant to the Defense Base Closure and Realignment Act (DBCRA) of 1990 (P.L. 101-526, 104 Stat. 1808, 10 U.S.C. Section 2687 note), the Department of Defense (DOD) must realign and reduce its military forces. DBCRA established an independent Defense Base Closure and Realignment Commission (Commission) to review the Secretary of Defense's base closure and realignment recommendations. After reviewing these recommendations, the 2005 Commission forwarded its recommended list of base closures and realignments to the President, who accepted the recommendations and submitted them to Congress. Since Congress did not disapprove the recommendations in the time given under DBCRA, the recommendations became law in late 2005. Because the 440th was on the Commission's 2005 list, the decision to close the installation is final. The 440th is scheduled to close on February 2, 2008.

The preparation of a Work Plan is required by DOD policy before any DOD property can be assessed or investigated. Air Force Policy Directives provide responsibilities and procedures for conducting site investigations and are implemented through Air Force Instructions (AFI).

The Work Plan will be used by the Air Force in meeting its obligations under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S. Code (U.S.C.) Section 9620(h), as amended by the Community Environmental Response Facilitation Act (CERFA) (Public Law [P.L.] 102-426). CERFA was enacted to facilitate the rapid return of uncontaminated properties identified during the Base Realignment and Closure (BRAC) process to local communities. Uncontaminated property refers to real property on which no hazardous substances and no petroleum products or their derivatives, including aviation fuel and motor oil, are known to have been released or disposed, This includes no migration of these substances from adjacent areas. In order to identify potentially contaminated properties on military installations scheduled for closure or realignment, a Phase II site investigation is conducted and the results are documented in a report. This Work Plan for the 440th is based on existing environmental information related to the past and present storage, release, or disposal of hazardous substances and petroleum products on the installation, including information sources such as previous Installation Restoration Program documentation, Environmental Condition of Property (ECP) Report (April 2007), and the EBS.

This Work Plan is based on available environmental information related to past and present storage, release, or disposal of hazardous substances and petroleum products at the 440th. This Work Plan will be used by the Air Force, along with other available information, to:

- Develop sufficient information to assess the health and safety risks of the property surveyed.
- Determine what actions are necessary to protect human health and the environment if health and safety risks exist.

- Support decisions for Finding of Suitability to Lease (FOSL) and Finding of Suitability to Transfer (FOST) Air Force facilities.
- Aid in determining potential land use restrictions.
- Document uncontaminated property as required and defined under Section 120 (h)(4) of CERCLA.
- Support notice, when required under Section 120(h) of CERCLA, of the type, quantity, and time frame of any storage, release, or disposal of hazardous substances or petroleum products or their derivatives on the property.
- Identify data gaps concerning environmental contamination.
- Identify potential environmental concerns associated with the property.

1.2 Past Environmental Work at the Installation

Previous environmental work completed at the 440th associated with the BRAC decision includes the ECP and EBS documents dated April 2007. The ECP was prepared to document the environmental condition of real property resulting from the storage, release, and disposal of hazardous substances and petroleum products and their derivatives over the installation's history. The EBS was prepared to document the environmental condition of property at the 440th resulting from the release and disposal of hazardous substances, petroleum products, and their derivatives, if any, over the installation's history, and establish a baseline for use by the Air Force in making decisions concerning real property transactions. The preparation of an EBS was required by DOD policy before any property can be sold, leased, transferred, or acquired.

The 440th and the Air Force Reserve Command completed obligations under the Air Force's Environmental Restoration Program (ERP) in 2003. The ERP is required at all DOD installations where past hazardous waste management practices and associated contamination potentially threatens human health and the environment. Working with the Wisconsin Department of Natural Resources (WDNR), the 440th followed the process set forth in CERCLA to complete the program. CERCLA forms the basis for identification, investigation, and clean up of hazardous waste contamination around the nation.

Following is a synopsis of program milestones and accomplishments at the 440th:

1. Initial ERP studies began in the mid to late 1980's. These studies resulted in the identification of four specific geographic sites that posed potential threats. Two of the sites were recommended for no further action because no threats were determined to exist. The two other sites associated with the Fire Training area and the Petroleum, Oil, and Lubricants (POL) area required further investigation.
2. In the early 1990's, additional investigations revealed the potential for soil and groundwater contamination in other areas in the installation. Consequently, the 440th restoration efforts evolved into a program of ten sites that required investigation, and possibly cleanup.
3. Detailed investigations were conducted in the mid to late 1990's at several sites that required further action. Using soil and groundwater sampling results, risks to human health and the environment were assessed, and several alternatives to address each site were evaluated. Throughout the process, selected alternatives were presented in decision documents for each site and submitted to WDNR for review and approval.
4. To ensure protection of human health and the environment, the 440th took several actions at these sites that were accepted and approved by WDNR. They included

requests for no further action where risks did not exist, removal of sources of contamination, excavation and disposal of buried debris, and submittal of closure packages demonstrating that residual contamination did not pose human health or environmental threats.

5. Concurrent with restoration actions, long-term monitoring of groundwater was conducted on a routine basis to observe and document trends in subsurface conditions. The monitoring program was completed in 2003 after sampling results consistently indicated that groundwater on and off the installation was no longer threatened by the ERP sites.

1.3 Description of Current Study

The facilities at the 440th were inventoried and assessed (both interior and exterior) during the site inspection phase of the EBS to identify specific facility characteristics and potential environmental concerns. Air Force property was classified into categories based on the findings of the EBS. The categories for all factors present at each location were then integrated to determine the overall property category. The Air Force facilities at the 440th were classified into one of the following categories:

- *Category 1* - Areas where no release or disposal of hazardous or petroleum substances has occurred (including no migration of these substances from adjacent areas)
- *Category 2* - Areas where only release or disposal of petroleum substances has occurred
- *Category 3* - Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require removal or remedial response
- *Category 4* - Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions have been taken
- *Category 5* - Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions are underway, but have not yet been completed
- *Category 6* - Areas where release, disposal, and/or migration of hazardous substances has occurred, but remedial actions have not been implemented
- *Category 7* - Areas that are not evaluated or require additional evaluation.

The Phase II site investigation activities described in this Work Plan focus on the areas of the 440th identified as Category 7 areas (see attached Figure 5-1 of the EBS). Category 7 areas were identified at facilities associated or formerly associated with oil-water separators (OWS) at buildings 104, 208, 217, 219, 302, and 303. These OWS sites require investigation for possible releases of hazardous substances. Building 302 also requires investigation of a removed underground storage tank (UST) site for releases of hazardous substances. The aircraft parking apron (Facility 7101) and adjacent grassy area to the east and the station's storm drain system are also considered Category 7 because the potential presence of hazardous substances from contaminated surface water runoff needs to be investigated. The reported flare burn site in the Munitions Storage Area has not been investigated and, therefore, was considered Category 7.

The Phase II site investigation activities will include a soil sampling program to evaluate the above-described Category 7 areas for contaminant releases. Surface soils will be sampled in the stormwater drainage ditches and the grassy area to the east of the aircraft parking apron. Drilling will be necessary to sample soils adjacent to and beneath the OWS, beneath the aircraft parking apron, as well as the flare burn area. Groundwater will be sampled from the Geoprobe at the boring locations beneath the OWSs. Phase II activities will also include cleaning several fuel tanks and OWSs by a subcontractor.. Further details of the Phase II site investigation activities are provided in the Field Sampling Plan (FSP), Section 2.0.

2.0 SUMMARY OF EXISTING INFORMATION

The following sections summarize information provided in documents available from base files pertaining to previous investigations and environmental activities at the 440th.

2.1 Installation Environmental Setting

The 440th is located within the boundaries of GMIAP in Milwaukee, Wisconsin, and occupies approximately 102 acres of land in the southwestern corner of the airport. The station is located within the City of Milwaukee, Milwaukee County in southeastern Wisconsin, approximately 7 miles south of the center of the city. The installation is approximately 3 miles west of Lake Michigan. Average annual temperature is 46.1 degrees (°) Fahrenheit (F) and ranges from a low of 18.9°F (January) to a high of 70.9° F (July). Average annual precipitation is 32.9 inches. The area is characterized by a strong annual temperature cycle, bringing cold winters and warm summers (Air Force 2007). A site location map is provided as Figure 2-1, and site features are presented in the site layout map (Figure 2-2).

2.2 Site-Specific Environmental Setting

2.2.1 Contaminant Sources and Contamination

The results of the EBS indicated that several areas at the 440th exhibit contamination or have the potential to exhibit contamination. Ten former ERP sites on the base were investigated and closed with approval from WDNR, some of which were closed with residual contamination left in place. Several areas of the base were determined in the EBS to be Category 2 areas, where a release of petroleum contaminants has occurred, and Category 7 areas, where potential contaminants have not been evaluated.

The focus of Phase II site investigation activities described in this Work Plan is to evaluate potential for contamination associated with the areas designated as Category 7 areas.

2.2.2 Geology

Soils at General Mitchell IAP ARS and adjacent areas are mapped as clayey land, which is a term used to describe areas where severe cutting and filling have occurred in populated areas (highly disturbed and industrialized), such as the area surrounding the airport. Soils adjacent to the site are mapped as Morley silt loam with 2 to 6 percent slopes. The Morley series consists of well-drained and moderately well-drained silty soils over calcareous silty clay loam glacial till. Morley soils have a moderately slow permeability and high available water capacity. Groundwater is typically less than 5 feet below ground surface during wet periods.

The regional geology consists of glacial unconsolidated deposits that overlay dolomite bedrock. The Niagara Dolomite is underlain by the Maquoketa Shale and a series of Ordovician and Cambrian sandstone units. Thickness of glacial and lake deposits range from approximately 50 to 100 feet thick (U.S. Air Force, 2002).

2.2.3 Groundwater

Groundwater beneath the 440th occurs within the unconsolidated glacial deposits and the underlying bedrock. Regional shallow groundwater within the glacial tills exists under artesian and semi-confined conditions and flows to the southeast across the station. This shallow aquifer is not used as a source of drinking water. The water table on station that occurs between Bong and Sijan Streets was found to be between 4 and 12 feet below the surface. At other locations on station, the water table was found to be less than 4 feet below the surface. Due to the low production of the shallow aquifer and the low permeability of the aquifer material, lateral and vertical contaminant migration is severely limited by the natural geologic and hydrologic conditions at the station. The nearest ground water supply well is located at the Wisconsin Air National Guard facility immediately north of the station. The shallowest bedrock aquifer in the area is located approximately 50 to 100 feet below ground surface (Science and Engineering Associates, Inc., 1996).

2.2.4 Surface Water

The 440th is located within the Oak Creek watershed, as identified by the WDNR. Surface water from the station drains into Oak Creek via two smaller tributaries, the north tributary of Oak Creek and the Mitchell Field Drainage Ditch. There are no lakes or rivers within or adjacent to the boundaries of General Mitchell IAP ARS (Science and Engineering Associates, Inc., 1996). The closest large surface water resource is Lake Michigan, located about 3 miles to the east. There are no natural surface water features on station, and all drainage is controlled by man-made ditches and culverts. Storm water exits the station via the drainage system and eventually discharges to Lake Michigan.

2.2.5 Air

Milwaukee County is situated within a non-attainment zone for air quality as designated by U.S. Environmental Protection Agency (USEPA). Milwaukee County received a passing grade from USEPA during 2002-2004 as compared to other counties with the worst particulate pollution in each state. The grades were based on USEPA's determination of meeting or failure to meet National Ambient Air Quality Standards for annual particulate matter levels for the period. Milwaukee County received a failing grade for having too many days of unhealthy levels of ground-level ozone in a report from 2005.

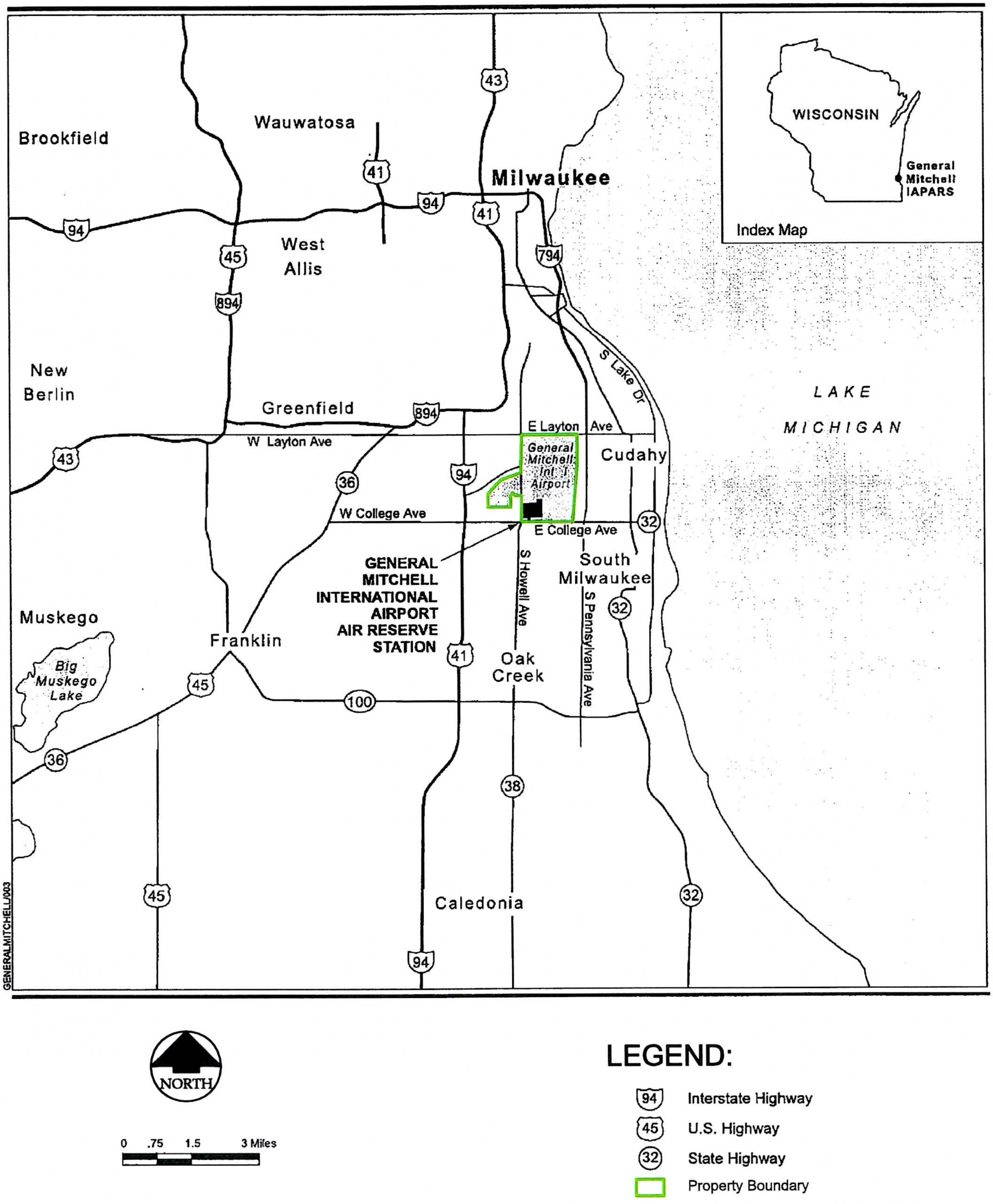
2.2.6 Biology

Limited biological resources exist based on the highly developed 440th and the adjacent commercial industrial operations. Limited green spaces exist at the 440th and consist of mowed, manicured grass lots. Trees and shrubs at the 440th serve as landscape plantings. The limited wildlife normally consists of songbirds.

Wildlife species utilizing the site are limited because vegetation does not provide sufficient cover for many species. In addition, development of the neighboring properties and the proximity of the airport further reduce the likelihood of wildlife species utilizing the site. Common songbirds are likely the only frequently occurring species at the property.

2.2.7 Demographics

As of the census of 2005, there were 921,654 people, 377,729 households, and 225,126 families residing in Milwaukee county. The population density was 3,892 per square mile. There were 400,093 housing units at an average density of 1,656 per square mile. The racial makeup of the county was 65.62% White, 24.59% Black or African American, 0.72% Native American, 2.57% Asian, 0.04% Pacific Islander, 4.25% from other races, and 2.21% from two or more races. 8.77% of the population were Hispanic or Latino of any race. 25.0% were of German, 10.9% Polish and 5.3% Irish ancestry according to the 2005 Census.



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TITLE:	SITE LOCATION MAP

DATE:	PROJECT:	FIGURE:
OCT 2007	440th AIRLIFT WING GENERAL MITCHELL INTERNATIONAL AIRPORT AIR RESERVE STATION, WISCONSIN	2-1
PROJECT NO.: 102171		

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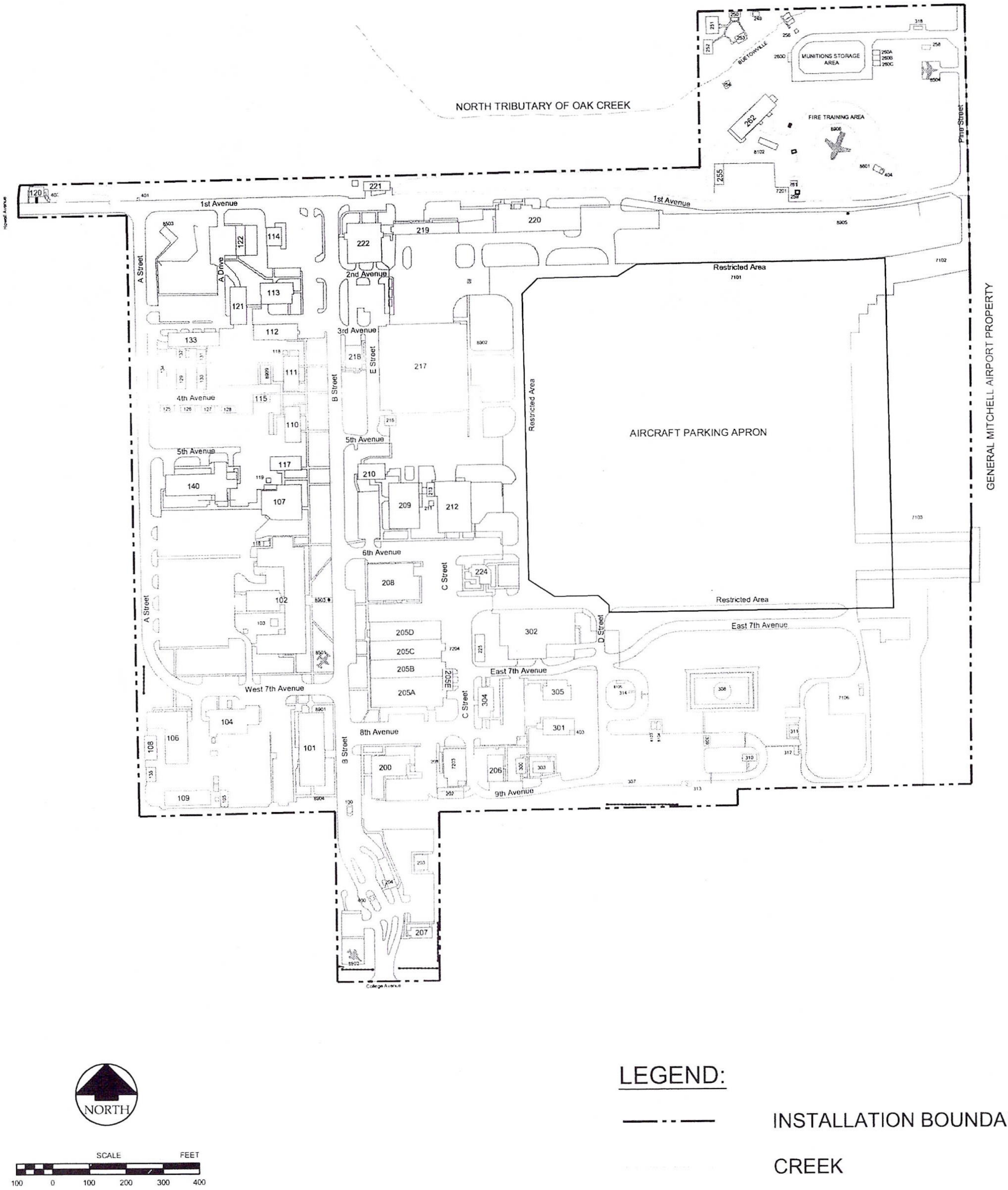

LEGEND:

—·-·— INSTALLATION BOUNDARY

CREEK

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TITLE:
SITE MAP

DATE:
OCT 2007

PROJECT NO.:
102171

PROJECT:
440th AIRLIFT WING
GENERAL MITCHELL INTERNATIONAL AIRPORT
AIR RESERVE STATION, WISCONSIN

FIGURE:
2-2

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3.0 PROJECT TASKS

3.1 Conceptual Site Model Development

Conceptual site models have been developed as part of previous investigations. The current conceptual site model will be revised as part of Phase II site investigation activities if necessary due to new information. Previous investigation reports, such as those prepared under the ERP will be used to develop the conceptual site model. The conceptual site model will provide a basis for understanding site conditions, potential contaminant migration pathways, and predicting potential risks to human health and the environment.

3.2 Characterization of Background Conditions

Based on previous investigation reports, it is assumed that background conditions have been established. Although the focus of the Phase II activities is on areas of the base that have not previously been investigated, other areas of the base, such as ERP sites, have been the subject of extensive investigations. Those reports will be used to establish background conditions during data analysis efforts.

3.3 Data Needs Assessment

The project-specific Quality Assurance Project Plan (QAPP) (based on the AFCEE QAPP version 4.0), the companion document to this Work Plan (Appendix A, Attachment 2), defines the laboratory quality assurance measures that will be used in generating analytical data. Data Quality Objectives (DQO) are presented in Table 3-1.

3.4 Field Investigation Tasks

Phase II field activities will consist mainly of soil sampling to assess OWSs, the aircraft parking apron and adjacent grassy areas, the suspected flare burn pit, and stormwater drainage ditches. Groundwater will be sampled through boreholes drilled adjacent to and through the bottom of the OWSs. The hole in the bottom of the OWSs will be patched by a subcontractor upon completion of sampling. Sampling methods, locations, analytical methods, and screening criteria are presented in the FSP provided in Appendix A, Attachment 1.

3.4.1 Mobilization

Subcontractor firms will be utilized to conduct cleaning of the POL area (large) aboveground storage tanks (AST), OWSs, and various small ASTs. A drilling subcontractor with a Geoprobe® will be utilized to collect soil samples from various depths adjacent to OWSs and within and adjacent to the flare burn pit. For boring locations near buried utilities, a hydro-excavator will be employed to remove soils near likely utility locations. The hydro-excavator uses high-pressure water or air and vacuum to loosen soil and remove it without damaging buried objects. Investigation-derived waste (IDW), such as used personal protective equipment, soil cuttings, and other waste, will be collected and stored in 55-gallon drums in a designated area on the base. Drilling and tank cleaning contractors will need access to water, so access points will be pre-determined and the information provided to the contractors. A base of operations will be established by field personnel to store equipment and supplies, process samples, and conduct sampling planning.

3.4.2 Geophysical Surveys

In order to determine the exact location and dimensions of the Flare Burn Pit prior to choosing the soil borings locations, a geophysical survey will be conducted. Mapping will be completed along parallel paths/lanes marked on the ground surface. A geophysical array will collect data over the length of a lane and return along an adjacent lane. This survey method will be conducted over the area(s) believed to contain the flare burn pit. Geophysical data will be collected using a multi-time gate EM system with a 3.28-foot (1-meter) wide footprint. A Time Domain EM (TEM) mapping system (Genonics EM-61®) with Global Positioning System (GPS) system capable of ± 1-meter precision will be the most likely array to be used to locate the burn pit as well as other metallic sources in the subsurface.

Instrument performance will be determined via on-site geophysical instrument validation and verified during data collection with quality control checks including instrument standardization checks and detection of seed items placed in the survey area. Continuous tracking, checks, and adjustments of the field data will be performed for QC and to establish efficient field procedures. The project geophysicist will review the field data to assess usefulness of the data for detecting and resolving metallic anomalies, including the burn pit. Noise levels in the data will be analyzed to ensure that they are sufficiently low to allow adequate signal-to-noise differentiation of pertinent anomalies. Unusable or incomplete data delivered for any survey lane will not be used for coverage calculations. Data shall be corrected for instrument bias, measurement drift, and if necessary, navigation errors. Data processing will be performed using Geosoft Oasis montaj or Golden Software SURFER for Windows software to perform quality checks, validate data, and plot findings.

3.4.3 Sampling and Analysis

Details of sampling activities, including proposed sample locations, the planned number and depths of soil samples, and analytical parameters are presented in the Field Sampling Plan provided in Appendix A: Attachment 1. Analytical parameters, required detection limits, and data quality objectives are presented in the QAPP provided in Appendix A: Attachment 2. Table 3-2 provides target analytes, analytical methods, and screening criteria for the proposed Phase II sampling.

3.4.4 Tank Cleaning

Additional Phase II activities include cleaning several tanks, ranging from the 400,000-gallon jet fuel AST to small 200-gallon ASTs associated with electrical generators. Earth Tech will supervise and subcontract labor, equipment, tools, transportation, and all materials necessary to:

- Clean-out JP-8 Fuel Storage Tank (400,000 gallons).
- Clean-out two (2) 10,000-gallon and one (1) 1,000-gallon ASTs (one diesel; one gasoline; one reclaimed JP-8 fuel).
- Clean-out Oil/Water Separators (8).
- Clean-out an additional (14) State of Wisconsin registered ASTs.
- Report with photographs that documents the work associated with the tank cleaning.

Table 3-1: Data Quality Objectives

440th Air Lift Wing ARS - Gen. Mitchell Airport Phase II Site Investigation

Step 1: Statement/Definition of the Problem	**Step 2: Identify the Decision**	**Step 3: Identify the Inputs to the Decision**	**Step 4: Define the Boundaries of the Study**	**Step 5: Develop a Decision Rule**	**Step 6: Specify Tolerable Limits on Decision Errors**	**Step 7: Optimize the Design for Obtaining Data**
Aircraft Parking Apron						
Current activities include aircraft fueling and deicing. Past activities on aircraft parking aprons may have included activities using hazardous substances that are no longer allowed, such as using degreasers to clean aircraft while on the parking apron, and the discharge of JP-8 from engine test activities that were formerly conducted on the apron. Runoff from a portion of the aircraft parking apron flows to grassy areas east of the apron. Because of the potential for releases of petroleum products and hazardous substances to the apron and the adjacent grassy area to the east, the apron (Facility 7101) and the adjacent grassy area are potentially impacted. Potential contamination at the site needs to be documented to facilitate BRAC 2005 real property disposal and transfer actions at 440th ARS.	Have these past activities have resulted in soil contamination beneath the concrete apron where petroleum products and hazardous substances may have entered the soil through seams in the paved surface and in contamination of adjacent unpaved grassy area to the east that received contaminated surface water runoff from the apron? Has the site been adequately characterized and documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS?	Observations from site reconnaissance. Phase I results and observations Multi-increment and discrete soil samples will be collected from and analyzed by definitive methods to determine the presence and concentration of TPH, VOCs and glycols. Table 3-3 of the work plan presents Methods and target analytes. Results from PID field screening will be used to determine sample locations and quantities. At a minimum, soil samples will be collected from three depth intervals at each boring location for laboratory analysis.	The Aircraft Parking Apron boundary and grassy area east of the apron will be the horizontal limits of the study area. Soil borings will be located directly under the location of the aircraft fuel tanks.	Results from the PID, visual and olfactory data will be used to determine whether gross contamination is present while still in the field. If gross contamination is observed, additional borings will be advanced and soil samples will be collected for lab analysis in an attempt to define the extent of soil contamination. For any boring location, if soil concentrations exceed WDNR clean up criteria, and/or background concentrations, as presented in Table 3-3, the soil contamination extent will be defined and possible impacts to groundwater will be determined during a future mobilization. If soil concentrations do not exceed WDNR clean up criteria, and/or background concentrations, as presented in Table 3-3, then the site will be considered adequately documented for BRAC 2005 real property disposal and transfer actions at the 440th ARS.	***Baseline Condition:*** The assumed baseline condition (i.e., the null hypothesis [H_o]) is that the soil concentrations exceed WDNR clean-up levels and background concentrations. The site investigation will collect the data necessary to demonstrate that the null hypothesis is correct (the site conditions do present a human health and/or environmental risk) or to reject the null hypothesis (the site conditions do not present a human health and/or environmental risk). The consequences of deciding that the soil concentrations do not exceed WDNR clean-up levels and background concentrations, when they truly do, is that the soil and possibly groundwater would be contaminated, possibly endangering the environment and human health. The decision error (false rejection) has the more severe consequences near the action level since the risk of jeopardizing the environment and human health likely outweighs the consequences of an unnecessary risk assessment and remedial action. To guard against the possibility of concluding that the human health or environmental risk posed by the site is acceptable, when in fact unacceptable risk does exist, Earth Tech will: use of historical records, air photos documenting site use through time; collect and analyze an appropriate number of soil samples; and follow the sampling and analytical methods specified in the QAPP	In this final process step, the team reviews the DQO outputs for consistency and completeness, and then reviews any existing data that may be used to support the sampling design. Any historical patterns, estimates of variance, and the homogeneity and characteristics of the matrices should be considered in any new sampling design. Heterogeneity may dictate that more samples be collected, while proven homogeneity of the matrices may allow fewer samples to be collected.

Table 3-1: Data Quality Objectives

440th Air Lift Wing ARS - Gen. Mitchell Airport Phase II Site Investigation

Step 1: **Statement/Definition of the Problem**	**Step 2:** **Identify the Decision**	**Step 3:** **Identify the Inputs to the Decision**	**Step 4:** **Define the Boundaries of the Study**	**Step 5:** **Develop a Decision Rule**	**Step 6:** **Specify Tolerable Limits on Decision Errors**	**Step 7:** **Optimize the Design for Obtaining Data**
Oil-Water Separators (OWSs)						
OWSs in locations where only petroleum products are utilized are assumed to have only received petroleum products. However, OWSs in locations where hazardous substances other than petroleum products are presently used or were known to be used in the past are assumed to have received hazardous substances. OWSs can leak and discharge petroleum products and hazardous substances to the environment. Although no evidence of a release was identified at any of the active OWSs during the EBS site inspections, the structural integrity of the OWSs could not be confirmed. Potential contamination at the site needs to be documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS.	Has the operation of the OWSs resulted in soil contamination around the OWS systems or beneath the waste oil accumulation tanks where petroleum products and hazardous substances may have entered the soil through structural defects? Has the site been adequately characterized and documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS?	Observations from site reconnaissance. Phase I Investigation data and observations Multi-increment and discrete soil samples will be collected from and analyzed by definitive methods to determine the presence and concentration of TPH, VOCs, and RCRA metals. Table 3-3 of the work plan presents Methods and target analytes. Results from PID field screening will be used to determine sample locations and quantities. At a minimum, soil samples will be collected from three depth intervals at each boring location for laboratory analysis.	Seven Category 7 and six Category 2 OWSs will be investigated after they are cleaned out. The investigation will be conducted horizontally within a 5-foot radius of each OWS system and vertically to the water table.	Results from the PID, visual and olfactory data will be used to determine whether gross contamination is present while still in the field. If gross contamination is observed, additional borings will be advanced and soil samples will be collected for lab analysis in an attempt to define the extent of soil contamination. For any boring location, if soil concentrations exceed WDNR screening criteria, and/or background concentrations, as presented in Table 3-3, the soil contamination extent will be defined and possible impacts to groundwater will be determined during a future mobilization. If soil concentrations do not exceed WDNR clean up criteria, and/or background concentrations, as presented in Table 3-3, then the site will be considered adequately documented for BRAC 2005 real property disposal and transfer actions at the 440th ARS.	***Baseline Condition:*** The assumed baseline condition (i.e., the null hypothesis [H_o]) is that the soil concentrations exceed WDNR clean-up levels and background concentrations. The site investigation will collect the data necessary to demonstrate that the null hypothesis is correct (the site conditions do present a human health and/or environmental risk) or to reject the null hypothesis (the site conditions do not present a human health and/or environmental risk). The consequences of deciding that the soil concentrations do not exceed WDNR clean-up levels and background concentrations, when they truly do, is that the soil and possibly groundwater would be contaminated, possibly endangering the environment and human health. The decision error (false rejection) has the more severe consequences near the action level since the risk of jeopardizing the environment and human health likely outweighs the consequences of an unnecessary risk assessment and remedial action. To guard against the possibility of concluding that the human health or environmental risk posed by the site is acceptable, when in fact unacceptable risk does exist, Earth Tech will: use of historical records, air photos documenting site use through time; collect and analyze an appropriate number of soil samples; and follow the sampling and analytical methods specified in the QAPP.	In this final process step, the team reviews the DQO outputs for consistency and completeness, and then reviews any existing data that may be used to support the sampling design. Any historical patterns, estimates of variance, and the homogeneity and characteristics of the matrices should be considered in any new sampling design. Heterogeneity may dictate that more samples be collected, while proven homogeneity of the matrices may allow fewer samples to be collected.

Table 3-1: Data Quality Objectives

440th Air Lift Wing ARS - Gen. Mitchell Airport Phase II Site Investigation

Step 1: Statement/Definition of the Problem	Step 2: Identify the Decision	Step 3: Identify the Inputs to the Decision	Step 4: Define the Boundaries of the Study	Step 5: Develop a Decision Rule	Step 6: Specify Tolerable Limits on Decision Errors	Step 7: Optimize the Design for Obtaining Data
Flare Burn Site						
Earth Tech conducted an interview with former facility personnel who indicated that a large number of flares may have been burned in the center of the Munitions Store Area in 1997. The flares were burned in a trench with approx. dimensions of 5 ft. deep, by 4.5 ft wide by 9 ft. long. The general location of the burn site is known, however the exact location is unknown. A geophysical survey will be conducted to look for subsurface anomalies. Potential contamination at the site needs to be documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS.	Has burning of flares in the Munitions Storage Area resulted in soil contamination adjacent to the trench location? Has the site been adequately characterized and documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS?	Observations from site reconnaissance. Phase I Investigation data and observations Soil borings locations will be selected based on the results of the geophysical survey that will better define the limits of the burn site. Multi-increment and discrete soil samples will be collected from and analyzed by definitive methods to determine the presence and concentration of TPH, VOCs, and RCRA metals. Table 3-3 of the work plan presents Methods and target analytes. Results from PID field screening will be used to determine sample locations and quantities. At a minimum, soil samples will be collected from one depth intervals at each of 5 boring locations for laboratory analysis.	The boundaries are the limits of the burn trench, which will be more accurately defined by the geophysical survey.	Results from the PID, visual and olfactory data will be used to determine whether gross contamination is present while still in the field. If gross contamination is observed, additional borings will be advanced and soil samples will be collected for lab analysis in an attempt to define the extent of soil contamination. For any boring location, if soil concentrations exceed WDNR screening criteria, and/or background concentrations, as presented in Table 3-3, the soil contamination extent will be defined and possible impacts to groundwater will be determined during a future mobilization. If soil concentrations do not exceed WDNR clean up criteria, and/or background concentrations, as presented in Table 3-3, then the site will be considered adequately documented for BRAC 2005 real property disposal and transfer actions at the 440th ARS.	***Baseline Condition:*** The assumed baseline condition (i.e., the null hypothesis [H_o]) is that the soil concentrations exceed WDNR clean-up levels and background concentrations. The site investigation will collect the data necessary to demonstrate that the null hypothesis is correct (the site conditions do present a human health and/or environmental risk) or to reject the null hypothesis (the site conditions do not present a human health and/or environmental risk). The consequences of deciding that the soil concentrations do not exceed WDNR clean-up levels and background concentrations, when they truly do, is that the soil and possibly groundwater would be contaminated, possibly endangering the environment and human health. The decision error (false rejection) has the more severe consequences near the action level since the risk of jeopardizing the environment and human health likely outweighs the consequences of an unnecessary risk assessment and remedial action. To guard against the possibility of concluding that the human health or environmental risk posed by the site is acceptable, when in fact unacceptable risk does exist, Earth Tech will: use of historical records, air photos documenting site use through time; collect and analyze an appropriate number of soil samples; and follow the sampling and analytical methods specified in the QAPP.	In this final process step, the team reviews the DQO outputs for consistency and completeness, and then reviews any existing data that may be used to support the sampling design. Any historical patterns, estimates of variance, and the homogeneity and characteristics of the matrices should be considered in any new sampling design. Heterogeneity may dictate that more samples be collected, while proven homogeneity of the matrices may allow fewer samples to be collected.

Table 3-1: Data Quality Objectives

440th Air Lift Wing ARS - Gen. Mitchell Airport Phase II Site Investigation

Step 1: Statement/Definition of the Problem	**Step 2: Identify the Decision**	**Step 3: Identify the Inputs to the Decision**	**Step 4: Define the Boundaries of the Study**	**Step 5: Develop a Decision Rule**	**Step 6: Specify Tolerable Limits on Decision Errors**	**Step 7: Optimize the Design for Obtaining Data**
Open Ditches						
Earthen drainage ditches that collect runoff from both on station and from the adjacent properties are present at the ARS. Properties south and west of the ARS include those where fuels are stored in ASTs, pesticides and fertilizers may be stored and used, paved area where vehicles are parked, fueled, washed, and maintained, and paved areas where aircraft are fueled and maintained. These activities could result in surface water runoff contaminated with hazardous substances and/or petroleum products that could drain onto the ARS property. The storm water drainage system consists of open ditches and underground drain lines. The areas of the storm water drainage system of most concern consist of open ditches that receive runoff from areas both on and off station where industrial activities occur that may result in contaminated runoff. Potential contamination at the site needs to be documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS.	Because the open ditches are not lined, has contaminated runoff resulted in contaminated sediment or soil in the open ditches? Has the site been adequately characterized and documented to facilitate BRAC 2005 real property disposal and transfer actions at the 440th ARS?	Observations from site reconnaissance. Phase I Investigation data and observations Shallow subsurface soil will be sampled by definitive methods to determine the presence and concentration of TPH, DRO, and polychlorinated biphenyls (PCBs). Approx. 3,000 linear feet of open ditches will be investigated. One soil samples will be collected along the open ditches at approximately 75 ft. intervals, but may be modified in the field based on field conditions. Table 3-3 of the work plan presents Methods and target analytes. Results from PID field screening will be used to determine sample locations and quantities. At a minimum, soil samples will be collected from one depth intervals at each of 5 boring locations for laboratory analysis.	The boundaries are the open ditches. The underground drain lines will not be sampled.	Results from the PID, visual and olfactory data will be used to determine whether gross contamination is present while still in the field. If gross contamination is observed, additional samples will be collected for lab analysis in an attempt to define the extent of soil contamination. For any boring location, if soil concentrations exceed WDNR screening criteria, and/or background concentrations, as presented in Table 3-3, the soil contamination extent will be defined and possible impacts to groundwater will be determined during a future mobilization. If soil concentrations do not exceed WDNR clean up criteria, and/or background concentrations, as presented in Table 3-3, then the site will be considered adequately documented for BRAC 2005 real property disposal and transfer actions at the 440th ARS.	***Baseline Condition:*** The assumed baseline condition (i.e., the null hypothesis [H_o]) is that the soil concentrations exceed WDNR clean-up levels and background concentrations. The site investigation will collect the data necessary to demonstrate that the null hypothesis is correct (the site conditions do present a human health and/or environmental risk) or to reject the null hypothesis (the site conditions do not present a human health and/or environmental risk). The consequences of deciding that the soil concentrations do not exceed WDNR clean-up levels and background concentrations, when they truly do, is that the soil and possibly groundwater would be contaminated, possibly endangering the environment and human health. The decision error (false rejection) has the more severe consequences near the action level since the risk of jeopardizing the environment and human health likely outweighs the consequences of an unnecessary risk assessment and remedial action. To guard against the possibility of concluding that the human health or environmental risk posed by the site is acceptable, when in fact unacceptable risk does exist, Earth Tech will: use of historical records, air photos documenting site use through time; collect and analyze an appropriate number of soil samples; and follow the sampling and analytical methods specified in the QAPP.	In this final process step, the team reviews the DQO outputs for consistency and completeness, and then reviews any existing data that may be used to support the sampling design. Any historical patterns, estimates of variance, and the homogeneity and characteristics of the matrices should be considered in any new sampling design. Heterogeneity may dictate that more samples be collected, while proven homogeneity of the matrices may allow fewer samples to be collected.

Table 3-2 Target Analytes, Methods and Screening Criteria

Analyte	Ground Water			Soil		
	RL[1]	Screening Level	Units	RL[1]	Screening Level	Units
Total Petroleum Hydrocarbons - Method SW8015						
C6-C10	42	none	µg/L	5.6	none	mg/kg
C10-C35	120	none	µg/L	10	none	mg/kg
Polychlorinated Biphenyls (PCBs) – Method SW8082						
PCB-1016	NA	NA	NA	0.05	5.5#	mg/kg
PCB-1221	NA	NA	NA	0.05	0.32#	mg/kg
PCB-1232	NA	NA	NA	0.05	0.32#	mg/kg
PCB-1242	NA	NA	NA	0.05	0.32#	mg/kg
PCB-1248	NA	NA	NA	0.05	0.32#	mg/kg
PCB-1254	NA	NA	NA	0.05	0.32#	mg/kg
PCB-1260	NA	NA	NA	0.05	0.32#	mg/kg
Glycols						
Ethylene Glycol	NA	NA	NA	TBD	160000#	mg/kg
Propylene Glycol	NA	NA	NA	TBD	55000#	mg/kg
Volatile Organic Compounds (VOCs) – Method SW8260B						
1,1,1,2-Tetrachloroethane	1.1	7*	µg/L	0.003	25#	mg/kg
1,1,1-Trichloroethane	1.0	40*	µg/L	0.005	22000#	mg/kg
1,1,2,2-Tetrachloroethane	**0.5 (0.14)**	**0.02***	µg/L	0.003	3#	mg/kg
1,1,2-Trichloroethane	1.0 (0.5)	0.5*	µg/L	0.005	11#	mg/kg
1,1-Dichloroethane	1.0	85*	µg/L	0.005	16000#	mg/kg
1,1-Dichloroethene	1.0 (0.4)	0.7*	µg/L	0.006	3900#	mg/kg
1,1-Dichloropropene	1.0	none	µg/L	0.005	none	mg/kg
1,2,3-Trichlorobenzene	1.0	none	µg/L	0.005	none	mg/kg
1,2,3-Trichloropropane	1.0	12*	µg/L	0.005	0.32#	mg/kg
1,2,4-Trichlorobenzene	1.0	14*	µg/L	0.005	780#	mg/kg
1,2,4-Trimethylbenzene	1.0	96*	µg/L	0.006	none	mg/kg
1,2-Dichloroethane	0.5	0.5*	µg/L	0.003	7#	mg/kg
1,2-Dichlorobenzene	1.0	60*	µg/L	0.005	7000#	mg/kg
1,2-Dibromo-3-chloropropane	**2.0 (0.4)**	**0.02***	µg/L	0.010	0.2#	mg/kg
1,2-Dichloropropane	1.0 (0.21)	0.5*	µg/L	0.005	9.4#	mg/kg
1,2-Dibromoethane (EDB)	**1.0 (0.13)**	**0.005***	µg/L	0.005	0.32#	mg/kg
1,3,5-Trimethylbenzene	1.0	96*	µg/L	0.005	none	mg/kg
1,3-Dichlorobenzene	1.0	125*	µg/L	0.006	230#	mg/kg
1,3-Dichloropropane	0.4	120#	µg/L	0.002	16000#	mg/kg
1,4-Dichlorobenzene	1.0	15*	µg/L	0.002	27#	mg/kg
1-Chlorohexane	1.0	none	µg/L	0.005	none	mg/kg
2,2-Dichloropropane	1.0	none	µg/L	0.005	none	mg/kg
2-Chlorotoluene	1.0	120#	µg/L	0.005	1600#	mg/kg
4-Chlorotoluene	1.0	430#	µg/L	0.005	5500#	mg/kg
Acetone	14	200*	µg/L	0.050	70000#	mg/kg
Benzene	0.4	0.5*	µg/L	0.002	0.0055**	mg/kg
Bromobenzene	1.0	none	µg/L	0.005	none	mg/kg
Bromochloromethane	1.0	none	µg/L	0.005	none	mg/kg
Bromodichloromethane	**0.5 (0.19)**	**0.06***	µg/L	0.002	11#	mg/kg
Bromoform	**1.0 (0.5)**	**0.44***	µg/L	0.006	81#	mg/kg
Bromomethane	3.0 (0.4)	1*	µg/L	0.010	110#	mg/kg
Carbon Disulfide	1.5	200*	ug/L	0.003	7800#	mg/kg

Table 3-2 Target Analytes, Methods and Screening Criteria

Carbon tetrachloride	1.0 (0.4)	0.5*	µg/L	0.005	4.9#	mg/kg
Chlorobenzene	0.5	20*	µg/L	0.002	1600#	mg/kg
Chloroethane	1.0	80*	µg/L	0.005	220#	mg/kg
Chloroform	0.44	0.6*	µg/L	0.002	780#	mg/kg
Chloromethane	1.0 (0.3)	0.3*	µg/L	0.005	none	mg/kg
cis-1,2-Dichloroethene	1.0	7*	µg/L	0.005	780#	mg/kg
cis-1,3-Dichloropropene	**0.5 (0.14)**	**0.02***	µg/L	0.003	6.4#	mg/kg
Dibromochloromethane	0.5	6*	µg/L	0.003	7.6#	mg/kg
Dibromomethane	1.0	61#	µg/L	0.005	780#	mg/kg
Dichlorodifluoromethane	1.0	200*	µg/L	0.005	16000#	mg/kg
Ethylbenzene	1.0	140*	µg/L	0.005	2.9**	mg/kg
n-Hexane	3.7	120*	ug/L	0.21	none	mg/kg
Hexachlorobutadiene	0.6	0.86#	µg/L	0.003	8.2#	mg/kg
Isopropylbenzene	1.0	660#	µg/L	0.005	7800#	mg/kg
Isopropyl ether	1.7	none	ug/L	0.0016	none	mg/kg
Methylene chloride	**1.0 (0.5)**	**0.05***	µg/L	0.005	85#	mg/kg
Methyl t-butyl ether (MTBE)	5.0	12*	µg/L	0.020	160#	mg/kg
MEK (2-Butanone)	10	90*	µg/L	0.020	47000#	mg/kg
MIBK (methyl isobutyl ketone)	10	50*	µg/L	0.020	none	mg/kg
Naphthalene	1.2	10*	µg/L	0.005	1600#	mg/kg
n-Butylbenzene	1.0	none	µg/L	0.005	none	mg/kg
n-Propylbenzene	1.0	none	µg/L	0.005	none	mg/kg
m,p-Xylene	2.0 (0.5)	1*	µg/L	0.005	4.1**	mg/kg
o-Xylene	1.0	1*	µg/L	0.005	4.1**	mg/kg
p-Isopropyltoluene	1.0	none	µg/L	0.006	none	mg/kg
sec-Butylbenzene	1.0	none	µg/L	0.005	none	mg/kg
Styrene	1.0	10*	µg/L	0.005	16000#	mg/kg
Trichloroethene (TCE)	1.0 (0.15)	0.5*	µg/L	0.005	1.6#	mg/kg
tert-Butylbenzene	1.0	none	µg/L	0.005	none	mg/kg
Tetrachloroethene	1.0 (0.4)	0.5*	µg/L	0.005	1.2	mg/kg
Tetrahydrofuran	10	10*	ug/L	0.026	84#	mg/kg
Toluene	1.0	200*	µg/L	0.005	1.5**	mg/kg
trans-1,2-Dichloroethene	1.0	20*	µg/L	0.005	1600#	mg/kg
trans-1,3-Dichloropropene	**1.0 (0.14)**	**0.02***	µg/L	0.005	6.4#	mg/kg
Trichlorofluoromethane	1.0	698*	µg/L	0.005	23000#	mg/kg
1,1,2-trichloro-1,2,2-trifluoroethane	2.8	59000#	µg/L	0.11	2300000#	mg/kg
Vinyl chloride	**1.0 (0.15)**	**0.02***	µg/L	0.005	0.09#	mg/kg
Explosives- Method SW8330						
HMX	NA	NA	NA	2.2	3900#	mg/kg
RDX	NA	NA	NA	1.0	5.8#	mg/kg
2,4,6- Trinitrotoluene	NA	NA	NA	0.25	21#	mg/kg
Tetryl	NA	NA	NA	0.34	none	mg/kg
1,3,5- Trinitrobenzene	NA	NA	NA	0.25	2300#	mg/kg
1,3- Dinitrobenzene	NA	NA	NA	0.38	7.8#	mg/kg
2-Amino-4,6-dinitrotoluene	NA	NA	NA	0.26	160#	mg/kg
4-Amino-2,6-dinitrotoluene	NA	NA	NA	0.28	160#	mg/kg
2,4-Dinitrotoluene	NA	NA	NA	0.25	160#	mg/kg
2,6-Dinitrotoluene	NA	NA	NA	0.30	78#	mg/kg
Nitrobenzene	NA	NA	NA	0.28	39#	mg/kg

Table 3-2 Target Analytes, Methods and Screening Criteria

2-Nitrotoluene	NA	NA	NA	0.30	780#	mg/kg
3-Nitrotoluene	NA	NA	NA	0.30	780#	mg/kg
4-Nitrotoluene	NA	NA	NA	0.26	780#	mg/kg
Metals – Method SW6010B						
Aluminum	NA	NA	mg/L	20	78000#	mg/kg
Antimony	NA	NA	mg/L	10	31#	mg/kg
Arsenic	**0.03 (0.0022)**	**0.001***	mg/L	1.0 (0.3)	1.6**	mg/kg
Barium	0.05	0.4*	mg/L	1	6000#	mg/kg
Beryllium	NA	NA	mg/L	1	160#	mg/kg
Cadmium	0.00058 (0.00017)	0.0005*	mg/L	0.5	510**	mg/kg
Calcium	NA	NA	mg/L	100	none	mg/kg
Chromium	0.01	0.01*	mg/L	1	200**	mg/kg
Cobalt	NA	NA	mg/L	1	none	mg/kg
Copper	NA	NA	mg/L	2	3100#	mg/kg
Iron	NA	NA	mg/L	3	55000#	mg/kg
Lead	0.005 (0.0014)	0.0015*	mg/L	3	500**	mg/kg
Magnesium	NA	NA	mg/L	100	none	mg/kg
Manganese	NA	NA	mg/L	1	1600#	mg/kg
Nickel	NA	NA	mg/L	2	1600#	mg/kg
Potassium	NA	NA	mg/L	200	none	mg/kg
Selenium	0.03	0.18#	mg/L	3	390#	mg/kg
Silver	0.01	0.18#	mg/L	1	180#	mg/kg
Sodium	NA	NA	mg/L	100	none	mg/kg
Thallium	NA	NA	mg/L	6	5.5#	mg/kg
Vanadium	NA	NA	mg/L	1	78#	mg/kg
Zinc	NA	NA	mg/L	2	23000#	mg/kg
Mercury – Method SW7470A/7471A						
Mercury	0.00028 (0.00008)	0.0002	mg/L	0.1	7.8#	mg/kg

Notes:

1. All results are reported down to the method detection limit. Method detection limit is provided in parentheses where reporting limit exceeds the screening criteria.

*Ch. NR 140.05 Preventative Action Limit (PAL)
**Ch. NR 720
EPA Region III RBC Table 4/6/2007

Bold font indicates target analytes with method detection limits that exceed screening criteria. Please note that PALs are 1/10 the Ch. NR 140.05 clean-up criteria and most method detection limits are less than Ch. NR 140.05 clean-up criteria.

µg/L: micrograms per kilogram
mg/L: milligrams per liter
mg/kg: milligrams per kilogram
NA: Will not be analyzed
none: No screening criteria available
RL: Reporting Limit

4.0 DATA ASSESSMENT, RECORDS, AND REPORTING REQUIREMENTS

The following sections discuss how data will be evaluated, records keeping, and reporting requirements.

4.1 Data Assessment

Soil quality will be evaluated using State of Wisconsin residual contaminant levels (RCL) and groundwater quality standards as detailed in the QAPP and in Table 3-2. For constituents where no state standards exist, U.S. Environmental Protection Agency (USEPA) Region III Risk-Based Concentrations (RBC) will be used.

4.2 Record Keeping

Field records sufficient to recreate all sampling and measurement activities and to meet data requirements will be maintained. The requirements listed in this section apply to all measuring and sampling activities. Requirements specific to individual activities are listed in the section that addresses each activity. The information will be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records will be archived in an easily accessible form and made available to the Air Force upon request.

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

The following additional information will be recorded for all sampling activities: (1) sample type and sampling method, (2) the identity of each sample and depth(s), where applicable, from which it was collected, (3) the amount of each sample, (4) sample description (e.g., color, odor, clarity), (5) identification of sampling devices, and (6) identification of site conditions/operations that might affect the condition of a sample (e.g., refueling operations, damaged casing). Daily Quality Control Reports summarizing this information will be prepared and emailed to the AFCEE Team Chief the following day.

4.3 Reporting Requirements

Data will be evaluated by comparison with Wisconsin state soil and groundwater quality standards, and for constituents where no state standards exist, USEPA Region III RBCs will be used. Soil sample results that exceed standards will be reported to WDNR in compliance with the state's Spills Law, following authorization by the Air Force. Wisconsin Administrative Code, Chapter NR 706.05(1)(b) requires that hazardous substance discharges be reported by fax, phone, or visiting a WDNR office in person.

If data indicates that contaminants have migrated beyond sample locations, recommendations for additional delineation of the horizontal or vertical extent of the plume will be provided.

Monthly progress reports, covering project status, plans, cost performance, labor requirements, and achievements will be prepared and submitted for review by AFCEE. Additionally, updates will be provided as required by the Air Force and regulatory authorities overseeing this project. This ensures timely communication of results, status, progress, resolution of problems, and directives for execution of the various tasks as required.

5.0 PROJECT SCHEDULE AND REFERENCES

Although work on preparation of the work plan, FSP, QAPP, and the health and safety plan has begun, a schedule for completion of the other Phase II site investigation activities has been developed, predicting the sequence and dates of project events. A Gantt chart depicting the project schedule is provided in Figure 5-1.

If events necessitate adjustment of the schedule, the project manager will notify Air Force personnel of the changes and potential impacts to deadlines and project completion.

References

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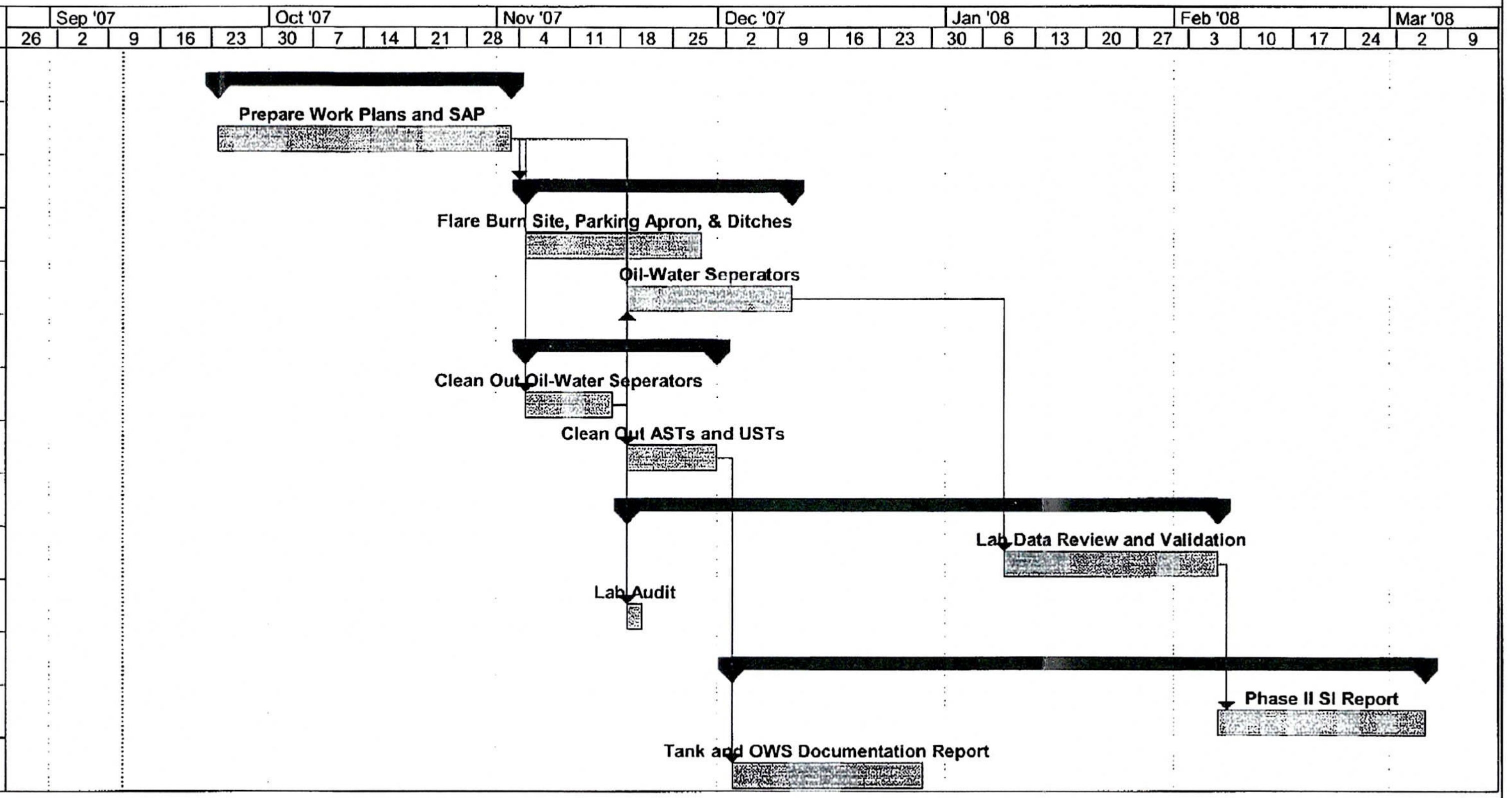
Wisconsin Department of Health and Family Services website. http://dhfs.wisconsin.gov/population/00demog/milwaukee.htm. October 2007

Gen. Mitchell ARS Project Schedule
Phase II Site Investigation & Tank Cleaning
4P-AE T.O. 0260

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Work Plans**	**30 days**	**Mon 9/24/07**	**Fri 11/2/07**	
2	Prepare Work Plans and SAP	30 days	Mon 9/24/07	Fri 11/2/07	
3	**Phase II Site Investigation Field Work**	**26 days**	**Mon 11/5/07**	**Mon 12/10/07**	2
4	Flare Burn Site, Parking Apron, & Ditches	18 days	Mon 11/5/07	Wed 11/28/07	
5	Oil-Water Seperators	16 days	Mon 11/19/07	Mon 12/10/07	7
6	**Tank Cleaning Field Work**	**20 days**	**Mon 11/5/07**	**Fri 11/30/07**	
7	Clean Out Oil-Water Seperators	10 days	Mon 11/5/07	Fri 11/16/07	2
8	Clean Out ASTs and USTs	10 days	Mon 11/19/07	Fri 11/30/07	7
9	**Chemistry Services**	**58 days**	**Mon 11/19/07**	**Wed 2/6/08**	
10	Lab Data Review and Validation	21 days	Wed 1/9/08	Wed 2/6/08	5FS+21 days
11	Lab Audit	2 days	Mon 11/19/07	Tue 11/20/07	2FS+10 days
12	**Reports**	**68 days**	**Mon 12/3/07**	**Wed 3/5/08**	
13	Phase II SI Report	20 days	Thu 2/7/08	Wed 3/5/08	10
14	Tank and OWS Documentation Report	20 days	Mon 12/3/07	Fri 12/28/07	8



Project: schedule
Date: Tue 9/11/07

Task	▬	Progress	▬	Summary	▬	External Tasks	▨	Deadline	⇩
Split	....	Milestone	◆	Project Summary	▬	External Milestone	◆		

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TITLE:
SCHEDULE

DATE:
OCT 2007

PROJECT NO.:
102171

PROJECT:
440th AIRLIFT WING
GENERAL MITCHELL INTERNATIONAL AIRPORT
AIR RESERVE STATION, WISCONSIN

FIGURE:
5-1

G:\us\MilwaukeeWI\home\sarah.provost\basket\projects\440th\Work Plan\Work Plan - Figure 5-1.dwg

APPENDIX A

SAMPLING AND ANALYSIS PLAN

AIR FORCE RESERVE COMMAND

FINAL

SAMPLING AND ANALYSIS PLAN

Prepared for:

Phase II Site Investigation and Tank Cleaning
440th Air Lift Wing
General Mitchell International Airport
Air Reserve Station, Wisconsin

Prepared by:

Earth Tech, Inc.
Chicago, Illinois

Contract No. F41624-03-D-8597
Delivery Order No. 260

Revision 0, October 31, 2007

LIST OF ATTACHMENTS

ATTACHMENT

1	Field Sampling Plan
2	Quality Assurance Project Plan

ATTACHMENT 1

FIELD SAMPLING PLAN

AIR FORCE RESERVE COMMAND

FINAL

FIELD SAMPLING PLAN

Prepared for:

Phase II Site Investigation and Tank Cleaning
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LIST OF ACRONYMS AND ABBREVIATIONS

AA	atomic absorption
AFCEE	Air Force Center for Engineering and the Environment
ARAR	applicable or relevant and appropriate requirement
ARS	Air Reserve Station
ASTM	American Society for Testing and Materials
bgs	below ground surface
Br^-	bromide
°C	degrees Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
Cl^-	chloride
cm/sec	centimeters per second
COC	chain of custody
COR	contracting officer representative
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DOD	Department of Defense
DOT	Department of Transportation
DNAPL	dense non-aqueous phase liquid
DQO	data quality objective
EC	electrical conductivity
EDB	ethylene dibromide
EPA	Environmental Protection Agency
F^-	fluoride
FID	flame ionization detector
FSP	Field Sampling Plan
ft	foot or feet
g/cm^3	grams per cubic centimeter
G	glass
gal/ft^3	gallons per cubic foot
GPR	ground penetrating radar
H_2SO_4	sulfuric acid
HCl	hydrochloric acid
HNO_3	nitric acid
HSP	Health and Safety Plan
IAW	in accordance with
IRP	Installation Restoration Program
IRPIMS	Installation Restoration Program Information Management System

lbs/gal	pounds per gallon
LNAPL	light non-aqueous phase liquid
mL	milliliter
mL/L	milliliters per liter
MS/MSD	matrix spike/matrix spike duplicate
$Na_2S_2O_3$	sodium thiosulfate
NCP	National Contingency Plan
NO_2^-	nitrite
NO_3^-	nitrate
NTU	nephelometric turbidity unit
OD	outside diameter
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
P	polyethylene
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
PO_4^{-3}	phosphate
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SO_4^{-2}	sulfate
SOW	statement of work
SP	spontaneous potential
SVOC	semivolatile organic compound

T	California brass
TCLP	toxicity characteristic leaching program
TPH	total petroleum hydrocarbon
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey
VOC	volatile organic compound
WP	work plan
µm	micrometer
3-D	three-dimensional

1.0 INTRODUCTION

The Field Sampling Plan (FSP) presents, in specific terms, the requirements and procedures for conducting field operations and investigations. This project specific FSP has been prepared to ensure (1) the data quality objectives specified for this project are met, (2) the field sampling protocols are documented and reviewed in a consistent manner, and (3) the data collected are scientifically valid and defensible. This site specific FSP and the Air Force Center for Engineering and the Environment (AFCEE) Quality Assurance Project Plan (QAPP), shall constitute, by definition, an AFCEE Sampling and Analysis Plan (SAP).

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

Guidelines followed in the preparation of this plan are set out in the: *Data Quality Objectives Process for Superfund, Interim Final Guidance* (U.S. Environmental Protection Agency [EPA], 1993).

This FSP is required reading for all staff participating in the work effort. The FSP shall be in the possession of the field teams collecting the samples. All contractors and subcontractors shall be required to comply with the procedures documented in this FSP in order to maintain comparability and representativeness of the collected and generated data.

Controlled distribution of the FSP shall be implemented by the prime contractor to ensure the current approved version is being used. A sequential numbering system shall be used to identify controlled copies of the FSP. Controlled copies shall be provided to applicable Air Force managers, regulatory agencies, remedial project managers, project managers, and quality assurance (QA) coordinators. Whenever Air Force revisions are made or addenda added to the FSP, a document control system shall be put into place to assure (1) all parties holding a controlled copy of the FSP shall receive the revisions/addenda and (2) outdated material is removed from circulation. The document control system does not preclude making and using copies of the FSP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. The distribution list for controlled copies shall be maintained by the prime contractor.

2.0 PROJECT BACKGROUND

2.1 THE U.S. AIR FORCE INSTALLATION RESTORATION PROGRAM

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

The 1976 Resource Conservation Recovery Act (RCRA) is one of the primary federal laws governing the disposal of hazardous wastes. Sections 6001 and 6003 of RCRA require federal agencies to comply with local and state environmental regulations and provide information to the EPA concerning past disposal practices at federal sites. RCRA Section 3012 requires state agencies to inventory past hazardous waste disposal sites and provide information to the EPA concerning those sites.

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

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

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

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

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

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

2.2 PROJECT PURPOSE AND SCOPE

The purpose of this project is to:

- Develop sufficient information to assess the health and safety risks on the property surveyed and to determine what actions are necessary to protect human health and the environment
- Support decisions for Finding of Suitability to Lease (FOSL) and Finding of Suitability to Transfer (FOST) Air Force facilities as well as aid in determining potential land use restrictions
- Document uncontaminated property as required and defined under Section 120 (h)(4) of CERCLA
- Support notice, when required under Section 120(h) of CERCLA, of the type, quantity, and time frame of any storage, release, or disposal of hazardous substances or petroleum products or their derivatives on the property
- Identify data gaps concerning environmental contamination
- Identify potential environmental concerns associated with the property.

Earth Tech will perform a Phase II Site Investigation at the Oil-Water Separators (OWS) Aircraft Parking Apron, Open Drainage Ditches and Flare Burn Site and clean OWS, above ground storage tanks (ASTs) and underground ground storage tanks (USTs) located at the 440 Air Lift Wing (440th) Air Reserve Station (ARS) located in Milwaukee, WI. The investigation is being conducted to support the Base Realignment and Closure (BRAC) 2005 property disposal and transfer actions for the ARS. The scope of work (SOW) presented in this FSP is in compliance with the AFCEE SOW dated September 5, 2007.

2.3 PROJECT SITE DESCRIPTION

The 440th lies within the boundaries of General Mitchell IAP in Milwaukee, Wisconsin, and occupies approximately 102 acres of land at the southwestern corner of the airport. The station is located within the City of Milwaukee and is approximately 7 miles south of the center of the city (Figure 2-1). It is situated on relatively flat terrain consisting of paved asphalt/concrete areas, improved grounds, and semi-improved grounds. The mission of the 440 ALW is to maintain operational readiness for the airlift of airborne units, personnel, supplies and equipment into prepared or unprepared areas by landing or airdrop. The wing is currently assigned 12 C-130H Hercules aircraft, which are now stationed at Pope Air Force Base, but return on occasion. The 440th is scheduled to close on February 2, 2008 pursuant to the 2005 BRAC.

A brief description of the sites where the Phase II Site Investigation will be conducted and tank cleaning task follows. The sites that will be investigated are shown on Figure 2-2.

2.3.1 Oil-Water Separators

Fifteen OWSs have been identified at the 440th. The station's OWS management plan identifies eight active OWSs located at buildings 104 (two OWSs), 208, 217, 219, 302, 308, and 314. The other seven OWSs have been closed. The eight active separators are either connected to indoor floor drains or receive rain and storm water from outdoor trenches (Corazon Mata, 2006). These OWS sites require investigation for possible releases of hazardous substances. Building 302 also requires investigation of a removed UST site for releases of hazardous substances. The WDNR requires facilities that discharge storm water from oil/water treatment devices to obtain an individual Wisconsin Pollutant Discharge Elimination System (WPDES) permit. Currently, there is an individual permit for the two OWSs located at the POL complex (facilities 308 and 314) that discharge to the storm water drainage system at outfalls 2 and 1, respectively. The remaining active OWSs discharge to the sanitary sewer system.

OWSs in locations where only petroleum products are utilized are assumed to have only received petroleum products. However, OWSs in locations where hazardous substances other than petroleum products are presently used or were known to be used in the past, are assumed to have received hazardous substances. OWSs can leak and discharge petroleum products and hazardous substances to the environment. Although no evidence of a release was identified at any of the active OWSs during past site inspections, the structural integrity of the OWSs could not be confirmed without a physical inspection. Therefore, all active OWSs in locations where only petroleum products are used are considered ECP Area Type 2; these include the OWSs at buildings 308 and 314. The active OWS at buildings 104 (two OWSs), 208, 217, 219, and 302 may have received hazardous substances in addition to petroleum products and are considered ECP Area Type 7.

The eight active OWSs will be investigated after they are cleaned out during another phase of this T.O. 260 project. The OWSs that will be investigated are located both outdoors and inside buildings.

2.3.2 Aircraft Parking Apron

Former activities on the aircraft parking apron at the 440th include aircraft fueling and deicing. Although best management practices are currently followed, past activities on aircraft parking aprons have not been documented but were likely to not follow current practices and often included activities using hazardous substances that are no longer allowed, such as using degreasers to clean aircraft while on the parking apron, and the previously mentioned discharge of JP-8 from engine test activities that were formerly conducted on the apron. At some other Air Force installations, these past activities have resulted in contamination beneath the concrete apron where petroleum products and hazardous substances entered the soil through seams in the paved surface and in contamination of adjacent unpaved areas that received contaminated surface water runoff from the apron. Therefore, as a result of past activities, the parking apron at the 440th may have been the site of releases of petroleum products, such as jet fuel, commingled with hazardous substances, such as degreasers. In addition, runoff from a portion of the aircraft parking apron flows to grassy areas east of the apron (EA Engineering Science and Technology Inc., 2005). Because of the potential for releases of petroleum products and hazardous substances to the apron and the adjacent grassy area to the east, the apron (Facility 7101) and the adjacent grassy area are considered ECP Area Type 7. Prior to construction of the engine test stand in 1993, engine testing activities were conducted on the aircraft apron where JP-8 was released to the apron and may have flowed to storm drains and/or adjacent unpaved areas.

2.3.3 Flare Burn Site

The flare burn site is approximately 0.25 acres and is located within the munitions storage area. Unused Teflon-magnesium anti-aircraft flares were destroyed in 1997 during a one-time burn in a trench with dimensions of 5 ft deep by 4.5 ft wide by 9 ft long based on an interview with former facility personnel. The flares were burned in a trench with approx. dimensions of 5 ft. deep, by 4.5 ft wide by 9 ft. long. The general location of the burn site is known, however the exact location is unknown.

2.3.4 Open Drainage Ditches

Earthen drainage ditches that collect runoff from both on station and from the adjacent properties are present at the ARS. Properties south and west of the ARS include those where fuels are stored in ASTs, pesticides and fertilizers may be stored and used, paved area where vehicles are parked, fueled, washed, and maintained, and paved areas where aircraft are fueled and maintained. These activities could result in surface water runoff contaminated with hazardous substances and/or petroleum products that could drain onto the ARS property. The storm water drainage system consists of open ditches and underground drain lines. The areas of the storm water drainage system of most concern consist of open ditches that receive runoff from areas both on and off station where industrial activities occur that may result in contaminated runoff. Approximately 3,000 linear feet of open drainage ditches will be investigated through shallow soil sampling.

The landscape company(ies) along A Street will be interviewed to find out what practices were routinely followed to determine whether any materials could have leached into the ditch along A Street.

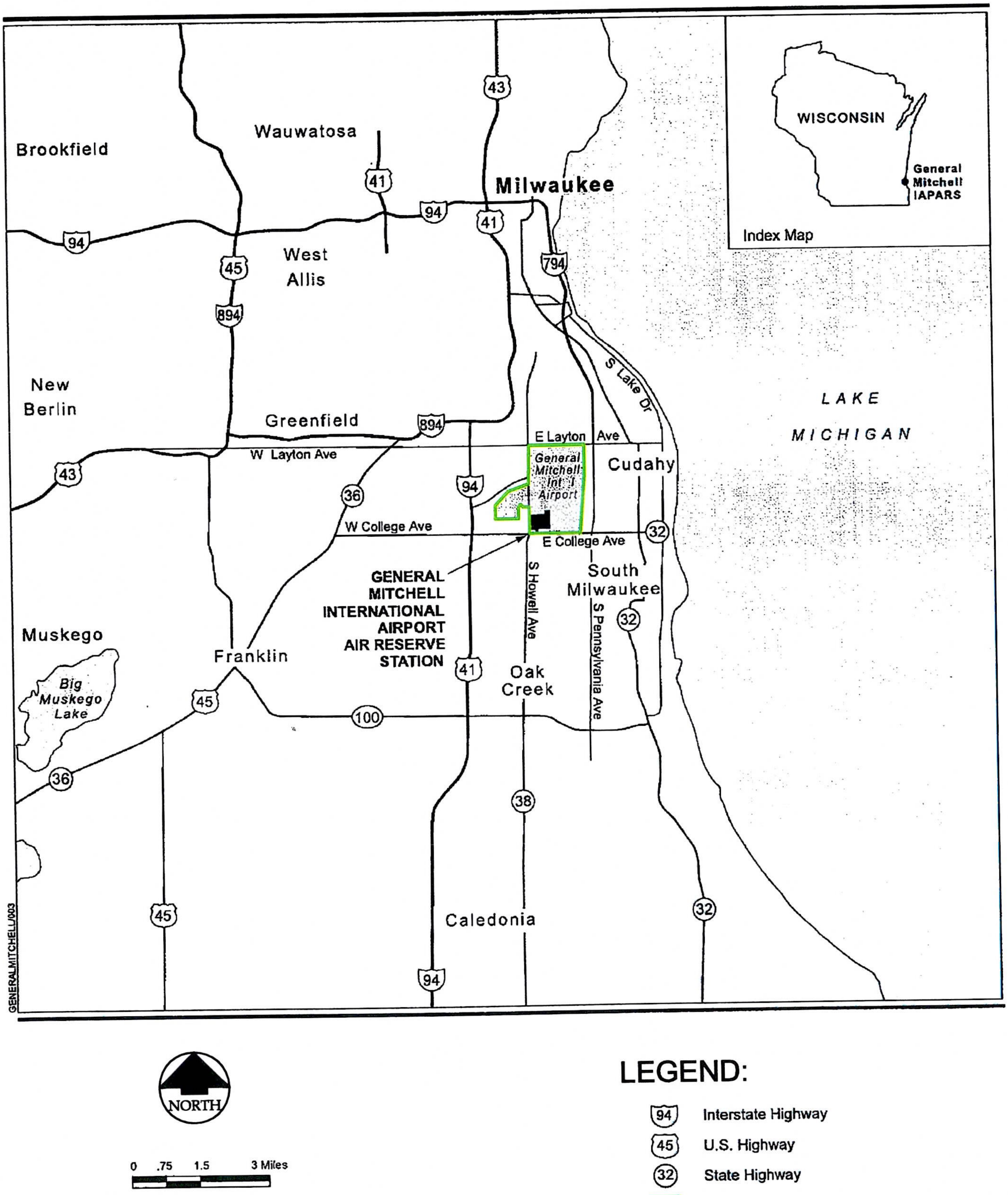
2.3.5 Tank Cleaning

Cleaning of OWS, ASTs and USTs will be completed as part of the this project. The cleaning will be conducted by Petroleum Equipment Co. under a subcontract to Earth Tech. No sampling will be conducted during the tank cleaning. The following tasks will be completed:

- Clean-out JP-8 Fuel Storage Tank (400,000 bbl). Subcontractor will draw down and empty remaining JP-8 fuel residue, clean-out (pressure wash with detergent) tank interior to "vapor free" condition; and empty/purge associated fueling and pipeline systems in preparation for extended shut-down.
- Clean-out two (2) 10,000 gallon and one (1) 1,000 gallon above ground storage tanks (one diesel; one gasoline; one reclaimed JP-8 fuel), clean-out (pressure wash with detergent) tank interior to "vapor free" condition; provide closure certification. Subcontractor will empty/purge associated fueling and piping systems in preparation for extended shutdown.
- Clean-out Oil/Water Separators. Draw down, empty and power wash eight (8) oil/water separators, including holding tanks and immediate adjacent piping. Caps will be provided to seal the inlets leading to Oil/Water Separators servicing shop areas where re-contamination could occur.
- Clean-out (pressure wash with detergent) tank interior to "vapor free" condition, and provide closure certification for an additional 14 State of Wisconsin registered above ground tanks.

2.4 PROJECT SITE CONTAMINATION HISTORY

None of the sites associated with this project have been investigated in the past so there is no contamination history available.



LEGEND:

94	Interstate Highway
45	U.S. Highway
32	State Highway
🟩	Property Boundary

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PHONE: 312-777-5500 FAX: 312-777-5501

TITLE:
SITE LOCATION MAP

DATE:
OCT 2007

PROJECT NO.:
102171

PROJECT:
440th AIRLIFT WING
GENERAL MITCHELL INTERNATIONAL AIRPORT
AIR RESERVE STATION, WISCONSIN

FIGURE:
2-1

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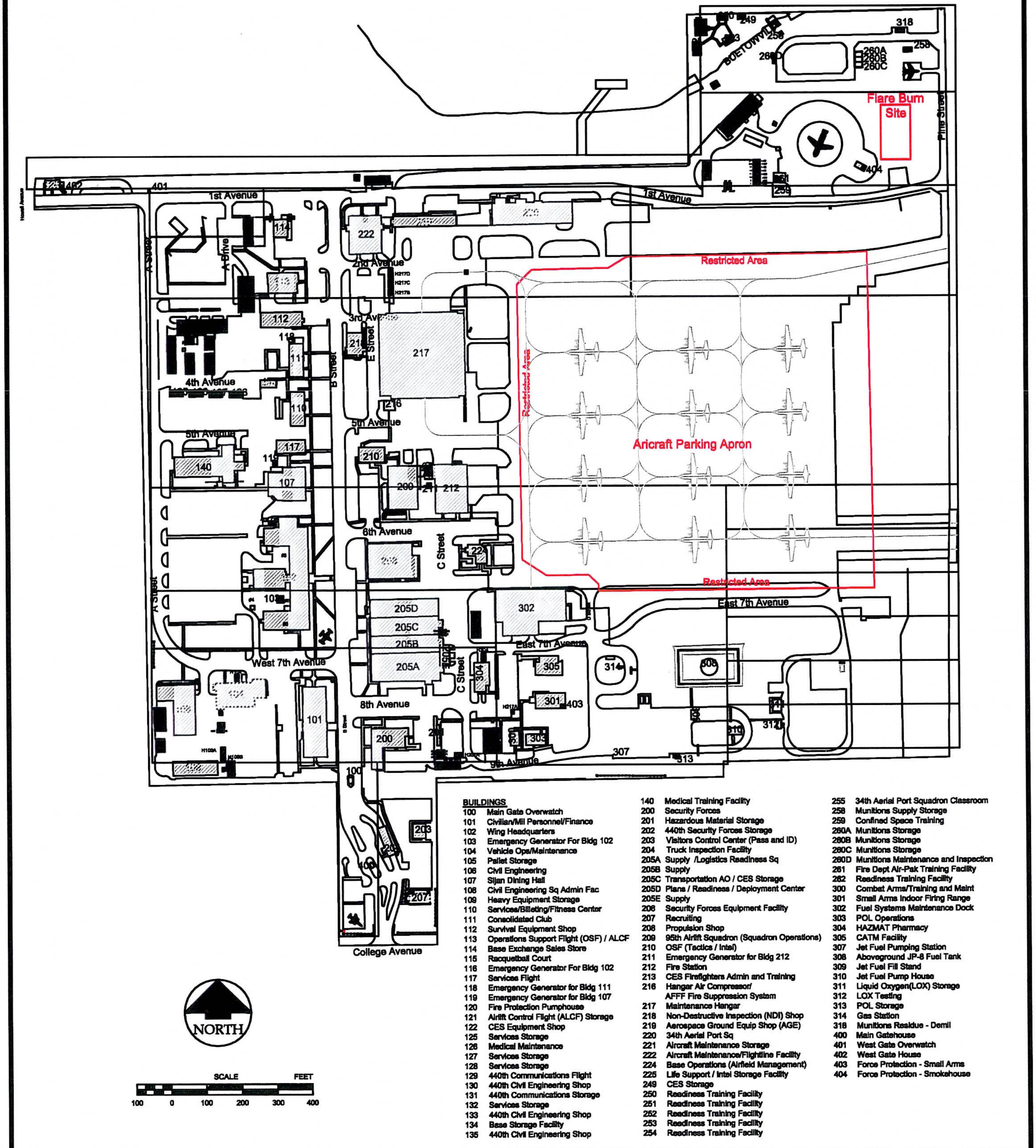

BUILDINGS	
100	Main Gate Overwatch
101	Civilian/Mil Personnel/Finance
102	Wing Headquarters
103	Emergency Generator For Bldg 102
104	Vehicle Ops/Maintenance
105	Pallet Storage
106	Civil Engineering
107	Siljan Dining Hall
108	Civil Engineering Sq Admin Fac
109	Heavy Equipment Storage
110	Services/Billeting/Fitness Center
111	Consolidated Club
112	Survival Equipment Shop
113	Operations Support Flight (OSF) / ALCF
114	Base Exchange Sales Store
115	Racquetball Court
116	Emergency Generator For Bldg 102
117	Services Flight
118	Emergency Generator for Bldg 111
119	Emergency Generator for Bldg 107
120	Fire Protection Pumphouse
121	Airlift Control Flight (ALCF) Storage
122	CES Equipment Shop
125	Services Storage
126	Medical Maintenance
127	Services Storage
128	Services Storage
129	440th Communications Flight
130	440th Civil Engineering Shop
131	440th Communications Storage
132	Services Storage
133	440th Civil Engineering Shop
134	Base Storage Facility
135	440th Civil Engineering Shop
140	Medical Training Facility
200	Security Forces
201	Hazardous Material Storage
202	440th Security Forces Storage
203	Visitors Control Center (Pass and ID)
204	Truck Inspection Facility
205A	Supply /Logistics Readiness Sq
205B	Supply
205C	Transportation AO / CES Storage
205D	Plans / Readiness / Deployment Center
205E	Supply
206	Security Forces Equipment Facility
207	Recruiting
208	Propulsion Shop
209	95th Airlift Squadron (Squadron Operations)
210	OSF (Tactics / Intel)
211	Emergency Generator for Bldg 212
212	Fire Station
213	CES Firefighters Admin and Training
216	Hangar Air Compressor/ AFFF Fire Suppression System
217	Maintenance Hangar
218	Non-Destructive Inspection (NDI) Shop
219	Aerospace Ground Equip Shop (AGE)
220	34th Aerial Port Sq
221	Aircraft Maintenance Storage
222	Aircraft Maintenance/Flightline Facility
224	Base Operations (Airfield Management)
225	Life Support / Intel Storage Facility
249	CES Storage
250	Readiness Training Facility
251	Readiness Training Facility
252	Readiness Training Facility
253	Readiness Training Facility
254	Readiness Training Facility
255	34th Aerial Port Squadron Classroom
258	Munitions Supply Storage
259	Confined Space Training
260A	Munitions Storage
260B	Munitions Storage
260C	Munitions Storage
260D	Munitions Maintenance and Inspection
261	Fire Dept Air-Pak Training Facility
262	Readiness Training Facility
300	Combat Arms/Training and Maint
301	Small Arms Indoor Firing Range
302	Fuel Systems Maintenance Dock
303	POL Operations
304	HAZMAT Pharmacy
305	CATM Facility
307	Jet Fuel Pumping Station
308	Aboveground JP-8 Fuel Tank
309	Jet Fuel Fill Stand
310	Jet Fuel Pump House
311	Liquid Oxygen(LOX) Storage
312	LOX Testing
313	POL Storage
314	Gas Station
318	Munitions Residue - Demil
400	Main Gatehouse
401	West Gate Overwatch
402	West Gate House
403	Force Protection - Small Arms
404	Force Protection - Smokehouse

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PHONE: 312-777-5500 FAX: 312-777-5501

TITLE:

SITE MAP

DATE:
OCT 2007

PROJECT NO.:
102171

PROJECT:
440th AIRLIFT WING
GENERAL MITCHELL INTERNATIONAL AIRPORT
AIR RESERVE STATION, WISCONSIN

FIGURE:
2-2

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3.0 PROJECT SCOPE AND OBJECTIVES

3.1 OBJECTIVES

The data quality objectives (DQOs) for this project were developed to characterize sites that have not been investigated in the past. A summary of the DQO for each of the sites to be investigated is included in Table 3-1 of the the Work Plan. Project specific decision rules were derived from the DQO process. The decision rules were similar for each of the sites and included an in-field evaluation of the PID readings, visual and olfactory data to determine whether gross contamination is present. If gross contamination is observed, additional samples will be collected for lab analysis in an attempt to define the extent of soil contamination.

For any boring location, if soil concentrations exceed WDNR screening criteria, and/or background concentrations, as presented in Table 3-1, the soil contamination extent will be defined and possible impacts to groundwater will be determined during a future mobilization. If soil concentrations do not exceed WDNR clean up criteria, and/or background concentrations, as then the site will be considered adequately documented for BRAC 2005 real property disposal and transfer actions at Mitchell ARS. Ultimately, the sites will need to been adequately characterized and documented to facilitate BRAC 2005 real property disposal and transfer actions.

The project-specific Quality Assurance Project Plan (QAPP) (based on the AFCEE QAPP version 4.0), the companion document to this FSP (Appendix A, Attachment 2), defines the laboratory quality assurance measures that will be used in generating analytical data.

The Phase II Site Investigation objectives for each of the sites are as follows:

Oil-Water Separators Objectives

The objective of the investigation at the OWSs is to determine whether the operation of the OWSs resulted in soil contamination around the OWS systems or beneath the waste oil accumulation tanks where petroleum products and hazardous substances may have entered the soil through structural defects?

In order to achieve this objective, surficial soils will be visually inspected and soil samples will be collected from borings using direct push technology. One boring will be advanced on each of the four sides of the eight OWS systems that will investigated, and one additional boring will be advanced through the bottom of the waste oil accumulation tank. A map showing the locations of the proposed boring locations is included as Figure 3-1. Core samples will be screened for VOCs using a photo ionization detector (PID). Two soil samples will be collected from each of the four sides (perimeter) of the OWS system within a five-foot radius for laboratory analysis of the following:

Soil

- Total Petroleum Hydrocarbons-Volatile & Extractable (TPH) – Method SW8015
- Volatile Organic Compounds (VOCs) – Method SW8260B
- RCRA Metals – Methods SW6010B and SW7470A/7471A

The perimeter soil samples will be collected over a 0.5 foot depth interval that is approximately two-thirds the depth of the bottom of waste-oil accumulation tank, and at the depth interval where the bottom of the tank is located.

The soil sample that will collected from the boring that is advanced through the bottom of the waste oil accumulation tank will be collected from a depth interval within one foot of the bottom of the tank. A surface soil sample will be collected for laboratory analysis if PID, olfactory or visual screening indicates contamination is present. A summary of the OWS locations, tank types, dimensions and proposed soil sample depths is shown on Table 3-2.

One groundwater sample will be collected from the boring that is advanced through the bottom of the waste oil accumulation tank. The sample will be collected from the boring using a groundwater sampling instrument, and no wells will be installed. The sample will be analyzed for TPH, VOCs and RCRA metals using the following analytical methods:

Groundwater

- Total Petroleum Hydrocarbons-Volatile & Extractable (TPH) – Method SW8015
- Volatile Organic Compounds (VOCs) – Method SW8260B
- RCRA Metals – Methods SW6010B and SW7470A/7471A

The depth to groundwater is expected to range from four to twelve feet below ground surface (bgs). The bottom of the waste oil accumulation tank that is penetrated by the boring will not be repaired.

Aircraft Parking Apron Objectives

The objective of the investigation at the Aircraft Parking Apron is to determine whether past activities have resulted in soil contamination beneath the concrete apron where petroleum products and hazardous substances may have entered the soil through seams in the paved surface and in contamination of adjacent unpaved grassy area to the east that received contaminated surface water runoff from the apron.

In order to achieve this objective, soil samples will be collected from borings using direct push technology. The apron concrete will be cored prior to advancing borings. The thickness of the concrete is assumed to be 12 inches and reinforced. One boring will be advanced under each wing of the twelve aircraft parking locations for a total of 24 borings. The fuel tanks are located in the wings of the aircraft and any fuel that was spilled is likely to be concentrated directly under the wings. Additionally, five borings will be advanced in the grassy area directly east of the apron to determine if runoff from the apron has impacted soil in this area. A map showing the locations of the proposed boring locations is included as Figure 3-2. Borings will be advanced to a depth of 5 feet below the sub-base gravel, and continuously sampled. The core sample will be screened for VOCs using a PID. One sample from each boring will be collected for laboratory analysis based on the interval with the highest PID reading. If there are no VOCs detected above background, the sample will be collected from the three foot depth interval for laboratory analysis. The soil samples will be analyzed for the following:

- Total Petroleum Hydrocarbons-Volatile & Extractable (TPH) – Method SW8015
- Volatile Organic Compounds (VOCs) – Method SW8260B
- Glycols – Method SW8015M

No groundwater sampling will be conducted. The concrete cores will be repaired at each of the boring locations on the apron.

Flare Burn Site Objectives

The first objective of the investigation at the Flare Burn Site is to determine the exact location of the trench where the flares where burned and whether anomalies are present. Anomalies may indicate the presence of unexploded ordnance. Photographs taken during the burn have been provided by the 440th. The second objective is to determine whether the burning of flares in the Munitions Storage Area resulted in soil contamination adjacent and under the trench where the burning was conducted.

In order to achieve the first objective, a geophysical survey will be conducted to determine the exact location and dimensions of the Flare Burn Pit. This task will be completed prior to locating the soil borings. Mapping will be completed along parallel paths/lanes marked on the ground surface. A geophysical array will collect data over the length of a lane and return along an adjacent lane. This survey method will be conducted over the area(s) believed to contain the flare burn pit. Geophysical data will be collected using a multi-time gate EM system with a 3.28-foot (1-meter) wide footprint. A Time Domain EM (TEM) mapping system (Genonics EM-61®) with GPS system capable of ± 1-meter precision will be the most likely array to be used to locate the burn pit as well as other metallic sources (anomalies) in the subsurface.

In order to achieve the second objective, soil samples will be collected from borings using direct push technology. One boring will be advanced adjacent to each of the four sides of the former trench location, and one boring will be advanced through the center of the trench. Borings will be advanced to a depth of 10 feet bgs and continuously sampled. The core sample will be screened for VOCs using a photo ionization detector (PID). One sample from each boring will be collected for laboratory analysis two feet below the bottom of the trench. The bottom of the trench is anticipated to be found at depth of 5 feet bgs, based on discussion with site personnel and photograph documentation, but the final depth will be determined after reviewing the results of the geophysical survey. The soil samples will be analyzed for the following:

- Explosives – Method SW8330
- RCRA Metals – Methods SW6010B and SW7470A/7471A

If anomalies indicative of unexploded ordnance are observed during the geophysical survey, the field investigation will be halted until the anomalies can be identified by qualified personnel.

No groundwater sampling will be conducted.

Open Drainage Ditches Objectives

The objective of the Open Drainage Ditch investigation is to determine whether contaminated runoff from the ARS and adjacent properties has resulted in contaminated sediment or soil in the open ditches. In general, soil samples will be collected every 75 feet along the open drainage ditches that are shown on Figure 3-4. A total of 39 samples will be collected from a depth of approximately 0.5 feet bgs. Certain drainages will be sampled more or less frequently depending on the adjacent land use and the type of operations that were conducted by the Air Reserve in that area. For example, at the ditch east of Building 7106 (engine test stand) in the southeast corner of the site, the sampling interval will be greater that 75 feet because no other potential contaminant sources were identified besides Building 7106 and ERP site LF-09. Three investigation have been conducted at this site in the past and minimal contamination was documented. The WDNR granted closure to this site in 2000. In some areas, such at the ditch west of the Visitors Control Center, fewer samples will be collected because no potential contaminant sources are located in the area.

The soil samples will be analyzed for the following:

- Total Petroleum Hydrocarbons -Volatile & Extractable (TPH) – Method SW8015
- Polychlorinated biphenyls (PCBs) – Method SW8082

3.2 SAMPLE ANALYSIS SUMMARY

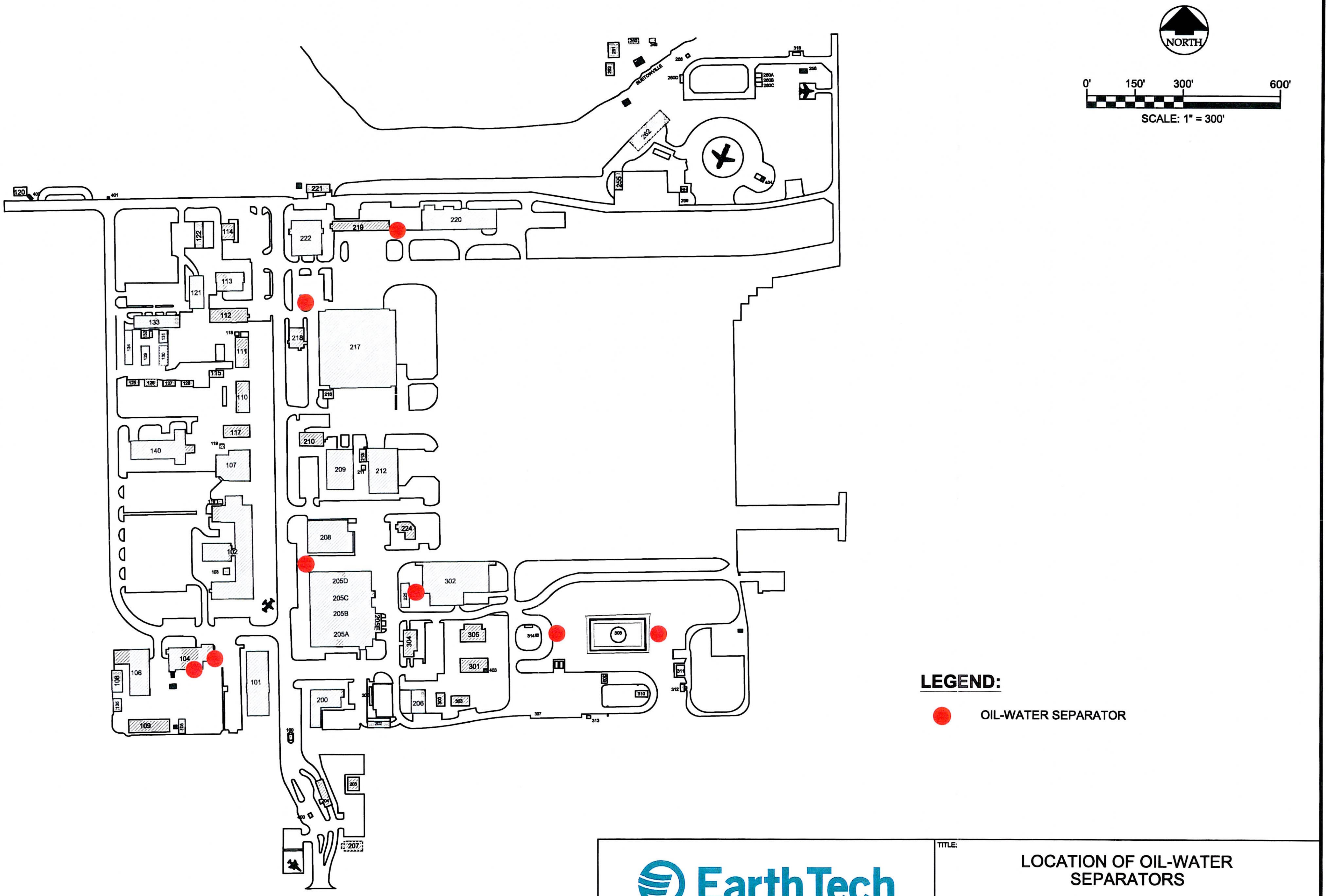
A summary of the sample analyses that will be used during this project are included in Table 3-3.

3.3 FIELD ACTIVITIES

A summary of the field activities that will be conducted during this project are shown in Table 3-4.

BUILDINGS

100	Main Gate Overwatch
101	Civilian/Mil Personnel/Finance
102	Wing Headquarters
103	Emergency Generator For Bldg 102
104	Vehicle Ops/Maintenance
105	Pallet Storage
106	Civil Engineering
107	Sijan Dining Hall
108	Civil Engineering Sq Admin Fac
109	Heavy Equipment Storage
110	Services/Billeting/Fitness Center
111	Consolidated Club
112	Survival Equipment Shop
113	Operations Support Flight (OSF) / ALCF
114	Base Exchange Sales Store
115	Racquetball Court
116	Emergency Generator For Bldg 102
117	Services Flight
118	Emergency Generator for Bldg 111
119	Emergency Generator for Bldg 107
120	Fire Protection Pumphouse
121	Airlift Control Flight (ALCF) Storage
122	CES Equipment Shop
125	Services Storage
126	Medical Maintenance
127	Services Storage
128	Services Storage
129	440th Communications Flight
130	440th Civil Engineering Shop
131	440th Communications Storage
132	Services Storage
133	440th Civil Engineering Shop
134	Base Storage Facility
135	440th Civil Engineering Shop
140	Medical Training Facility
200	Security Forces
201	Hazardous Material Storage
202	440th Security Forces Storage
203	Visitors Control Center (Pass and ID)
204	Truck Inspection Facility
205A	Supply /Logistics Readiness Sq
205B	Supply
205C	Transportation AO / CES Storage
205D	Plans / Readiness / Deployment Center
205E	Supply
206	Security Forces Equipment Facility
207	Recruiting
208	Propulsion Shop
209	95th Airlift Squadron (Squadron Operations)
210	OSF (Tactics / Intel)
211	Emergency Generator for Bldg 212
212	Fire Station
213	CES Firefighters Admin and Training
216	Hangar Air Compressor/ AFFF Fire Suppression System
217	Maintenance Hangar
218	Non-Destructive Inspection (NDI) Shop
219	Aerospace Ground Equip Shop (AGE)
220	34th Aerial Port Sq
221	Aircraft Maintenance Storage
222	Aircraft Maintenance/Flightline Facility
224	Base Operations (Airfield Management)
225	Life Support / Intel Storage Facility
249	CES Storage
250	Readiness Training Facility
251	Readiness Training Facility
252	Readiness Training Facility
253	Readiness Training Facility
254	Readiness Training Facility
255	34th Aerial Port Squadron Classroom
258	Munitions Supply Storage
259	Confined Space Training
260A	Munitions Storage
260B	Munitions Storage
260C	Munitions Storage
260D	Munitions Maintenance and Inspection
261	Fire Dept Air-Pak Training Facility
262	Readiness Training Facility
300	Combat Arms/Training and Maint
301	Small Arms Indoor Firing Range
302	Fuel Systems Maintenance Dock
303	POL Operations
304	HAZMAT Pharmacy
305	CATM Facility
307	Jet Fuel Pumping Station
308	Aboveground JP-8 Fuel Tank
309	Jet Fuel Fill Stand
310	Jet Fuel Pump House
311	Liquid Oxygen(LOX) Storage
312	LOX Testing
313	POL Storage
314	Gas Station
318	Munitions Residue - Demil
400	Main Gatehouse
401	West Gate Overwatch
402	West Gate House
403	Force Protection - Small Arms
404	Force Protection - Smokehouse



LEGEND:

● OIL-WATER SEPARATOR

EarthTech
A Tyco International Ltd. Company
10 S. RIVERSIDE PLAZA, SUITE 1900, CHICAGO, ILLINOIS 60606
PHONE: 312-777-5500 FAX: 312-777-5501

TITLE:
LOCATION OF OIL-WATER SEPARATORS

DATE: OCT 2007
PROJECT NO.: 102171
PROJECT: 440th AIRLIFT WING
GENERAL MITCHELL INTERNATIONAL AIRPORT
AIR RESERVE STATION, WISCONSIN
FIGURE: 3-1

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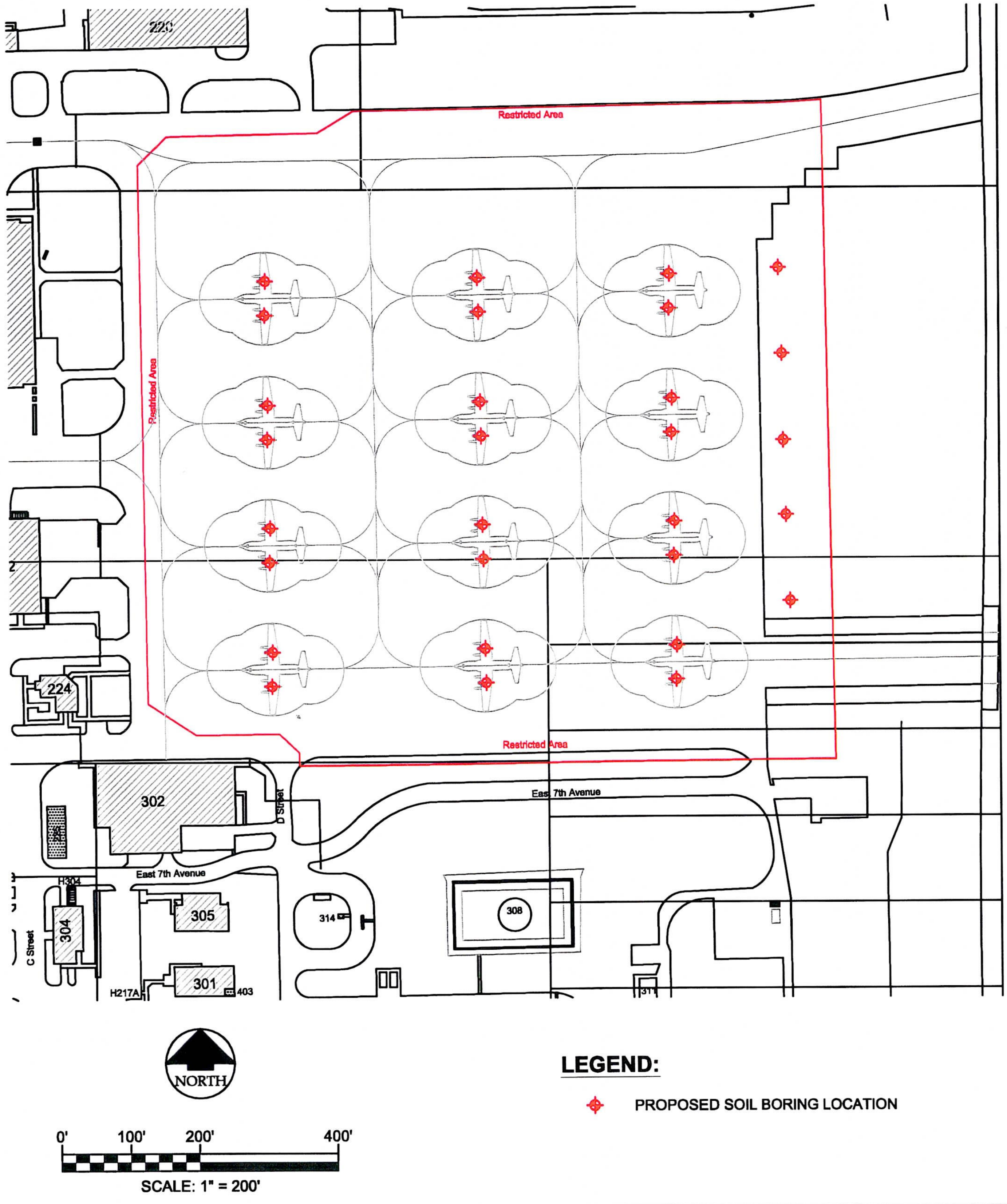

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PHONE: 312-777-5500 FAX: 312-777-5501

TITLE:

PROPOSED BORING LOCATIONS
AIRCRAFT PARKING APRON

DATE:
OCT 2007

PROJECT NO.:
102171

PROJECT:
440th AIRLIFT WING
GENERAL MITCHELL INTERNATIONAL AIRPORT
AIR RESERVE STATION, WISCONSIN

FIGURE:
3-2

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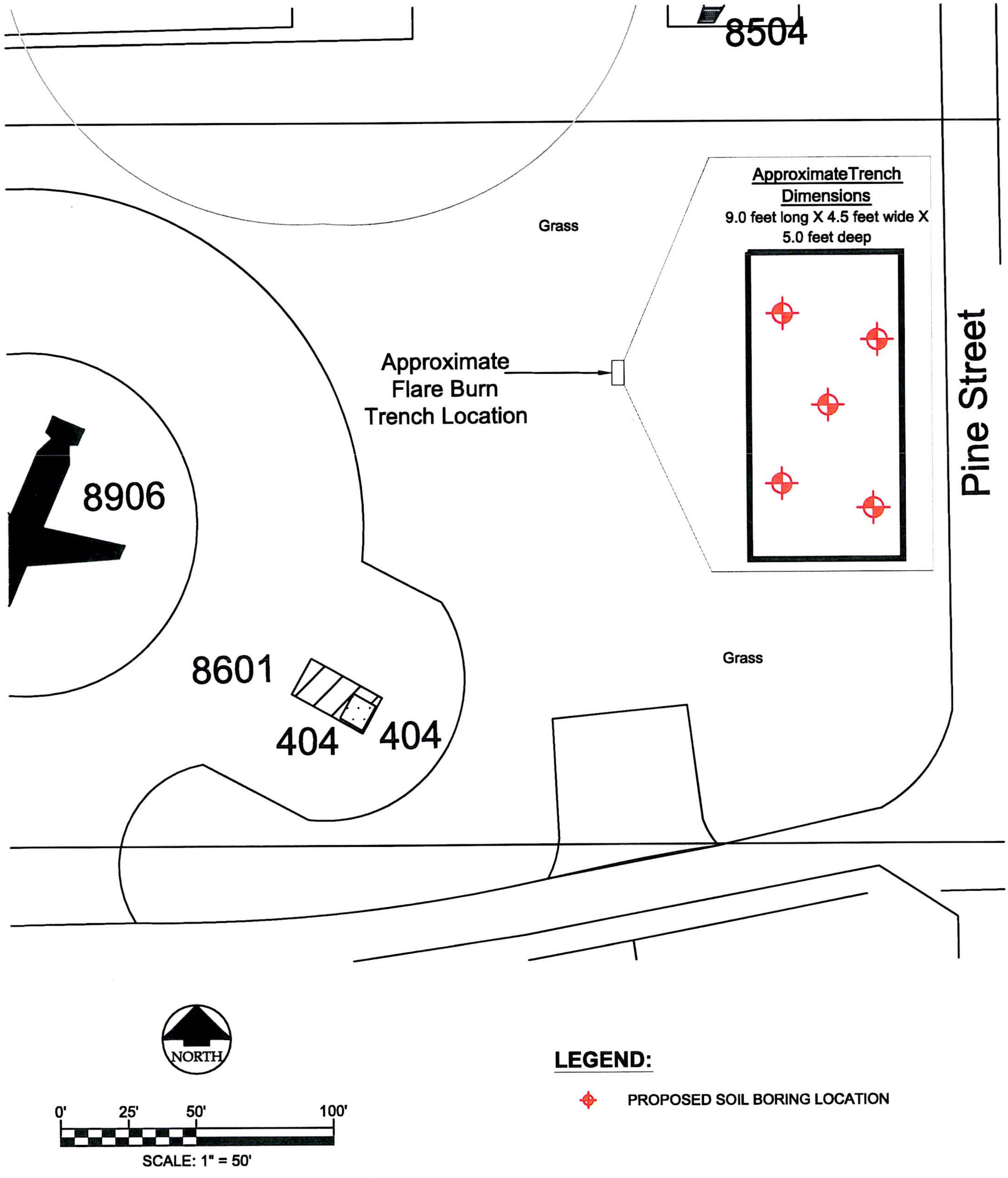

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TITLE:

PROPOSED BORING LOCATIONS
FLARE BURN SITE

DATE:	PROJECT:	FIGURE:
OCT 2007	440th AIRLIFT WING GENERAL MITCHELL INTERNATIONAL AIRPORT AIR RESERVE STATION, WISCONSIN	3-3
PROJECT NO.: 102171		

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BUILDINGS

100	Main Gate Overwatch
101	Civilian/Mil Personnel/Finance
102	Wing Headquarters
103	Emergency Generator For Bldg 102
104	Vehicle Ops/Maintenance
105	Pallet Storage
106	Civil Engineering
107	Sijan Dining Hall
108	Civil Engineering Sq Admin Fac
109	Heavy Equipment Storage
110	Services/Billeting/Fitness Center
111	Consolidated Club
112	Survival Equipment Shop
113	Operations Support Flight (OSF) / ALCF
114	Base Exchange Sales Store
115	Racquetball Court
116	Emergency Generator For Bldg 102
117	Services Flight
118	Emergency Generator for Bldg 111
119	Emergency Generator for Bldg 107
120	Fire Protection Pumphouse
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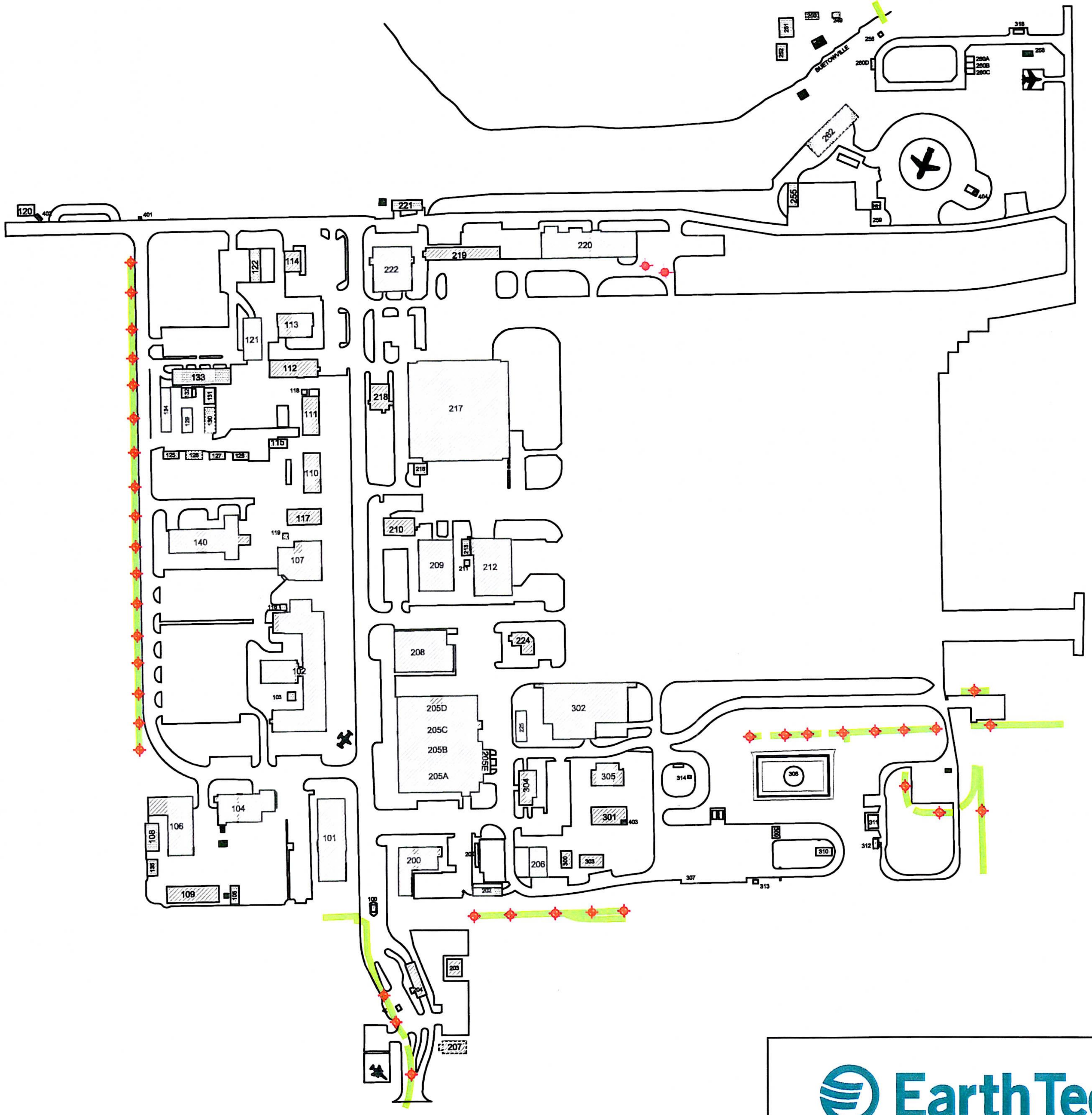
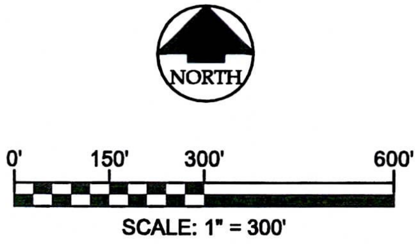
125	Services Storage
126	Medical Maintenance
127	Services Storage
128	Services Storage
129	440th Communications Flight
130	440th Civil Engineering Shop
131	440th Communications Storage
132	Services Storage
133	440th Civil Engineering Shop
134	Base Storage Facility
135	440th Civil Engineering Shop
140	Medical Training Facility
200	Security Forces
201	Hazardous Material Storage
202	440th Security Forces Storage
203	Visitors Control Center (Pass and ID)
204	Truck Inspection Facility
205A	Supply /Logistics Readiness Sq
205B	Supply
205C	Transportation AO / CES Storage
205D	Plans / Readiness / Deployment Center
205E	Supply
206	Security Forces Equipment Facility
207	Recruiting
208	Propulsion Shop
209	95th Airlift Squadron (Squadron Operations)
210	OSF (Tactics / Intel)
211	Emergency Generator for Bldg 212
212	Fire Station
213	CES Firefighters Admin and Training
216	Hangar Air Compressor/ AFFF Fire Suppression System
217	Maintenance Hangar
218	Non-Destructive Inspection (NDI) Shop
219	Aerospace Ground Equip Shop (AGE)
220	34th Aerial Port Sq
221	Aircraft Maintenance Storage
222	Aircraft Maintenance/Flightline Facility
224	Base Operations (Airfield Management)
225	Life Support / Intel Storage Facility
249	CES Storage
250	Readiness Training Facility
251	Readiness Training Facility
252	Readiness Training Facility
253	Readiness Training Facility
254	Readiness Training Facility
255	34th Aerial Port Squadron Classroom
258	Munitions Supply Storage
259	Confined Space Training
260A	Munitions Storage
260B	Munitions Storage
260C	Munitions Storage
260D	Munitions Maintenance and Inspection
261	Fire Dept Air-Pak Training Facility
262	Readiness Training Facility
300	Combat Arms/Training and Maint
301	Small Arms Indoor Firing Range
302	Fuel Systems Maintenance Dock
303	POL Operations
304	HAZMAT Pharmacy
305	CATM Facility
307	Jet Fuel Pumping Station
308	Aboveground JP-8 Fuel Tank
309	Jet Fuel Fill Stand
310	Jet Fuel Pump House
311	Liquid Oxygen(LOX) Storage
312	LOX Testing
313	POL Storage
314	Gas Station
318	Munitions Residue - Demil
400	Main Gatehouse
401	West Gate Overwatch
402	West Gate House
403	Force Protection - Small Arms
404	Force Protection - Smokehouse





LEGEND:

🔴 PROPOSED SURFACE SOIL SAMPLING LOCATIONS

🟩 DITCH LINE

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10 S. RIVERSIDE PLAZA, SUITE 1900, CHICAGO, ILLINOIS 60606
PHONE: 312-777-5500 FAX: 312-777-5501

TITLE:	PROPOSED OPEN DRAINAGE DITCH SAMPLING LOCATIONS
DATE:	OCT 2007
PROJECT NO.:	102171
PROJECT:	440th AIRLIFT WING GENERAL MITCHELL INTERNATIONAL AIRPORT AIR RESERVE STATION, WISCONSIN
FIGURE:	3-4

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Table 3-1
State of Wisconsin RCLs and Groundwater Quality Standards

Parameter	NR720.09 RCL GW Protection	NR720.11 RCL Direct Contact Industrial	NR746.06 RCL Direct Contact	NR746.06 RCL Indicators of Residual Petroleum Product	DNR Interim PAH Generic RCLs GW Protection	DNR Interim PAH Generic RCL's Direct Contact Industrial
RCRA Metals						
Arsenic		1,600				
Barium						
Cadmium		510,000				
Chromium (hex)		200,000				
Lead		500,000				
Mercury						
Selenium						
Silver						
PVOC's/Detected VOC's						
Benzene	5.5		1,100	8,500		
sec-Butylbenzene						
n-Butylbenzene						
Ethylbenzene	2,900			4,600		
Isopropylbenzene						
p-Isopropyltoluene						
Naphthalene	NS			2,700		
n-Propylbenzene						
Toluene	1,500			38,000		
1,2,4-Trimethylbenzene				83,000		
1,3,5-Trimethylbenzene				11,000		
Total Trimethylbenzene						
m&p-Xylene						
o-Xylene						
Xylenes, Total	4,100			42,000		
1,2-Dichloroethane (DCA)			540	600		
cis-1,2-Dichloroethene (DCE)						
trans-1,2-Dichloroethene (DCE)						
Trichloroethene (TCE)						
Tetrachloroethene (PCE)						
PAH's						
Acenaphthene					38,000	60,000,000
Acenaphthylene					700	360,000
Anthracene					3,000,000	300,000,000
Benzo(a)anthracene					17,000	3,900
Benzo(a)pyrene					48,000	390
Benzo(b)fluoranthene					360,000	3,900
Benzo(ghi)perylene					6,800,000	39,000
Benzo(k)fluoranthene					870,000	39,000
Chrysene					37,000	390,000
Dibenzo(a,h)anthracene					38,000	390
Fluoranthene					500,000	40,000,000
Fluorene					100,000	40,000,000
Indeno(1,2,3-cd)pyrene					680,000	3,900
1-Methylnaphthalene					23,000	70,000,000
2-Methylnaphthalene					20,000	40,000,000
Naphthalene					400	110,000
Phenanthrene					1,800	390,000
Pyrene					8,700,000	30,000,000

RCL - Residual Contaminant Level

Note: For compounds for which there are no state standards, WDNR recommends using EPA's Soil Screening Level website to calculate soil standards.

All concentrations given in ug/kg.

Table 3-2
Summary of OWS Dimensions and Proposed Sample Depths
Phase II Site Investigation
General Mitchell Airport Air Reserve Station

Bldg #	Location	Tank Type	Dimensions LxWxH (ft)	Sample Depth (ft)	
				Wall	Floor
104A	Vehicle Maintenance	Gravity Baffled (3 chambers w skimmer)	6 x 3 x 5		
		Waste Oil (horizontal)	5.8 x 4(H)	2.5 - 3.0	4.0 - 4.5
		Collection tank (vertical cylinder)	3(W) x 4		
104B	Refuel Maintenance	Vertical Compartment	2.5(W) x 5(H)		
		Waste Oil (horizontal)	6(L) x 4(H)	2.5 - 3.0	4.0 - 4.5
208	Engine shop	Gravity (2 chambers, 2 5ft long))	10 x 5 x 8.5	6.0 - 7.0	8.5 - 9.0
		No waste oil tank			
217	Aircraft Maintenance	Gravity Baffled (3 chambers w skimmer pipe)	30 x 15 x 10		
		Waste Oil (attached inside OWS)	6 x 3 x 12	9.0 - 9.5	12.0 - 12.5
219A &B	AGE	Manhole (Cylindrical 2 man-ways)	3(W) x 8(H)	3.0 - 3.5	5.0 - 5.5
		Waste Oil	Unknown (360 gal)		
302	Fuel System Maintenance Dock	Gravity Baffled (3 chambers w skimmer)	22 x 9 x 15		
		Waste Oil (attached outside OWS)	6 x 3 x 16	12.0 - 12.5	16.0 - 16.5
308	POL Dike	Gravity Baffled (3 chambers w skimmer)	20 x 10 x 10		
		Waste Oil (horizontal)	14(L) x 3.5(H)	2.0 - 2.5	3.5 - 4.0
314	Base Gas Station	Horizontal Manufactured (2 chambers)	33(L) x 8(H)	6.0 - 6.5	8.0 - 8.5
		No waste oil tank			

OWS - Oil water separator; WOAT - Waste Oil Accumulation Tank
Blgd - building
ft - feet
L - length W - width H - height
Last dimension value is always height of OWS

Table 3-3
Sample Analysis Summary

Site	Method	Matrix	# Samples	# Equipment Blanks	# Trip Blanks	# Field Duplicates	# MS and MSDs	Total # Samples
OWS	SW8260B-VOCs	Soil	85	0	8	8	8	109
	SW8015B – Volatile TPH C6-C10	Soil	85	0	8	8	8	109
	SW8015B – Extractable TPH C10-C35	Soil	85	0	0	8	8	101
	SW6010B – RCRA Metals	Soil	85	0	0	8	8	101
OWS	SW8260B-VOCs	Water	8	2	2	1	2	15
	SW8015B – Volatile TPH C6-C10	Water	8	2	2	1	2	15
	SW8015 – Extractable TPH C10-C35	Water	8	2	0	1	2	13
	SW6010B – RCRA Metals	Water	8	2	0	1	2	13
Flare Burn Pit	SW8330 – Explosives	Soil	5	0	0	1	2	8
	SW6010B – RCRA Metals	Soil	5	0	0	1	2	8
Aircraft Apron	SW8260B-VOCs	Soil	29	0	3	3	4	39
	SW8015B – Volatile TPH C6-C10	Soil	29	0	3	3	4	39
	SW8015B – Extractable TPH C10-C35	Soil	29	0	0	3	4	36
	SW8015M – Glycols	Soil	29	0	0	3	4	36
Open Ditches	SW8015B – Volatile TPH C6-C10	Soil	39	0	4	4	4	51
	SW8015B – Extractable TPH C10-C35 and DRO	Soil	39	0	0	4	4	47
	SW8082 – PCBs	Soil	39	0	0	4	4	47

Notes:
C: Carbon
DRO: Diesel Range Organics
MS: Matrix Spike
MSD: Matrix Spike Duplicate
OWS: Oil Waste Separator
PCBs: Polychlorinated Biphenyls
RCRA: Resource Conservation Recovery Act
TPH: Total Petroleum Hydrocarbon
VOCs: Volatile Organic Compounds

Table 3-4
Field Activities Summary

Site	Activity	Number of samples for analysis
Active Oil-Water Separators	Soil sampling for laboratory analysis	40 borings; 80 soil samples *
	Groundwater sampling for laboratory analysis	5 temporary wells; 5 samples
Aircraft Parking Apron	Soil sampling for laboratory analysis	29 borings; 29 samples
Flare Burn Site	Geophysical investigation	1 investigation
	Soil sampling for laboratory analysis	5 borings; 5 samples
Open Drainage Ditches	Surface soil sampling for laboratory analysis	39 samples locations

* - additional soil samples may be collected for laboratory analysis if surficial contamination is suspected during site inspection.

Does not include QA/QC samples.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

4.1 SUBCONTRACTORS

The project organization is comprised of AFCEE and Earth Tech staff, and subcontractors. A project organization chart is included at Figure 4-1. The Earth Tech field staff will be mobilized out of the Milwaukee and Chicago offices. The project manager, Greg McGovern, is located in the Chicago office. Ken Brown in the Milwaukee office is the regulatory specialist and tank cleaning task manager. Eric Slusser is the field team leader and is located in Chicago. Lisa McKenzie, the chemistry services manager, and other chemistry support will come from the Englewood office. Lisa and a junior staff member will perform the audit of CT Laboratories.

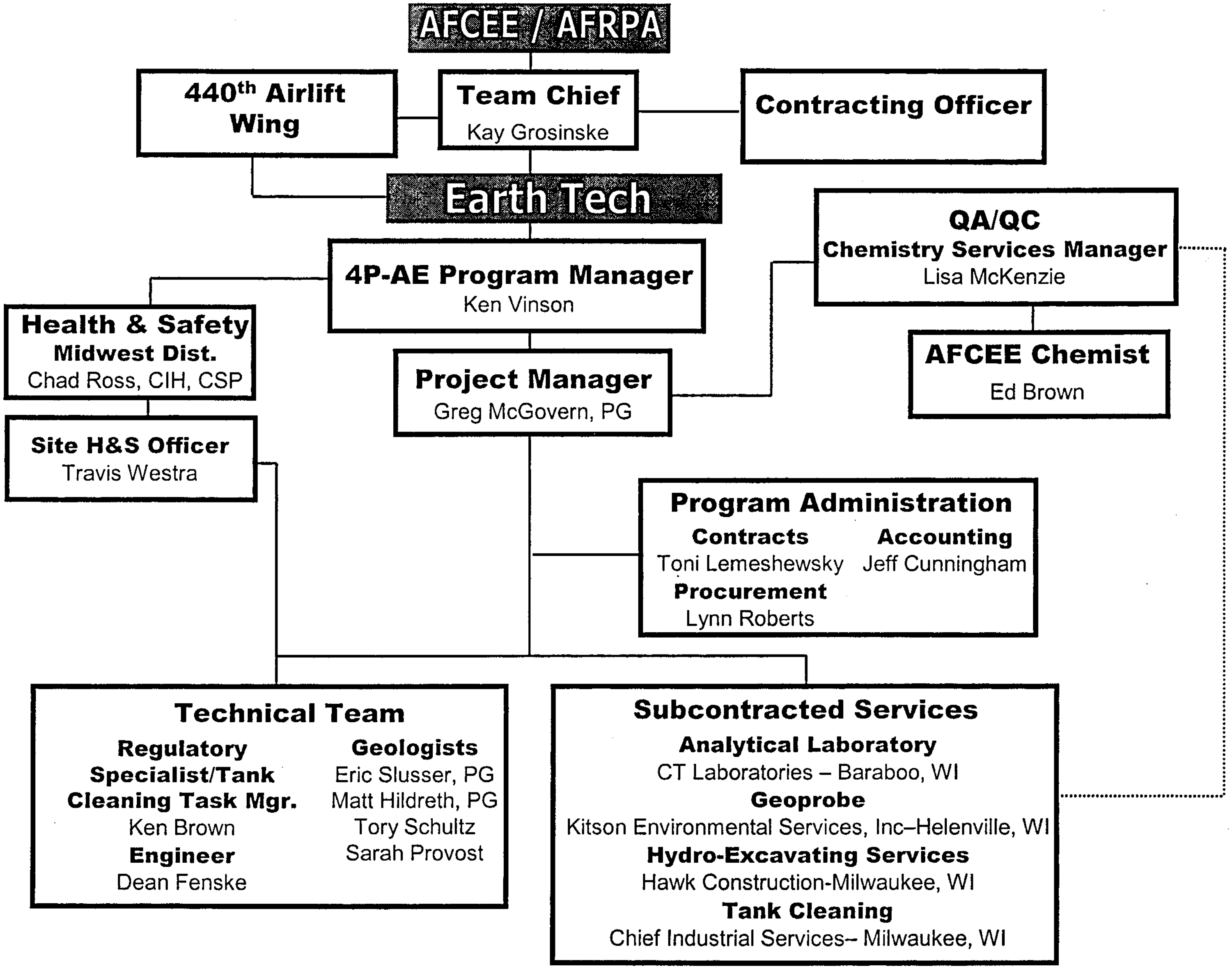
Subcontractors include CT Laboratories (lab) in Baraboo, Wisconsin. The lab will perform analysis of soil and groundwater samples. The lab has been audited by U.S. Army Corps of Engineers the recent past, and has analyzed samples under the AFCEE QAPP. Earth Tech will conduct an audit of the lab as part of this project.

Direct push technology soil sampling will be conducted by Kitson Environmental Services, Inc. Earth Tech has successfully worked on similar projects in Wisconsin with Kitson in the past.

In order to eliminate the risk of contacting/severing underground utilities during Geoprobing, a vacuum excavator will be used to "bore" a hole to a depth of ~ 4 feet at each of the four borings that will be drilled around the perimeter of each OWS. This process uses pressurized water and a truck-mounted vacuum system, and will be conducted by Hawk Construction located in Milwaukee. After the hole is created and any utilities have been observed, undisturbed soil samples will be collected using the Geoprobe® rig. The soil/water slurry will be disposed at a local landfill. Earth Tech has successfully worked on similar projects in Wisconsin with Great Lakes Power Vac in the past.

Tank cleaning services will be performed by Chief Industrial Services located in Milwaukee. Earth Tech has successfully worked with this firm on tank cleaning projects in Wisconsin in the past.

Figure 4-1 Phase II Site Investigation Project Organization Chart October 2007
General Mitchell ARS Milwaukee, WI



5.0 FIELD OPERATIONS

No additional field operations will be conducted at the 440th other than those described in Section 4.0.

5.1 GEOLOGIC STANDARDS

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

The sedimentary, igneous, and metamorphic rocks and deposits will be represented graphically by the patterns shown in the AFCEE Model FSP. Columnar sections, well and boring logs, well construction diagrams, cross sections, and three-dimensional (3-D) diagrams will use these patterns. Supplementary patterns shall follow Swanson, R. G., 1981, *Sample Examination Manual*, American Association of Petroleum Geologists, p IV-41 and 43. Geologic structure symbols shall follow *American Geological Institute Data Sheets*, 3d Edition, 1989, sheets 3.1 through 3.8.

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

For orientation, the cross sections will show the Northern end on the viewer's right. If the line of cross section is predominantly East-West, the Eastern end will be shown on the right. Maps will be oriented with North toward the top, unless the shape of the area dictates otherwise. Orientation will be indicated with a North arrow.

5.2 SITE RECONNAISSANCE, PREPARATION, AND RESTORATION PROCEDURES

Areas designated for intrusive sampling will be surveyed for the presence of underground utilities. Utility locations will be determined using existing utility maps, and in the field, will be verified using a hand-held magnetometer or utility probe. Fiber optic telecommunication, natural gas, electricity and water utilities are present at many locations throughout the ARS, especially near the OWSs. In order to eliminate the risk of contacting or severing underground utilities during Geoprobing, a vacuum excavator will be used to "bore" a hole to a depth of ~ 4 feet at each of the four borings that will be drilled around the perimeter of each OWS. This process uses pressurized water and a truck-mounted vacuum system, and will be conducted by Great Lakes Power Vac, LLC located in Milwaukee. After the hole is created and any utilities have been observed, undisturbed soil samples will be collected using the Geoprobe® rig. The soil/water slurry will be disposed at a local landfill.

Vehicle access routes to sampling locations shall be determined prior to any field activity.

A centralized decontamination area will be provided for drilling rigs and equipment. The location will be selected with input for base staff. The decontamination area will be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. The decontamination area will be lined with a heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. Solid wastes will be accumulated in 55-gallon drums and subsequently transported to a waste storage area designated by the Air Force. Smaller decontamination areas for personnel and portable equipment will be provided as necessary. These locations will include basins or tubs to capture decontamination fluids, which will be transferred to a large accumulation tank as necessary. These designated areas of decontamination are shown on the site maps in Section 3.0.

Each work site or sampling location will be returned to its original condition when possible. Efforts will be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a site, all drums, trash, and other waste will be removed. Decontamination and/or purge water and soil cuttings shall be transported to the designated staging location.

5.3 GEOPHYSICAL SURVEYS

5.3.1 General Requirements for Geophysical Surveys

The following general requirements for the geophysical survey at the Flare Burn Site will be met: (1) Earth Tech will have a state licensed geologist or engineer to supervise the work, (2) the locations of surface geophysical grid system layouts will be shown on a site map, (3) final results will be presented in plain views and cross sections. (4) the interpretation of results will discuss positive and negative results as well as limitations of the method and data and, (5) the interpretation of the data will be incorporated into the conceptual site model.

5.3.2 Surface Geophysical Surveys – Flare Burn Site

In order to determine the exact location and dimensions of the Flare Burn Pit prior to locating the soil borings, a geophysical survey will be conducted. The general survey location will be identified using measurements from landmarks recorded after the burn and photographs taken by 440th staff during the actual burn. Mapping will be completed along parallel paths/lanes marked on the ground surface. A geophysical array will collect data over the length of a lane and return along an adjacent lane. This survey method will be conducted over the area(s) believed to contain the flare burn pit. Geophysical data will be collected using a multi-time gate EM system with a 3.28-foot (1-meter) wide footprint. A Time Domain EM (TEM) mapping system (Genonics EM-61®) with GPS system capable of ± 1-meter precision will be the most likely array to be used to locate the burn pit as well as other metallic sources in the subsurface.

Instrument performance will be determined via on-site geophysical instrument validation and verified during data collection with quality control checks including instrument standardization checks and detection of seed items placed in the survey area. Continuous tracking, checks, and adjustments of the field data will be performed for QC and to establish efficient field procedures. The project geophysicist will review the field data to assess usefulness of the data for detecting and resolving metallic anomalies, including the burn pit. Noise levels in the data will be analyzed to ensure that they are sufficiently low to allow adequate signal-to-noise differentiation of pertinent anomalies. Unusable or incomplete data delivered for any survey lane will not be used for coverage calculations. Data shall be corrected for instrument bias, measurement drift, and if necessary, navigation errors. Data processing will be performed using Geosoft Oasis montaj or Golden Software SURFER for Windows software to perform quality checks, validate data, and plot findings.

5.5 BOREHOLE DRILLING, LITHOLOGIC SAMPLING, LOGGING, AND ABANDONMENT

5.5.1 General Drilling Procedures

All drilling activities will conform with state and local regulations and will be supervised by a state licensed geologist or state licensed engineer. The contractor shall obtain and pay for all permits, applications, and other documents required by state and local authorities.

The location of all borings shall be coordinated, in writing, with the base civil engineer or equivalent before drilling commences.

The drill rig shall be cleaned and decontaminated in accordance with the specification in Section 5.5.1. No drilling fluids will be used when advancing borings with the Geoprobe®.

Any lubricants that are used by the Geoprobe® subcontractor will not introduce or mask contaminants. The contractor will provide chemical analyses of all lubricants proposed for down hole use to the AFCEE. Lubricants with constituents that are toxic or that increase, decrease, or mask the target chemical species of the investigation will not be permitted. The contractor shall provide the analysis results to the AFCEE prior to drilling mobilization.

A log of drilling activities will be kept in a bound field notebook. Information in the log book will include location, time on site, personnel and equipment present, down time, materials used, samples collected, measurements taken, and any other observations or information that would be necessary to reconstruct field activities at a later date. At the end of each day of drilling the drilling supervisor will complete a Daily Drilling Log.

Earth Tech will dispose of all trash, waste grout, cuttings, and drilling fluids as coordinated with the base civil engineer or representative

5.5.2 Sampling and Logging

The lithology in all boreholes will be logged. The boring log form, in Section 8.0, will be used for recording the lithologic logging information. Information on the boring log sheet includes the borehole location; drilling information; sampling information such as sample intervals, recovery, and blow counts; and sample description information.

Unconsolidated samples for lithologic description will be obtained at each change in lithology or every five (5) foot interval, whichever is less or as specifically stated in the SOW. Lithologic descriptions of unconsolidated materials encountered in the boreholes will generally be described in accordance with American Society for Testing and Materials (ASTM) D-2488-90 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM, 1990). Descriptive information to be recorded in the field will include: (1) identification of the predominant particles size and range of particle sizes, (2) percent of gravel, sand, fines, or all three, (3) description of grading and sorting of coarse particles, (4) particle angularity and shape, and (5) maximum particle size or dimension.

Plasticity of fines description include: (1) color using Munsell Color System, (2) moisture (dry, wet, or moist), (3) consistency of fine grained soils, (4) structure of consolidated materials, and (4) cementation (weak, moderate, or strong).

Identification of the Unified Soil Classification System (USCS) group symbol will be used. Additional information to be recorded includes the depth to the water table, caving or sloughing of the borehole, changes in drilling rate, depths of laboratory samples, presence of organic materials, presence of fractures or voids in consolidated materials, and other noteworthy observations or conditions, such as the locations of geologic boundaries.

Lithologic descriptions of consolidated materials encountered in the boreholes will generally be described in accordance with Section 5.1. Consolidated samples for lithologic description will be obtained at each change in lithology or at five-foot intervals, whichever is less, or as specified in the SOW. All borehole cores will be screened at one-foot intervals with an organic vapor monitor (e.g., PID, organic vapor analyzer [OVA]). The samples will be handled in such a way as to minimize the loss of volatiles, and these procedures will be described in Section 6.0. Cuttings will be examined for their hazardous characteristics. Materials suspected to be hazardous because of abnormal color, odor, or organic vapor monitor readings will be containerized in conformance with the Resource Conservation and Recovery Act (RCRA) and the state and local requirements. Rock cores will be stored in standard core boxes, and missing sections of core will be replaced with spacers.

5.5.3 Borehole Abandonment

Boreholes that are not converted to monitor wells will be abandoned in accordance with applicable federal, state or local requirements. If a slurry is used, a mud balance and/or Marsh Funnel will be used to ensure the density (lbs/gal) of the abandonment mud mixture conforms with the manufacturer's specifications. The slurry will be emplaced from the bottom to the top of the hole using a tremie pipe.

All abandoned boreholes will be checked 24 to 48 hours after mud/solid bentonite emplacement to determine whether curing is occurring properly. More specific curing specifications may be recommended by the manufacturer and will be followed. If settling has occurred, a sufficient amount of mud/solid bentonite will be added to fill the hole to the ground surface. These curing checks and any addition of mud/solid bentonite will be recorded in the field log.

5.11 SURVEYING

All surveying locations of field activities will be measured by a certified land surveyor as the distance in feet from a reference location that is tied to the state plane system. The surveys will be third order (cf. Urquhart, L.C., *1962 Civil Engineering Handbook*, 4th Edition, p. 96 and 97). An XY-coordinate system will be used to identify locations. The X-coordinate will be the East-West axis; the Y-coordinate will be the North-South axis. The reference location is the origin. All surveyed locations will be reported using the state plane coordinate system. The surveyed control information for all data collection points will be recorded and displayed in a table. The table will give the X and Y coordinates in state plane coordinate values, the ground elevation, and the measuring point elevation if the location is a ground-water monitor well.

5.12 EQUIPMENT DECONTAMINATION

All equipment that may directly or indirectly contact samples and/or hazardous substances will be decontaminated in a designated decontamination area. This includes well casing, drill bits, auger flights, the portions of drill rigs that stand above boreholes, instruments, and sampling devices such as portable pumps, bailers, and water level indicators. In addition, the contractor will take care to prevent the sample from coming into contact with potentially contaminating substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

The following procedure will be used to decontaminate large pieces of equipment, such as casings, auger flights, pipe and rods, and those portions of the drill rig that may stand directly over a boring or well location or that come into contact with casing, auger flights, split spoons, pipe, or rods. The external surfaces of equipment will be washed with high-pressure hot water and Alconox, or equivalent laboratory-grade detergent, and if necessary, scrubbed until all visible dirt, grime, grease, oil, loose paint, rust flakes, and so forth, have been removed. The equipment will then be rinsed with potable water. The inside surfaces of casing, drill rod, and auger flights will also be washed as described. This procedure will be completed after the drill rigs arrive onsite and before beginning work, and after work is completed prior to demobilization.

Sampling equipment will be scrubbed with a solution of potable water and Alconox, or equivalent laboratory-grade detergent. The equipment will be rinsed with a tap water followed by a methanol spray and triple rinsed with distilled water. The equipment will be air dried on a clean surface or rack, such as Teflon®, stainless steel, or oil-free aluminum elevated at least 2 feet above ground. If the sampling device will not be used immediately after being decontaminated, it will be wrapped in oil-free aluminum foil, or placed in a closed stainless steel, glass, or Teflon® container. For pumps being used to develop or sample wells, the pump and hosing will be flushed with three gallons of an Alconox wash followed by 5 gallons of potable water and 5 gallons of distilled water. Water level indicators and interface probes will be decontaminated after each use by washing the external surfaces with water and Alconox, or equivalent laboratory-grade detergent followed by a distilled water rinse. This procedure will be performed before beginning work, and after each soil sample is collected.

Methanol will be purchased, stored, and dispensed only in glass, stainless steel, or Teflon® containers. These containers will have Teflon® caps or cap liners. These containers will ensure that these materials remain free of contaminants. If any question of purity exists, new materials will be used. Liquids that are generated during decontamination procedures will be containerized and handled as described in Section 5.5.

5.13 WASTE HANDLING

5.13.1 General Waste Handling Procedures

Investigative waste, such as litter and household garbage, will be collected on an as-needed basis to maintain each site in a clean and orderly manner. This waste will be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers will be sealed boxes or plastic garbage bags.

Investigation derived waste will be properly containerized and temporarily stored at each site, prior to transportation. Depending on the constituents of concern, fencing or other special marking may be required. The number of containers will be estimated on an as-needed basis. Acceptable containers will be sealed, U.S. Department of Transportation (DOT)-approved steel 55-gallon drums or small dumping bins with lids. The containers will be transported in such a manner to prevent spillage or particulate loss to the atmosphere.

The investigative derived waste will be segregated at the site according to matrix (solid or liquid) and as to how it was derived (drill cuttings, drilling fluid, decontamination fluids, and purged groundwater). Each container will be properly labeled with site identification, sampling point, depth, matrix, constituents of concern, and other pertinent information for handling.

5.14 HYDROGEOLOGICAL CONCEPTUAL MODEL

The project geologist will revise the existing base and site geological and hydrological conceptual model based on information developed during the project. Maps and cross sections shall be used to depict the conceptual model. The model shall be the basis for evaluating monitor well and piezometer locations, contaminant distribution (plume delineation), and the closeness of fit to natural conditions of analytical or computer-based numerical models.

6.0 ENVIRONMENTAL SAMPLING

6.1 SAMPLING PROCEDURES

The construction material of the sampling devices (e.g., plastic, PVC, metal) discussed below will be appropriate for the contaminant of concern and shall not interfere with the chemical analyses being performed.

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

6.1.1 Groundwater Sampling

Borehole sampling will be conducted at the OWS sites with a Geoprobe® groundwater sampling tool or a one-inch diameter temporary well depending on how turbid the samples are. If a temporary monitoring well is installed, samples will be collected using polyethylene tubing connected to a foot valve. Before the start of sampling activities, plastic sheeting shall be placed on the ground surrounding the well. The plastic sheeting shall be used to provide a clean working area around the well head, and prevent any soil contaminants from contacting sampling equipment. Remove water in the protective casing or in the vaults around the well casing prior to venting and purging. Every time a casing cap is removed to measure water level or collect a sample, the air in the breathing zone shall be checked with an organic vapor meter and the air in the well bore shall be checked with an explosimeter. Procedures in the Health and Safety Plan (HSP) shall be followed when high concentrations of organic vapors or explosive gases are detected. Air monitoring data shall be recorded on the well sampling form.

Purge pump intakes shall be equipped with a positive foot check valve to prevent purged water from flowing back into the well. Purging and sampling shall be performed in a manner that minimizes aeration in the well bore and the agitation of sediments in the well and formation. Equipment shall not be allowed to free-fall into a well.

In addition to the information required in Section 8.0, the following information shall be recorded each time a borehole is purged and sampled: (1) depth to water before and after purging, (2) borehole volume calculation, (3) sounded total depth of the borehole, and (4) the thickness of any nonaqueous layer.

6.1.1.1 Water Level Measurement

An interface probe will be used if a nonconductive floating product layer is suspected in the borehole. The interface probe will be used to determine the presence of floating product, if any, prior to measurement of the ground-water level. The groundwater level will then be measured to the nearest 0.01 foot using an electric water level indicator. Water levels will be measured from the ground surface.

6.1.1.2 Purging Prior to Sampling

Purging of boreholes is performed to evacuate water that has been stagnant in the borehole and to attempt to remove soil-laden groundwater. Purging shall be accomplished using a PVC bailer.

At least three well borehole volumes shall be removed from the boring before it is sampled. One well volume can be calculated using the following equation (reference: Ohio EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, June 1993):

$$V = H \times F$$

where V = one bore volume
H = the difference between the depth of boring and depth to water (ft)
F = factor for volume of one foot section of borehole (see table below)

Volume of Water in One-Foot Section of Well Casing

Diameter of Boring (inches)	F Factor (gallons)
1.5	0.09
2	0.16
3	0.37
4	0.65
6	1.47

Boreholes with yields too low to produce three bore volumes before the borehole goes dry shall be purged to dryness. Water removed from the well during purging shall be containerized. Detailed information concerning investigative derived wastes is presented in Section 5.13.

6.1.1.3 Sample Collection

Samples will be collected after three bore volumes have been removed. Before collecting ground-water samples, the sampler will don clean, phthalate-free protective gloves. Samples to be analyzed for volatile organic compounds (VOCs) will be collected using a bottom-filling or PVC bailer. Samples to be analyzed for volatile or gaseous constituents will not be withdrawn with pumps that exert a vacuum on the sample (e.g., centrifugal and peristaltic). Disposable nylon rope will be used to lower and retrieve the bailers. A new length of nylon rope will be used for each well, and the rope will be disposed of following the sampling activities. Each bailer will be equipped with a dedicated stainless steel or Teflon® coated leader so that the nylon rope will not contact the water in the well.

If DNAPL are suspected, a bailer will be lowered to the bottom of the well before purging, retrieved, and observed for the presence of DNAPL. The preservative hydrochloric acid will be added to the VOC sample bottle before introducing the sample water. The sample will be collected from the bailer using a slow, controlled pour down the side of a tilted sample vial to minimize volatilization. The sample vial will be filled until a meniscus is visible and immediately sealed. When the bottle is capped, it will be inverted and gently tapped to ensure no air bubbles are present in the vial. If, after the initial filling bubbles are present, the vials will be discarded and the VOC sampling effort will be repeated. Refilling of vials will result in loss of preservatives. After the containers are sealed, sample degassing may cause bubbles to form. These bubbles will be left in the container. These samples will never be composited, homogenized, or filtered.

Following collection of VOC samples, remaining water samples will be collected in the following order: SVOCs (semivolatile organic compounds), including polynuclear aromatic hydrocarbons (PAHs); metals; mercury; cyanide; total organic carbon; anions/cations; dissolved oxygen.

Water samples requiring filtering (i.e., those for metals analysis) will be filtered through a 0.45 µm membrane filter immediately (within five minutes) after sampling and prior to preservation. Do not use vacuum filtration or any method that may aerate the samples. Exposure of samples to atmospheric oxygen will be kept to a minimum. In-line filtration and use of disposable filter assemblies are preferred. Filters with larger pores may be used as pre-filters. If samples are filtered, the contractor will prepare a blank by filtering Type II Reagent-Grade Water and submitting the blank for analysis for metals. This will be done once per sampling round to assure that filtration does not bias sample results. Sample turbidity will be recorded and reported.

Required sample containers, preservation methods, volumes and holding times are given in Section 6.2 and Table 6-1. Sampling equipment will be decontaminated in accordance with Section 5.12 upon completion of sampling activities.

6.1.2 Subsurface Soil Sampling

Soil samples shall be collected based on odors, discoloration, organic vapor meter readings and any other field screening method.

Direct push sampling involves advancing a sampling probe/tool by direct hydraulic pressure, or by using a slide or rotary hammer. Samples may be collected continuously or at specific depths. The samples are collected in brass, stainless steel, or acetate sleeves. The sleeve will be capped with Teflon® tape and end caps. The ends of the capped sleeve will then also be wrapped with Teflon® tape. Care will be taken not to touch the ends of the sleeves prior to capping. Custody seals will be placed across the capped ends of the sleeve. Once the container has been filled, the appropriate information will be recorded in the field logbook.

6.1.3 Surface Soil Sampling

Surface soil samples will be collected from the land surface to six inches below the surface as part of the Open Drainage Ditch investigation. The sample will be homogenized and quartered before being containerized. If chemicals that are highly adsorbed to clay surfaces were released at the site, an additional sample will be collected from the surface to the 1 inch depth.

Stainless steel scoops or trowels, glass jars with Teflon® lids or equivalent equipment compatible with the chemical analyses proposed will be used to collect and store samples. Above ground plant parts and debris from the sample will be excluded.

In addition to records outlined in Section 8.0, unusual surface conditions will be recorded that may affect the chemical analyses, such as the following: (1) asphalt chunks that may have been shattered by mowers, thus spreading small fragments of asphalt over the sampling area, (2) distance to roadways, aircraft runways, or taxiways, (3) obvious, deposition of contaminated or clean soil at the site, (4) evidence of dumping or spillage of chemicals, (5) soil discoloration, and/or (6) unusual condition of growing plants, etc.

6.2 SAMPLE HANDLING

6.2.1 Sample Containers

Sample containers are purchased precleaned and treated according to EPA specifications for the methods. Sampling containers that are reused are decontaminated between uses by the EPA-recommended procedures (i.e., EPA 540/R-93/051). Containers are stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles are used routinely where glass containers are specified in the sampling protocol.

6.2.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on AFCEE samples are listed in Table 6-1. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods required in the is project are specified in Table 6-1.

6.2.3 Sample Identification

Two distinct codes will be used for sample identification to complete sample documentation, including chain-of-custody forms and sample labels. The two codes are necessary for use in the Air Force ERPIMS database, which is used to store the analytical data from the subcontract fixed laboratories.

The two identification codes will consist of up to 10 characters that will combine alpha and numeric characters and are referred to as the LOCID and FULLLOCID. Both the LOCID and the FULLLOCID will be used on all sample documentation. The LOCID is simply the well or sample point ID (ex. B011), and will be recorded on the upper right corner on the COC. The FULLLOCID combines the project code, site code, LOCID, and sample-type code and is recorded in the "Sample I.D." column on the COC form.

Sample labels are adhesive with unique numbers printed on them. Sample labels will be affixed to each sample container to avoid misidentification of samples. Sample labels will be preprinted and will include the following information:

- Sample identification code (FULLLOCID)
- Signature of collector
- Date and time of collection
- Analyses requested
- Preservatives used, if any

6.3 SAMPLE CUSTODY

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

WWA will maintain COC records for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view, after being in their possession, (3) it was in their possession and they locked it up or, (4) it is in a designated secure area.

All sample containers will be sealed in a manner that will prevent or detect tampering if it occurs. In no case will tape be used to seal sample containers. Samples will not be packaged with activated carbon unless prior approval is obtained from the AFCEE.

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

- Unique sample identification
- Date and time of sample collection
- Source of sample (including name, location, and sample type)
- Designation of matrix spike/matrix spike duplicate (MS/MSD)
- Preservative used
- Analyses required
- Name of collector(s)
- Pertinent field data (pH, temperature, etc.)
- Serial numbers of custody seals and transportation cases (if used)
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories
- Bill of lading or transporter tracking number (if applicable)

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

Samples collected in the field will be transported to the laboratory or field testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated, the samples will be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a volatile organics compounds sampling vial filled with water) will be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

All samples shall be uniquely identified, labeled, and documented in the field at the time of collection according to Section 6.2.3.

Samples collected in the field shall be transported to the laboratory or field testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated, the samples shall be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a volatile organics compounds sampling vial filled with water) shall be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

6.4 FIELD QUALITY CONTROL SAMPLES

6.4.1 Ambient Blank

The ambient blank consists of ASTM Type II reagent grade water poured into a volatile organic compound (VOC) sample vial at the sampling site. It is handled like an environmental sample and transported to the laboratory for analysis. Ambient blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes.

Ambient blanks are used to assess the potential introduction of contaminants from ambient sources (e.g., active runways, engine test cells, gasoline motors in operation, etc.) to the samples during sample collection. Ambient blanks shall be collected downwind of possible VOC sources. The frequency of collection for ambient blanks is specified in Section 3.2.

6.4.2 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent grade water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. The frequency of collection for equipment blanks is specified in Section 3.2. Equipment blanks shall be collected immediately after the equipment has been decontaminated. The blank shall be analyzed for all laboratory analyses requested for the environmental samples collected at the site.

6.4.3 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of VOCs.

6.4.4 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field such that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples prior to the beginning of sample collection.

Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. The frequency of collection for field duplicates is specified in Section 3.2.

6.4.5 Field Replicates

A field replicate sample, also called a split, is a single sample divided into two equal parts for analysis. The sample containers are assigned an identification number in the field such that they cannot be identified as replicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection. Replicate sample results are used to assess precision. The frequency of collection for field replicates is specified in Section 3.2.

Table 6-1
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Parameter	Analytical Methods	Sample Container		Preservation		Holding Time	
		Aqueous	Solid	Aqueous	Solid	Aqueous	Solid
Volatile organics (VOCs) BTEX	SW8260B	3 X 40-mL glass VOA vials, PTFE septum caps No headspace **Note:** Small bubbles may occur during shipping and handling.	3 X 60- or 125-mL glass vials with PTFE-lined caps 3 X 40- or 60-mL glass VOA vials (with stir bar for low level soil), PTFE septum caps	HCl to a pH <2 Cool to 4 °C	Low level Frozen to < -7 °C or cooled to 4 °C and frozen within 48 hours Low level soil Add 5g soil to 40 or 60 mL VOA vial prepreserved with 1g of $NaHSO_4$/5mL water Medium level soil Add 5g soil to 40 or 60 mL VOA vial prepreserved with 5 mL methanol	14 days	48 hours if only cooled to 4 °C 14 days for solid samples preserved by: • 4 °C/ frozen in 48 hrs • Frozen onsite • $Na_2S_2O_3$ • Methanol
Volatile TPH Gasoline Range organics (GRO)	SW8015B WDNR Modified GRO Method	3 X 40-mL glass VOA vials, PTFE septum caps No headspace **Note:** Small bubbles may occur during shipping and handling.	3 tared 40 (8-11 grams of soil) or 60 (20-26 grams of soil) mL VOC vials	500 uL 50% HCl Cool to 4°C	10 mL Methanol for 40 mL vials 25 mL Methanol for 60 mL vials Cool to 4°C	14 days	4 days to laboratory receipt 21 days to extraction 21 days to analyses
Extractable TPH Diesel Range Organics (DRO)	SW8015B WDNR modified DRO method	2 X 1-Liter amber glass bottles with PTFE-lined lids	3 tared 60 (25-25 grams of soil) or 120 (25-70 grams of soil) mL VOC vials Brass tube with plastic caps and Teflon sheets placed between cap and tube. Pack soil into tube with no headspace. Encore samplers with stainless steel "o-ring" cap packed with no headspace a	5 mL 50% HCl Cool to 4°C	Cool to 4°C	7 days to extraction 47 days to analyses	72 hours to addition of extraction solvent 47 days to extraction 47 days to analyses
PCBs Explosives Glycols	SW8082 SW8330 SW8015B	2 X 1-Liter amber glass bottles with PTFE-lined lids per parameter	250-mL amber glass wide-mouth jar (or can be clear if stored in dark)	Cool to 4°C	Cool to 4°C	7 days until extraction, and extracts analyzed within 40 days after extraction	14 days until extraction, and extracts analyzed within 40 days after extraction

Table 6-1
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Parameter	Analytical Methods	Sample Container		Preservation		Holding Time	
		Aqueous	Solid	Aqueous	Solid	Aqueous	Solid
Metals (except Cr [VI] and Hg)	SW6010B SW6020 and SW-846 AA methods	1-Liter glass or HDPE bottle	250-mL wide-mouth glass jar	HNO_3 to pH < 2	Cool to 4°C	180 days	180 days
Mercury	SW7470A (aqueous) SW7471A (solid)	250-mL glass or HDPE bottle	250-mL wide-mouth glass jar	HNO_3 to pH < 2	Cool to 4°C	28 days	28 days

7.0 FIELD MEASUREMENTS

7.1 PARAMETERS

Field measurement tests are described in the field sampling protocol SOPs. Field measurements will include static water levels and screening bore hole cores for VOCs. The equipment used for these measurements includes static water level indicators, interface probes and PIDs.

7.2 EQUIPMENT CALIBRATION AND QUALITY CONTROL

All field equipment will be calibrated using standard solutions at the beginning of each sampling day. Equipment will be calibrated and then checked against a known calibration solution. If readings are not within +/- 10% then instruments will be recalibrated. If the instrument fails the acceptance criteria after a second calibration it will be reported to the Field Team Leader (FTL). Extra equipment will be on hand to replace it. The FTL will call the equipment rental company and request a replacement field device. Daily calibrations are recorded on the Calibrations Log.

7.3 EQUIPMENT MAINTENANCE AND DECONTAMINATION

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

7.4 FIELD PERFORMANCE AND SYSTEM AUDITS

An Earth Tech representative will act as the FTL and will monitor all activities that are completed as part of the this FSP. The FTL will be responsible for the implementation of this FSP while in the field, and will ensure that the facilities, supplies, equipment and other materials required to perform the field programs are in place and available when needed.

The laboratory systems audit is an on-site, qualitative review of the analytical system to ensure that the activities are being performed in compliance with the project QAPP specifications. The analytical laboratory shall be audited by the Earth Tech at the beginning of the project. The laboratory systems audit results will be used to review laboratory operation and ensure the technical procedures and documentation are in place and operating to provide data that fulfill the project objectives and to ensure corrective actions have been implemented.

Critical items for a laboratory systems audit include: (1) sample custody procedures, (2) calibration procedures and documentation, (3) completeness of data forms, notebooks, and other reporting requirements, (4) data review and validation procedures, (5) data storage, filing, and record keeping procedures, (6) QC procedures, tolerances, and documentation, (7) operating conditions of facilities and equipment, (8) documentation of training and maintenance activities, (9) systems and operations overview, and (10) security of laboratory automated systems.

8.0 RECORD KEEPING

Field records sufficient to recreate all sampling and measurement activities and to meet all ERPIMS data loading requirements will be maintained. The requirements listed in this section apply to all measuring and sampling activities. Requirements specific to individual activities are listed in the section that addresses each activity. The information will be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records will be archived in an easily accessible form and made available to the Air Force upon request.

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

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

ATTACHMENT 2

QUALITY ASSURANCE PROJECT PLAN

AIR FORCE RESERVE COMMAND

FINAL

QUALITY ASSURANCE PROJECT PLAN

Prepared for:

Phase II Site Investigation and Tank Cleaning
440th Air Lift Wing
General Mitchell International Airport
Air Reserve Station, Wisconsin

Prepared by:

Earth Tech, Inc.
Chicago, Illinois

Contract No. F41624-03-D-8597
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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%R	percent recovery
AA	atomic absorption
AAB	AFCEE analytical batch
AFCEE	Air Force Center for Engineering and the Environment (formerly Air Force Center for Environmental Excellence)
AFB	Air Force Base
ASTM	American Society for Testing and Materials
BFB	4-bromoflurobenzene
CDPHE	Colorado Department of Public Health and Environment
CCV	corrective calibration verification
CFR	Code of Federal Regulations
COC	chain of custody
COPC	chemical of potential concern
DO	dissolved oxygen
DoD	Department of Defense
DQI	data quality indicator
DQO	data quality objective
DRO	diesel range organics
Earth Tech	Earth Tech, Inc.
ECD	electron capture detector
EDD	electronic data deliverable
EPA	Environmental Protection Agency, U.S.
ERPIMS	Environmental Restoration Program Information Management System
FID	flame ionization detector
FSP	Field Sampling Plan
GALP	Good Automated Laboratory Practices
GC	gas chromatography
GRO	gasoline range organics
HPLC	high-performance liquid chromatography
IC	ion chromatography
ICP-AES	inductively coupled plasma-atomic emission spectroscopy
ICS	interference check sample
ICV	initial calibration verification
IDL	instrument detection limit
IS	internal standard
LCS	laboratory control sample
MDL	method detection limit
mg/kg	milligram per kilogram
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
PAH	polyaromatic hydrocarbon

PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCBs	polychlorinated biphenyls
PFTBA	perfluorotributylamine
PID	photoionization detector
PQO	project quality objective
PTFE	polytetrafluoroethylene
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RF	response factor
RL	reporting limit
RPD	relative percent difference
RT	retention time
SI	Site Inspection
SOP	standard operating procedure
SVOC	semi-volatile organic compound
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
USAF	U.S. Air Force
VOA	volatile organic analyte
VOC	volatile organic compound

1. INTRODUCTION

This project-specific *Quality Assurance Project Plan* (QAPP) establishes the analytical protocols and documentation requirements to ensure that data are collected, reviewed, and assessed in a consistent manner to meet the overall project goals and that the data are scientifically valid and defensible for the Phase II investigation of the OWSS, Flare Burn Site, Apron, and Ditches at General Mitchell (Mitchell) Air Reserve Station (ARS), Milwaukee Wisconsin. This QAPP is based on the Air Force Center for Engineering and Environment (AFCEE) QAPP, Version 4.0. This QAPP presents, in specific terms, the policies, organization, functions, and quality assurance/quality control (QA/QC) requirements designed to achieve the data quality objectives (DQOs) described in the Phase II investigation of the OWSS, Flare Burn Site, Apron, and Ditches *Field Sampling Plan* (FSP) (Field Sampling Plan, Table 3-1).

This QAPP shall be read by all essential staff participating in the work effort and shall be in the possession of the field teams and in all laboratories performing analytical services. All contractors and subcontractors shall be required to comply with the procedures documented in this QAPP in order to maintain comparability and representativeness of the data produced.

2. PROJECT DESCRIPTION

2.1 The U.S. Air Force Installation Restoration Program

Section 2.1 of the e AFCEE QAPP 4.0 provides an overall description of the USAF Installation Restoration Program.

2.2 Project Background

Phase II investigation of the OWSS, Flare Burn Site, Apron, and Ditches Work Plan Section presents the project background.

2.3 Project Scope and Objectives

Section 3 of the Phase II investigation of the OWSS, Flare Burn Site, Apron, and Ditches FSP discuss the project scope and objectives. Data collected during the Phase II investigation will be used to develop and provide the appropriate documentation to facilitate the BRAC 2005 real property disposal and transfer actions at Mitchell ARS.

3. PROJECT ORGANIZATION AND RESPONSIBILITY

Section 4 of the FSP summarizes project organization and responsibilities.

CT Laboratories in Baraboo Wisconsin, has been subcontracted to provide analytical services in support of the Phase II investigation at Mitchell ARS, with Earth Tech oversight. CT Laboratories is certified by the State of Wisconsin Department of Natural Resources (WDNR) to perform groundwater and soil analyses by the method presented in this QAPP (Laboratory ID 157066030). They will be responsible for analyzing soil and groundwater samples according to this QAPP.

4. PROJECT QUALITY OBJECTIVES AND ELEMENTS OF QUALITY CONTROL

The project quality objectives (PQOs) presented in this section provide the basis for the DQOs (FSP Table 3-1), which specify the quantity and quality of data to be collected and evaluated.

Specific measurement performance criteria for the data quality indicators (DQIs)—precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS)—are developed in the planning phase and become essential elements in the assessment of overall data quality. The goals of these indicators (field and laboratory) are incorporated into the overall PQOs. Evaluation of the data against well-defined measurement performance criteria facilitates the process of data qualification and/or necessary corrective actions.

4.1 Data Types

The two general types of data, screening data and definitive data, are defined in Section 4.1 of the AFCEE QAPP, Version 4.0.

The following physical test methods that will be employed for the Mitchell ARS Phase II Investigation have been designated by definition as screening methods (see Section 6): pH, dissolved oxygen (DO), turbidity, conductance, and temperature.

For the Mitchell ARS Phase II Investigation, definitive data shall be generated for concentrations of volatile and extractable total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), explosives, glycols, and metals in soil and groundwater using the rigorous U.S. Environmental Protection Agency (EPA) SW-846 and WDNR methods presented in Section 7.

4.2 Data Quality Indicators

The measurement performance criteria presented in Section 6 for screening level data and in Section 7 for definitive data for soil and groundwater relate to the DQIs: PARCCS parameters. The DQIs are discussed in the following subsections.

4.2.1 Precision

Precision refers to the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar or prescribed conditions. Precision reflects random error and may be affected by systematic error. It also reflects variation imposed by a given matrix.

Laboratory precision is measured by the variability associated with duplicate (two) or replicate (more than two) analyses. Multiple laboratory control sample (LCS) analyses and serial dilutions shall be used to access laboratory precision.

Total precision is the measurement of the variability associated with the entire sampling and analytical process. Total precision shall be determined by the collection and analyses of field duplicate samples at a frequency of 1 in 10 investigative samples per matrix spike (MS) and 1 in 20 samples per matrix spike duplicate (MSD). The precision is evaluated using the relative percent difference (RPD) between the duplicate sample results. The formula for the calculation of precision is provided as RPD in the AFCEE QAPP, Version 4.0, Table 4.2.1-1.

The required level of precision for each method, analyte, and matrix are identified in Sections 6 and 7.

4.2.2 Accuracy

Accuracy is the degree of agreement between an observed value and a "true" value (correctness), and includes a combination of the random error (precision) and systematic error (bias) components that result from the sampling and analytical procedures. It therefore reflects the total error associated with a measurement. A measurement is considered accurate when the reported value agrees with the true value or known concentration of the spike or standard within acceptable limits. Accuracy shall be assessed for each method, analyte, and matrix by comparing LCS, MS, MSD, and post-digestion spike recoveries to the QC limits presented in Sections 6 and 7.

Both accuracy and precision shall be calculated for each AFCEE analytical batch, and the associated sample results are interpreted by considering these specific measurements. The formula for calculation of accuracy is included as percent recovery (%R) from pure and sample matrices in AFCEE QAPP, Version 4.0, Table 4.2.1-1.

4.2.3 Representativeness

Representativeness is a qualitative term that refers to the degree in which data accurately and precisely depict the characteristics of a population, whether referring to the distribution of a contaminant within a sample, a sample within a matrix, or the distribution of a contaminant at a site. Representativeness is determined by appropriate program design, with consideration of elements such as proper sampling locations. Objectives for representativeness are defined for each sampling and analysis task and are a function of the investigative objectives. Assessment of representativeness shall be achieved through use of the standard field, sampling, and analytical procedures. The sampling design, sample locations, and sample numbers are documented in the Work Plan, Section 3.

4.2.4 Completeness

Completeness is a measure of the amount of valid data obtained and then compared with the amount that was expected to be obtained under correct, normal conditions. Valid data are those that are usable in the context of the project goals. Completeness shall be calculated for each definitive method, matrix, and analyte measured in support of the Rapier Areas 1, 2, 3, 4, and 7 SIs. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with an R-flag after a usability assessment has been performed. Completeness shall not be determined only on the basis of laboratory data qualifiers (see Section 8 for an explanation of flagging criteria). The project goal is 100 percent for chemicals of concern in sediment, surface water, and fly ash samples and 95 percent for other target analytes. Earth Tech shall evaluate completeness with respect to project goals to determine its impact on the decision-making process. The formula for calculation of completeness is presented below:

$$\%\ \text{completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of possible results}}$$

4.2.5 Comparability

Comparability is a qualitative indicator of the confidence with which one data set can be compared to another data set. The objective for this QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability shall be achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms shall support the assessment of comparability. Historical comparability shall be achieved through consistent use of methods and documentation procedures throughout the project.

4.2.6 Sensitivity

Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. This capability is established during the planning phase to meet the PQOs. It is important to be able to detect the target analytes at the levels of interest. Calibration requirements, instrument detection limits (IDLs), method detection limits (MDLs), and project-specific reporting limits (RLs) presented in this QAPP shall ensure that target analytes can be detected at concentrations necessary to support the PQOs.

4.3 Method Detection Limits, Reporting Limits, and Instrument Calibration Requirements

The MDLs, RLs, and instrument calibration procedures provided in this QAPP were established according to guidelines set forth below.

4.3.1 Method Detection Limits

The MDL, as defined by 40 Code of Federal Regulations [CFR] Part 136, Appendix B, is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The laboratory shall establish

MDLs for each method, matrix, and analyte as specified in Section 4.3.1 of the AFCEE QAPP, Version 4.0.

4.3.2 MDL Verification

An MDL verification check shall be performed on each instrument immediately following an MDL study and can be performed quarterly in place of the annual (i.e., every 12 months) MDL study. However, this may not substitute for the initial, MDL determination. The MDL check sample shall be spiked at **approximately 2 times** the current reported MDL and taken through all preparatory and analytical steps. The MDL is verified if the laboratory can reliably detect and identify all analytes in the check sample by the method-specified criteria. If the method has no confirmation criteria, the check sample must produce a signal that is at least 3 times the instrument's noise level. If the MDL is not verified, the sample shall be spiked at successively higher concentrations until the verification criteria are met, and the first successful concentration shall be used as the reported MDL.

4.3.3 Reporting Limits

The requirements for RLs specified in Section 4.3.3 of the AFCEE QAPP, Version 4.0, and Sections 6 and 7 of this QAPP shall be met.

4.3.4 Instrument Calibration

Analytical instruments shall be calibrated in accordance with the analytical methods, Section 4.3.4 of the AFCEE QAPP, Version 4.0, and Sections 6 and 7 of this QAPP.

4.4 Quality Control Activities

QC elements relevant to screening data are presented in Section 6.0. This section presents QC requirements relevant to analysis of environmental samples that shall be followed during all analytical activities producing definitive data. The purpose of these QC activities is to produce data of known quality that satisfy the PQOs. These activities provide a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials.

Laboratory QC samples (e.g., blanks and LCSs) shall be included in the preparation batch with the field samples. An AFCEE analytical batch (AAB) is a group of samples (not exceeding 20 environmental samples plus associated laboratory QC samples) that are similar in composition (matrix), are extracted or digested at the same time and with the same lot of reagents, and are analyzed together as a group. MS and MSDs are not treated as environmental samples. The term AAB also extends to cover samples that do not need separate extraction or digestion. The identity of each AAB shall be unambiguously reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples. All references to the analytical batch in the following sections and tables in this QAPP refer to the AAB.

The type of QC samples and the frequency of use of these samples are discussed below and in the method-specific subsections of Section 7.

4.4.1 Laboratory Control Sample

The LCS is a sample of known composition, prepared using contaminant-free water or an inert solid such as glass beads or Teflon chips, that is spiked with all target analytes. Each analyte in the LCS shall be spiked at a level less than or equal to the midpoint of the calibration curve (the midpoint is defined as the median point in the curve, not the middle of the range). The LCS shall be carried through the complete sample preparation and analysis procedure.

The LCS is used to evaluate each AAB and to determine whether the method is in control. Except for VOC analysis, the LCS cannot be used as the CCV.

At least one LCS shall be included in every AAB. If more than one LCS is analyzed in an AAB, results from all LCSs shall be reported.

4.4.1.1 LCS Control Limits

The LCS recoveries shall be compared to the QC acceptance limits specified in Section 7. Whenever an analyte recovery in the LCS is outside the acceptance limit, corrective action shall be performed. When an analyte recovery in the LCS exceeds the upper or lower control limit and no corrective action is performed or the corrective action is ineffective, the appropriate flag, as described in Sections 7 and 8, shall be applied to all affected results.

4.4.1.2 Marginal Exceedance

A number of sporadic marginal exceedances of the LCS control limits are allowed. The number of exceedances are based on the total number of analytes spiked into the LCS and may not exceed 5 percent of the total number of analytes in the LCS. The table below presents the allowable number of marginal exceedances for a given number of analytes in the LCS.

NUMBER OF MARGINAL EXCEEDANCES

Number of Analytes in LCS	Allowable Number of Marginal Exceedances of LCS Control Limits
> 90	5
71 – 90	4
51 – 70	3
31 – 50	2
11 – 30	1
< 11	0

A *marginal exceedance* is defined as being beyond the LCS control limits but within the marginal exceedance limits, which are set at 4 standard deviations around the mean. This outside boundary prevents a grossly out-of-control LCS from passing.

Marginal exceedances must be sporadic (i.e., random). If the same analyte repeatedly exceeds the LCS control limits (e.g., two out of three consecutive LCS), it is an indication that the problem is systematic, not random. The source of error should be located and appropriate corrective actions taken. Laboratories must monitor, through QA channels, the application of the sporadic marginal exceedance allowance to the LCS results to ensure random behavior. The allowance for marginal exceedances is a new policy being introduced throughout the U.S. Department of Defense (DoD). Its effective implementation requires cooperation from the laboratory. If the laboratory fails to implement the policy properly, the privilege of using the marginal exceedance option will be revoked. Laboratory oversight and appropriate corrective actions will be a focus in future laboratory audits.

4.4.1.3 LCS Failure

Each LCS must be evaluated against the LCS control limits and marginal exceedance limits presented in Section 7 before being accepted. The recoveries for the analytes spiked into the LCS should first be compared with the LCS control limits. If a recovery is less than the lower control limit or greater than the upper control limit, it is an exceedance. The laboratory should note which analytes exceeded the control limits and compare them to the list of project-specific analytes of concern. **If a project-specific analyte of concern exceeds its LCS control limit, the LCS has failed. Project-specific analytes of concern are indicated in bold in Section 7.** Next, the laboratory should add up the total number of exceedances for the LCS. Based on the number of analytes spiked into the LCS, the total number of exceedances is compared to the allowable number in the table. **If an LCS has more than the allowable number of marginal exceedances, the LCS has failed.** Finally, the recoveries for those analytes that exceeded the LCS control limits should be compared to the marginal exceedance limits. **If a single analyte exceeds its marginal exceedance limit, the LCS has failed** (this only applies to methods with greater than 10 analytes).

In summary, failure of the LCS can occur several ways:

- Exceedance of an LCS control limit by any project-specific analyte of concern as indicated in bold font in Section 7.
- Marginal exceedance of the LCS control limits by more than the allowable number of analytes.
- Exceedance of the marginal exceedance limits by one or more analytes.

Once an LCS has failed, corrective action is required (see Section 4.4.1.4).

4.4.1.4 Corrective Action

If a sample fails, based on any of the criteria in Section 4.4.1.3, corrective action is required. The corrective action requirement applies to all analytes that exceeded the LCS control limits, even if one specific analyte's exceedance was not the trigger of LCS failure. **All exceedances of the LCS control limits, marginal or otherwise, are subject to corrective action.**

If an LCS fails, an attempt must be made to determine the source of error and then find a solution. All the findings and corrective action must be documented. After the system problems have been resolved and system control has been reestablished, all samples in the AAB shall be re-prepped and reanalyzed for the out-of-control analyte(s). The corrective action applied shall be based on the professional judgment of Earth Tech's QA manager in the review of other QC measures (e.g., MS recoveries). If an analyte recovery falls outside the LCS control limits a second time or if there is not sufficient sample material available to be reanalyzed, then all the results in the AAB for that analyte must be flagged. The recoveries of those analytes subject to corrective action must be documented in the case narrative, whether flagging is needed or not.

If an LCS recovery exceeds the upper control limit, but does not exceed the upper marginal control limit for a specific analyte and that specific analyte is not detected in any of the samples in the AAB, note the failure in the case narrative. No further corrective action is required.

4.4.2 Matrix Spike/Matrix Spike Duplicate

An MS/MSD is an aliquot of sample that is spiked with known concentrations of all target analytes. The spiking occurs prior to sample preparation and analysis. Each analyte in the MS/MSD shall be spiked at a level less than or equal to the midpoint of the calibration curve for each analyte. Only project samples shall be used for spiking. The MS/MSD shall be designated on the chain-of-custody (COC) form.

The MS/MSDs are used to document potential matrix effects associated with a site. Earth Tech shall select the samples for MS/MSDs. The sample replicates will be generated in the field and will be used by the laboratory to prepare the appropriate MS/MSDs. Only one soil or groundwater sample container may be necessary for the parent sample, the MS sample, and the MSD sample. The MS/MSD results and flags must be associated or related to samples that are collected from the same site from which the MS/MSD set was collected. AFCEE does not use MS/MSDs to control the analytical process.

A site-specific MS/MSD shall be specified for each media (e.g., soil and groundwater) during each sampling event. The Earth Tech project manager shall designate the MS/MSD and determine whether they are site specific based on the project requirements. A minimum of 1 MS and 1 MSD shall be designated by the project manager for each site and included for every 20 field samples (i.e., collect up to 20 field samples followed by 2 additional samples designated as MS and MSD). It is possible that not every sample delivery group will include an MS/MSD pair. This is acceptable provided the overall project requirements are met.

The performance of the MS/MSD is evaluated against the QC acceptance limits given in the tables in Section 7. If either the MS or the MSD is outside the QC acceptance limits, the data shall be evaluated to determine whether a matrix effect or analytical error exists, and then the analytes in all related samples shall be qualified according to the data flagging criteria in Sections 7 and 8. The laboratory shall communicate potential matrix difficulties to the Earth Tech's QA manager so an evaluation can be made with respect to the PQOs.

4.4.3 Surrogates

Surrogates are compounds similar to the target analyte(s) in chemical composition and behavior in the analytical process but are not normally found in environmental samples. They are used to evaluate accuracy, method performance, and extraction efficiency. Surrogates shall be added to environmental samples, controls, and blanks, in accordance with the method requirements.

Whenever a surrogate recovery is outside the acceptance limit, corrective action must be performed. After the system problems have been resolved and system control has been reestablished, re-prepare and reanalyze the sample. If corrective actions are not performed or are ineffective, the appropriate flag, as described in Sections 7 and 8, shall be applied to the sample results.

If a surrogate recovery exceeds the upper control limit, but does not exceed the upper marginal control limit and no target analytes are detected in the sample, note the failure in the case narrative. No further corrective action is required.

4.4.4 Internal Standards

Internal standards (ISs) are known amounts of standards added to a portion of a sample or sample extract and carried through the entire determination procedure. They are used as a reference for calibration and for controlling the precision and bias of the analytical method. ISs shall be added to environmental samples, controls, and blanks in accordance with the method requirements.

When the IS results are outside of the acceptance limits, corrective actions shall be performed. After the system problems have been resolved and system control has been reestablished, all samples analyzed while the system was malfunctioning shall be reanalyzed. If corrective actions are not performed or are ineffective, the appropriate flag, as described in Sections 7 and 8, shall be applied to the sample results.

4.4.5 Retention Time Windows

Retention time (RT) windows are used in gas chromatography (GC), ion chromatography (IC), and high-performance liquid chromatography (HPLC) analysis for qualitative identification of analytes. They are calculated from replicate analyses of a standard on multiple days. The procedure and calculation method are given in SW-846, Method 8000C. The center of the RT window is established for each analyte and surrogate using the RT of the mid-point standard of the initial calibration. Non-MS methods are updated daily using the absolute RTs in the initial calibration verification (ICV).

When the RT is outside of the acceptance limits, corrective action shall be performed. This applies to all corrective calibration verifications (CCVs) subsequent to the ICV and to LCSs. After the system problems have been resolved and system control has been reestablished, reanalyze all samples analyzed since the last acceptable RT check. If corrective actions are not performed, the appropriate flag, as described in Sections 7 and 8, shall be applied to the sample results.

4.4.6 Interference Check Samples

Interference check samples (ICSs) are used in inductively coupled plasma-atomic emission spectroscopy (ICP-AES) and ICP-MS analyses only, and contain known concentrations of both interfering and analyte elements.

The ICSs are used to verify background and inter-elemental correction factors.

The ICSs are run at the beginning of each run sequence for SW6010B.

When the interference check sample results are outside of the acceptance limits given in Section 7, corrective action shall be performed. After the system problems have been resolved and system control has been reestablished, reanalyze the ICSs. If the ICS results are acceptable, reanalyze all affected samples. If corrective action is not performed or the corrective action was ineffective, the appropriate flag, as described in Sections 7 and 8, shall be applied to all affected results.

4.4.7 Method Blank

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

The presence of analytes in a method blank at concentrations greater than the MDL indicates the need for further assessment of the data. The source of contamination should be investigated, and measures must be taken to correct, minimize, or eliminate the problem if the concentration exceeds one-half the RL. For common laboratory contaminants (e.g., calcium, iron, potassium, magnesium, sodium, and zinc), the method blank must not exceed the RL. For further guidance on method blank evaluation, see Section 8.2.2.1. No analytical data shall be corrected for the presence of analytes in blanks. When an analyte is detected in the method blank and in the associated samples and corrective actions are not performed or are ineffective, the appropriate flag, as described in Sections 7 and 8, shall be applied to the sample results.

4.4.8 Equipment Blank

An equipment blank is a sample of American Society for Testing and Materials (ASTM) Type II reagent-grade water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. These may also be called rinse blanks or rinsate blanks. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures.

Equipment blanks shall be collected immediately after the equipment has been decontaminated and included for each sampling event, as appropriate. The equipment blank samples shall be analyzed for all laboratory analyses requested for the environmental samples collected at the site.

When an analyte is detected in the equipment blank, the appropriate flag, as described in Section 8, shall be applied to all sample results from samples collected with the affected equipment.

4.4.9 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade or organic-free water and preservative (e.g. HCl) OR methanol, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field, and are prepared only when VOC samples are collected and analyzed for VOC analytes.

Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. Each cooler of samples sent to the laboratory for analysis of VOCs shall contain one trip blank. For methanol-preserved soil samples being analyzed for GRO or VOCs, a methanol blank shall be utilized.

When an analyte is detected in the trip blank, the appropriate flag, as described in Section 8, shall be applied to all sample results from samples in the cooler with the affected trip blank.

4.4.10 Field Duplicate (Replicate) Samples

Field duplicates comprise two (or more) field samples taken at the same time in the same location. They are intended to represent the same population and are taken through all steps of the analytical procedure in an identical manner. These samples are used to assess precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.

Field duplicate samples shall be collected per FSP Section 6 and 7, using identical recovery techniques, and are treated in an identical manner during storage, transportation, and analysis.

A minimum of 1 duplicate or replicate sample shall be included for every 10 field samples. Acceptance criteria are given in Section 7 and are the same as for MS/MSD samples.

4.5 Quality Control Checks

4.5.1 Holding Time Compliance

All sample preparation and analysis shall be completed within the method-required holding times as specified in Table 5-1 of this QAPP and Section 4.5.1 of the AFCEE QAPP, Version 4.0, with the exception that holding times shall be tracked to the day or hour, as specified in Table 5-1.

If holding times are exceeded and the analyses are performed, the results shall be flagged according to the procedures described in Section 8 and identified in the data package case narrative.

4.5.2 Confirmation

Quantitative confirmation of results at or above the RL for samples analyzed by method SW8330 shall be required and shall be completed within the method-required holding times. If holding times are exceeded and the analyses are performed, the results shall be flagged according to the procedures as described in Section 8. For method SW8330, a second column or a different detector will be used. Unless otherwise specified or overlapping peaks are causing erroneously high results, the higher of the two confirmed results shall be reported as the primary result. The column used for both the primary and confirmation results shall be indicated on the sample reports. The associated calibration and QC results (including method blank, LCS, MS/MSD, surrogates and internal standards) shall be submitted for both columns so that sample results can be appropriately evaluated.

Confirmation is not required for GRO, DRO, and PCBs.

4.5.3 Control Charts

Control charts are used to track laboratory performance over time and shall be established and maintained per Section 4.5.3 of the AFCEE QAPP, Version 4.0.

4.5.4 Standard Materials

Standard materials, including second source materials, used in calibration and to prepare samples shall meet the specifications in Section 4.5.4 of the AFCEE QAPP, Version 4.0.

4.5.5 Supplies and Consumables

The laboratory shall inspect supplies and consumables prior to their use in analysis per Section 4.5.5 of the AFCEE QAPP, Version 4.0.

5. SAMPLING PROCEDURES

5.1 Field Sampling

The field sampling procedures for collecting samples and sampling methods are specified in FSP Section 6.0 and briefly summarized in this section of the QAPP.

5.1.1 Sample Containers

Sample containers shall be purchased, pre-cleaned, and treated according to the EPA specifications for the methods. Sample containers that are reused should be cleaned and decontaminated between uses by EPA-recommended procedures (i.e., EPA 540/R-93/051). Containers shall be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants.

5.1.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the definitive analytical methods completed for AFCEE project samples are listed in Table 5-1 below.

Table 5-1 Requirements for Containers, Preservation, and Holding Times

Parameter	Analytical Methods	Sample Container		Preservation		Holding Time	
		Aqueous	Solid	Aqueous	Solid	Aqueous	Solid
Volatile organics (VOCs) BTEX	SW8260B	3 X 40-mL glass VOA vials, PTFE septum caps No headspace **Note:** Small bubbles may occur during shipping and handling.	3 X 60- or 125-mL glass vials with PTFE-lined caps 3 X 40- or 60-mL glass VOA vials (with stir bar for low level soil), PTFE septum caps	HCl to a pH <2 Cool to 4 °C	Low level Frozen to < -7 °C or cooled to 4 °C and frozen within 48 hours Low level soil Add 5g soil to 40 or 60 mL VOA vial prepreserved with 1g of $NaHSO_4$/5mL water Medium level soil Add 5g soil to 40 or 60 mL VOA vial prepreserved with 5 mL methanol	14 days	48 hours if only cooled to 4 °C 14 days for solid samples preserved by: • 4 °C/ frozen in 48 hrs • Frozen onsite • $Na_2S_2O_3$ • Methanol
Volatile TPH Gasoline Range organics (GRO)	SW8015B WDNR Modified GRO Method	3 X 40-mL glass VOA vials, PTFE septum caps No headspace **Note:** Small bubbles may occur during shipping and handling.	3 tared 40 (8-11 grams of soil) or 60 (20-26 grams of soil) mL VOC vials	500 uL 50% HCl Cool to 4°C	10 mL Methanol for 40 mL vials 25 mL Methanol for 60 mL vials Cool to 4°C	14 days	4 days to laboratory receipt 21 days to extraction 21 days to analyses

[redacted]

Parameter	Analytical Methods	Sample Container		Preservation		Holding Time	
		Aqueous	Solid	Aqueous	Solid	Aqueous	Solid
Extractable TPH Diesel Range Organics (DRO)	SW8015B WDNR modified DRO method	2 X 1-Liter amber glass bottles with PTFE-lined lids	3 tared 60 (25-25 grams of soil) or 120 (25-70 grams of soil) mL VOC vials Brass tube with plastic caps and Teflon sheets placed between cap and tube. Pack soil into tube with no headspace. Encore samplers with stainless steel "o-ring" cap packed with no headspace a	5 mL 50% HCl Cool to 4°C	Cool to 4°C	7 days to extraction 47 days to analyses	72 hours to addition of extraction solvent 47 days to extraction 47 days to analyses
PCBs Explosives Glycols	SW8082 SW8330 SW8015B	2 X 1-Liter amber glass bottles with PTFE-lined lids per parameter	250-mL amber glass wide-mouth jar (or can be clear if stored in dark)	Cool to 4°C	Cool to 4°C	7 days until extraction, and extracts analyzed within 40 days after extraction	14 days until extraction, and extracts analyzed within 40 days after extraction
Metals (except Cr [VI] and Hg)	SW6010B SW6020 and SW-846 AA methods	1-Liter glass or HDPE bottle	250-mL wide-mouth glass jar	HNO_3 to pH < 2	Cool to 4°C	180 days	180 days

Parameter	**Analytical Methods**	**Sample Container**		**Preservation**		**Holding Time**	
		Aqueous	**Solid**	**Aqueous**	**Solid**	**Aqueous**	**Solid**
Mercury	SW7470A (aqueous) SW7471A (solid)	250-mL glass or HDPE bottle	250-mL wide-mouth glass jar	HNO_3 to pH < 2	Cool to 4°C	28 days	28 days

5.2 Sample Handling and Custody

Section 5.2 of the AFCEE QAPP, version 4.0, documents procedures that shall be employed to ensure the custody and integrity of the samples, which begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples shall be maintained in field records and combined with the laboratory records.

Earth Tech shall maintain chain-of-custody records for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession; (2) it is in their view, after being in their possession; (3) it was in their possession and they locked it up; or (4) it is in a designated secure area.

6. SCREENING ANALYTICAL METHODS

Table 6-1 lists the screening methods contained in this section. This section includes brief descriptions of the methods and QC required for screening procedures commonly used to conduct work efforts. The methods and QC procedures were taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, Third Edition, and its subsequent updates), *Methods for Chemical Analysis of Water and Waste* (EPA 1979), *ASTM Annual Book of Standards* (1993), and from various manufacturers' literature. It is understood that some of these methods may be performed in a laboratory, and if accompanied by the appropriate QC procedures and documentation, the data generated may be considered as definitive.

Table 6-1 Screening Analytical Methods

Method	Parameter
SW846 (3550)	Moisture (as % solids)
SW9040B/SW9045C	pH (water/soil)
SW9050A	Conductance
E180.1	Turbidity
E170.1	Temperature
E360.1	Dissolved Oxygen

6.1 Method Descriptions

Section 6.1 contains subsections for each screening analytical procedure. Each subsection contains a brief method description and associated reporting limits, if applicable.

6.1.1 Method SW9040B (water)/SW9045C (soil) – pH

A pH measurement shall be performed for aqueous samples using Method SW9040; pH measurements of soil or solid samples are performed using Method SW9045C. Measurements are determined electrometrically using either a glass electrode in combination with a reference potential, or a combination electrode. The pH measurements are important tools for predicting the extent of contamination as well as providing information regarding the potential ionization forms of contaminants in groundwater. This can be used to predict their respective fate and transport.

6.1.2 Method SW9050A – Conductance

Standard conductivity meters are used. Temperature is also reported. Conductivity is an important parameter used in fate and transport modeling of contaminants.

6.1.3 EPA Method 170.1 – Temperature

Temperature measurements are made with a mercury-filled or dial-type centigrade thermometer or a thermistor.

6.1.4 EPA Method 360.1 – Dissolved Oxygen

An instrumental probe, usually dependent upon an electrochemical reaction, is used for determination of DO in water. Under steady-state conditions, the current or potential can be correlated with DO concentrations. This measurement is used in fate and transport modeling as well as a factor in the determination of natural attenuation potential. It is also useful in predicting the chemical forms of the contaminants and their breakdown products.

6.1.5 EPA Method 180.1 – Turbidity

This method is based on a comparison of the light scattered by the sample under defined conditions with the light intensity scattered by a standard reference suspension—the higher the intensity, the greater the turbidity. Turbidity measurements are made in a nephelometer and are reported in terms of nephelometric turbidity units (NTUs). The working range for the method is from 0 to 40 NTUs. Higher levels of turbidity can be measured by diluting the sample with turbidity-free deionized water.

6.2 Calibration and QC Procedures for Screening Methods

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

Table 6-2 Summary of Calibration and QC Procedures for Screening Methods

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Data Flagging Criteria[b]
SW-846[c]	Moisture	Field duplicate	1 per 20 samples	% solid RPD ≤ 15%	Correct problem, repeat measurement. If still out, flag data	J if RPD > 15% and ≤ 30% Q if RPD > 30%

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Data Flagging Criteria[b]
SW9040B /SW9045 C	pH	2-point calibration with pH buffers	Once per day	± 0.05 pH units for every buffer	If calibration is not achieved, check meter, buffer solutions, and probe; replace if necessary; repeat calibration	Flagging criteria are not appropriate
		pH 7 buffer	At each sample location	± 0.1 pH units	Correct problem, recalibrate	Flagging criteria are not appropriate
		Field duplicate (2 consecutive readings)	10% of field samples	± 0.1 pH units	Correct problem, repeat measurement	J
SW9050A	Conductance	Calibration with KCl standard	Once per day at beginning of testing	± 5%	If calibration is not achieved, check meter, standards, and probe; recalibrate	Flagging criteria are not appropriate
		Field duplicate (2 consecutive readings)	10% of field samples	± 5%	Correct problem, repeat measurement	J
E180.1	Turbidity	Calibration following manufacturer's instructions (minimum one blank and three standards)	As needed	In accordance with manufacturer's instructions	If calibration is not achieved, check meter; replace if necessary, recalibrate	Flagging criteria are not appropriate
		Calibration verification (mid-range)	Daily, before sample analysis	± 10% of expected value	Correct problem, repeat measurement, recalibrate	Flagging criteria are not appropriate
E170.1	Temperature	Field duplicate (2 consecutive readings)	10% of field samples	± 1.0°C	Correct problem, repeat measurement	J
E360.1	Dissolved Oxygen	Field duplicate (2 consecutive readings)	10% of field samples	RPD < 50%	Correct problem, repeat measurement	J

[a] All corrective actions shall be documented, and the records shall be maintained by the prime contractor.

[b] All screening results shall first be flagged with an "S" and also any other appropriate validation flags identified in the Data Flagging Criteria column of the table. For example: "SJ," "SB," and "SQ."

[c] Follow the preparation procedure as detailed in the individual determinative method.

7. DEFINITIVE DATA ANALYTICAL METHODS

The following procedures basically follow requirements and guidelines set forth in the EPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. These methods have been developed specifically for the highly variable environmental samples, and are reviewed and updated on a frequent basis in order to obtain the best possible quality data.

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

- A brief method description
- A table of analyte RLs
- A table of QC acceptance criteria
- A table summarizing calibration, QC procedures, and data verification guidelines for the laboratory

These tables were developed from various sources, including the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (U.S. EPA SW-846, Third Edition, and its subsequent updates); AFCEE *Guidance for Contract Deliverables (GCD), Version 1.1, March 1998*; and project experience. Definitions of terms are given in Section 4.0, and data review, verification, and validation procedures are presented in Section 8.0.

7.1 Preparative Methods

Typical SW-846 and other EPA extraction and digestion procedures for liquid and solid matrices are presented in Table 7-1. These preparatory methods are also listed with the associated analytical procedures in Table 7-2. Method-specific preparations are covered in the appropriate determinative methods.

Table 7-1 Sample Preparation Methods

Method	Parameter
Volatile Organics	
SW5030B	Purge and Trap for Volatile Organic Compounds (aqueous samples)
SW5035A[a]	Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples
Extractable Organics	
SW3510C	Separatory Funnel Liquid-Liquid Extraction (aqueous samples)
SW3545	Pressurized Fluid Extraction (solid samples)
SW3630	Silica gel cleanup
Metals	
SW3010A	Acid Digestion of Aqueous Samples and Extracts for Metals Analysis
SW3050B	Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis
SW7470A[c]	Mercury prep for aqueous samples
SW7471A[c]	Mercury prep for solid samples

[a] Although method has not been promulgated, its use has received widespread acceptance.
[b] Although method has not been promulgated, its use is recommended, especially for the extraction of explosives.
[c] Follow the preparation procedure as detailed in the individual determinative method.

7.1.1 Method SW5030B – Purge and Trap for Volatile Organic Compounds

Method SW5030B describes sample preparation and extraction for the analysis of VOCs. This method is applicable to aqueous samples and soil/sediment extracts.

An inert gas is then bubbled through the sample solution at ambient temperature to transfer the volatile components to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and back flushed with inert gas to desorb the components onto a GC column.

7.1.2 Method SW5035A – Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples

Method SW5035A describes sample preparation and extraction for the analysis of VOCs in solid matrices. The method involves a heated purge of volatile components followed by analysis on a GC or GC/MS. Several sample preservation options are given in the method. Analyzing the sample unpreserved within the prescribed 48-hour holding time is the preferred option. If this is not possible, an appropriate preservation option must be chosen. For low-level VOC analysis, the preferred preservation is freezing with a 14-day holding time. The soil is extruded into a 40- or 60-milliliter (mL) volatile organic analyte (VOA) vial with water, a polytetrafluoroethylene (PTFE) stirrer, and, if necessary, sodium bisulfate. Use of syringe-type purge and trap soil samplers is recommended. Samples should not be frozen below -20°C because of potential problems with vial or coring tool seals.

7.1.3 Method SW3510C – Separatory Funnel Liquid-Liquid Extraction

Method SW3510C is designed to quantitatively extract nonvolatile and SVOCs from liquid samples using standard separatory funnel techniques. The sample and the extracting solvent must be immiscible in order to yield recovery of target compounds. Subsequent cleanup and detection methods are described in the organic analytical method used to analyze the extract.

7.1.4 Method SW3545 – Pressurized Fluid Extraction

Method SW3545 is a procedure for extracting water insoluble or slightly water soluble SVOCs from soils, sediments, sludges, and waste solids using elevated temperature and pressure.

7.1.5 Method SW3010A – Acid Digestion of Aqueous Samples and Extracts for Metals Analysis

Method SW3010A prepares aqueous samples, extracts, or waste samples for total metals determination by ICP-AES or ICP-MS. The samples are vigorously digested with acid and then diluted.

7.1.6 Method SW3050B – Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis

Method SW3050B is applicable to the preparation of sediment, sludge, and soil samples for metals analysis by ICP-AES, ICP-MS or, for some metals, by GFAA. A sample is digested then refluxed with acid. A separate aliquot of the sample is dried for a total solids and/or percent moisture determination.

7.2 Determinative Methods

The analytical methods presented in this section are listed in Table 7-2.

A brief description and two tables for each method are included in the following subsections. The first table presents the RLs for the default analytes in the method. The RLs are presented for both soil and water matrices. The second table presents acceptance criteria for the accuracy of spiked analyte and surrogate recoveries. This table also presents acceptance criteria for the precision of MS, field duplicate, and laboratory duplicate samples.

An additional table presents the calibration and QC procedures for each method. Corrective actions and data flagging criteria are also included in this table. The first two columns in this table designate the QC check and the minimum frequency at which the check is to be performed. The third column designates the acceptance criteria for each calibration and QC element, and the fourth column designates the corrective action in the event that a calibration or QC element does not meet the acceptance criteria. The last column designates the data flagging criteria that shall be applied by the laboratory in the event that the method-required calibration and QC acceptance criteria or acceptance criteria are not met. It should be clearly understood that these are laboratory data qualifiers. If a laboratory has more and they are consistent with these and properly defined, the laboratory may use them. When other flags are required contractually, they shall be used. As described in Chapter 8, data usability shall be carefully assessed by Earth Tech's QA Manager.

Each analyst must demonstrate the ability to generate acceptable accuracy and precision using at least four replicate analyses of a QC check sample. If the acceptance criteria are not met, then the problem must be located and fixed, and a demonstration must be successfully rerun prior to the analyst analyzing project samples. All data analyzed by an unqualified analyst (i.e., failing to meet QC criteria) shall be flagged R.

Table 7-2 Analytical Methods

Analytical Method	Parameter	Preparation Methods	
		Water/Aqueous	**Soil**
Gas Chromatography Methods			
SW8015B	Volatile TPH (C6-C10)	SW5030B	SW5035A
SW8015B	Extractable TPH (C10-C35)	SW3510C	SW3545
SW8015M	Glycols	NA	Sonication per laboratory SOP
SW8082	PCBs	NA	SW3545
Gas Chromatography/Mass Spectrometry Methods			
SW8260B	VOCs	SW5030B	SW5035A
High Performance Liquid Chromatography Methods			
SW8330	Explosives	NA	SW8330
Metals			
SW6010B	Trace metals by ICP-AES	SW3010A	SW3050B

Analytical Method	**Parameter**	**Preparation Methods**	
		Water/Aqueous	**Soil**
SW7470A/7471A	Mercury by CVAA	SW7470A	SW7471A

NA: Not analyzed

7.2.1 Method SW8082 – Polychlorinated Biphenyls (PCBs)

PCBs in water and soil samples are analyzed using Method SW8082. This analytical method involves the extraction of the samples. The PCBs are then separated and quantified by GC using an ECD or an ELCD. RLs for this method are presented in Table 7-3. Table 7-4 provides acceptance criteria for Method SW8082. Table 7-5 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

For analysis of PCBs, the initial five-point calibration and second source calibration verification standards shall, at a minimum, contain a mixture of the Aroclors 1016 and 1260. Retention times shall be set during the initial five-point calibration. The initial and daily calibration verifications may be accomplished using an Aroclor 1016/1260 PCB mixture. Single standards of each of the other five Aroclors are required to aid the analyst in pattern recognition. Assuming that the Aroclor 1016/1260 standards have been used to validate the linearity of the detector, the single standards of the remaining five Aroclors may be used to determine the response factor for each Aroclor. The concentrations of the individual Aroclor standards should be at or below the middle of the linear range of the detector. If an Aroclor other than 1016 or 1260 is detected (i.e., qualitatively identified above the MDL based on its pattern), report the result for that Aroclor using the response factor from the single Aroclor standard (linear through origin). The LCS and MS/MSD should be spiked using the 1016/1260 mix. Second-column confirmation is not required.

Table 7-3 Reporting Limits for Method SW8082 Polychlorinated Biphenyls (PCBs)

Analyte	**Water**		**Soil**	
	RL	**Units**	**RL**	**Units**
PCB-1016	0.5	µg/L	0.05	mg/kg
PCB-1221	0.5	µg/L	0.05	mg/kg
PCB-1232	0.5	µg/L	0.05	mg/kg
PCB-1242	0.5	µg/L	0.05	mg/kg
PCB-1248	0.5	µg/L	0.05	mg/kg
PCB-1254	0.5	µg/L	0.05	mg/kg
PCB-1260	0.5	µg/L	0.05	mg/kg

Table 7-4 QC Acceptance Criteria for Method SW8082 PCBs

Analyte	**Accuracy Water (% R)**	**Precision Water RPD (%)**	**Accuracy Soil (% R)**	**Precision Soil RPD (%)**
PCB-1016	40–144	≤ 30	41–138	≤ 50
PCB-1221	41–136	≤ 30	45–136	≤ 50
PCB-1232	41–136	≤ 30	45–136	≤ 50
PCB-1242	39–150	≤ 30	43–150	≤ 50
PCB-1248	41–136	≤ 30	44–136	≤ 50
PCB-1254	29–141	≤ 30	41–141	≤ 50
PCB-1260	45–145	≤ 30	61–131	≤ 50
1016/1260 Mix	50–135	≤ 30	40–130	≤ 50
Surrogate:				
DCBP	42–133	-	58–125	-

Table 7-5 Summary of Calibration and QC Procedures for GC Method SW8082

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Five point ICAL for 1016 and 1260. Single point for PCBs other than 1016 and 1260. If other PCBs detected, perform five point ICAL)	Initial calibration prior to sample analysis	One of the options below *Option 1*: linear – RSD for each analyte ≤20% *Option 2*: linear – least squares regression r ≥ 0.995 for each analyte.	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration verification	Once after each ICAL	All analytes within ± 20% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position established for each analyte and surrogate	Each ICAL and after the initial daily CCV	Position shall be set using the midpoint standard of the initial calibration curve.	N/A	N/A
Retention time window width established for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	3 times standard deviation for each analyte (each quantitation peak SW8082) retention time from 72-hour study	N/A	N/A
Retention time window verification for each analyte and surrogate	Each calibration verification	Analyte within established window	Correct problem then reanalyze all samples analyzed since the last acceptable retention time check.	**ICV:** Flagging criteria are not appropriate for initial verification. **CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample which are outside the established window.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Calibration verification: initial (ICV) and continuing (CCV)	**ICV:** Daily, before sample analysis, unless ICAL performed on same day **CCV:** After every 10 samples and at the end of the analysis sequence	All analytes within ± 20% of expected value (% D)	**ICV:** Correct problem, rerun ICV. If that fails, repeat initial calibration. **CCV:** Correct problem then repeat CCV. Reanalyze all samples since last successful calibration verification.	**ICV:** Flagging criteria are not appropriate. **CCV:** Apply Q-flag to all results for the specific analyte(s) >20 %D for all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > 1/2 RL. For common lab contaminants, no analytes detected > RL.	Assess data. Correct problem. If necessary, re-prep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance Section 8.2.1.4
LCS for PCB 1016/1260 mix)	One LCS per analytical batch	Acceptance criteria: Table 7-4. marginal exceedances not applicable	Correct problem and then reanalyze. If still out, re-prep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Table 7-4.	Correct problem then re-extract and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ -flag to all associated non-detects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7-4.	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if; (1)%R for MS or MSD > UCL (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ 1/2 the RLs in Table 7-3. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or re-conduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

[a] All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

[b] Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful, or corrective action was not performed.

7.2.2 Method 8015B – *Volatile and Extractable Total Petroleum Hydrocarbons (TPH)*

Volatile petroleum hydrocarbon components, such as gasoline, jet fuel, and other low molecular weight petroleum products, are analyzed by the direct purge and trap technique described in Method SW5030B followed by a modified approach to Method SW8015B. Extractable petroleum hydrocarbon components are analyzed by extraction followed by GC analysis.

For volatile TPH, the sample is placed in the purge and trap sparge vessel and analysis is conducted using a GC equipped with a FID.

Extractable TPH components, such as kerosene, diesel, motor oil, and other high molecular weight extractable petroleum products, are typically prepared by Method SW3520C or SW3510C for water-based matrices or by Method SW3550B for soil/sludge matrices. Other extraction options are listed in table 7.2.1. After the sample is extracted, analysis is accomplished on a GC equipped with a capillary or megabore column and a FID. RLs for volatile TPH and extractable TPH are provided in Table 7.6

Identification and quantitation of TPH components require more analytical judgment than other GC methods. The TPH chromatograms consist of groups of peaks that fall within a noted carbon retention time range (i.e., number of carbon atoms in the molecule). Standard fuel components are used to calibrate the instruments. The total petroleum hydrocarbons results are reported in mg/kg or µg/L based on quantitation of the total area count for the volatile TPH (i.e., C6-C10) or the extractable TPH (i.e., C10-C35). Table 7.7 provides acceptance criteria for Method SW8015B. Table 7.8 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria. Second-column confirmation is not required.

Table 7.6. Reporting Limits for Method SW8015B Volatile and Extractable Total Petroleum Hydrocarbons (TPH)

Analyte	Water		Soil	
	RL	Unit	RL	Unit
Volatile TPH (C6-C10)	42	µg/L	5.6	mg/kg
Extractable TPH (C10-C35)	120	µg/L	10	mg/kg
DRO (C10-C28)	120	µg/L	10	mg/kg

Table 7.7. QC Acceptance Criteria for Method SW8015B Volatile and Extractable Total Petroleum Hydrocarbons (TPH)

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	Accuracy Soil (% R)	Precision Soil RPD (%)
Volatile TPH (C6-C10)	67–136	≤ 30	57–146	≤ 50
Surrogate:				
a,a,a-Trifluorotoluene	80–114	-	60–140	-
Extractable TPH (C6-C35)	61–143	≤ 30	51–153	≤ 50
DRO (C6 – C28)	61–143	≤ 30	51–153	≤ 50
Surrogates:				
Octacosane	26–152	-	25–162	-
Tricontane	40–140	-	30–150	-

Table 7.8. Summary of Calibration and QC Procedures for GC Method SW8015B- TPH

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	One of the options below *Option 1*: linear – RSD for each analyte ≤20% *Option 2*: linear – least squares regression r ≥ 0.995 for each analyte. *Option 3*: non-linear – COD ≥ 0.99 (six points shall be used for second order, seven points shall be used for third order)	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration verification	Once after each ICAL	All analytes within ± 20% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position established for each analyte and surrogate	Each ICAL and after the initial daily CCV	Position shall be set using the midpoint standard of the initial calibration curve.	N/A	N/A
Retention time window width established for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	3 times standard deviation for each analyte (each quantitation peak SW8082) retention time from 72-hour study **GRO:** calculate retention time based on 2-methylpentane and 1,2,4-trimethylbenzene (see 7.4.2 in Method SW8015A). **DRO:** calculate retention time based on C10 and C28 alkanes (see 7.4.3 in Method SW8015A).	N/A	N/A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Retention time window verification for each analyte and surrogate	Each calibration verification	Analyte within established window	Correct problem then reanalyze all samples analyzed since the last acceptable retention time check.	**ICV:** Flagging criteria are not appropriate for initial verification. **CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample which are outside the established window.
Calibration verification: initial (ICV) and continuing (CCV)	**ICV:** Daily, before sample analysis, unless ICAL performed on same day **CCV:** After every 10 samples and at the end of the analysis sequence	All analytes within ± 20% of expected value (% D)	**ICV:** Correct problem, rerun ICV. If that fails, repeat initial calibration. **CCV:** Correct problem then repeat CCV. Reanalyze all samples since last successful calibration verification.	**ICV:** Flagging criteria are not appropriate. **CCV:** Apply Q-flag to all results for the specific analyte(s) >20 %D for all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > ½ RL. For common lab contaminants no analytes detected > RL.	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance Section 8.2.1.4
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7.7. marginal exceedances not applicable.	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Table 7.7	Correct problem then re-extract and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ -flag to all associated non-detects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7.7	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if; (1)%R for MS or MSD > UCL (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Table 7.6. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

Notes:

[a] All corrective actions shall be documented and the laboratory shall maintain all records.

[b] Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

7.2.3 SW-8015M – Glycols

Method SW8015M is used to determine the concentration of ethylene glycol and propylene glycol in solid and aqueous matrices. A capillary column is employed with a Flame Ionization detector (FID).

A sample of a known volume or weight is extracted with deionized water. Method applies for aqueous samples to be directly injected into the gas chromatograph. Soil/sediment are extracted by in-house extraction procedures utilizing a shaker table and sonicator.

These procedures contained within this method are restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results.

Table 7.9 presents reporting limits, Table 7.10 presents QC acceptance criteria, and Table 7.11 presents calibration and QC requirements.

Table 7.9. Reporting Limits for Method 8015M - Glycols

Analyte	Water		Soil	
	RL	Unit	RL	Unit
Ethylene Glycol	TBD	mg/L	TBD	mg/L
Propylene Glycol	TBD	mg/L	TBD	mg/L

Table 7.10. QC Acceptance Criteria for Method 8015M – Glycols

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	Accuracy Soil (% R)	Precision Soil RPD (%)
Ethylene Glycol	70-130	≤ 20	70-130	≤ 20
Propylene Glycol	70-130	≤ 20	70-130	≤ 20

Table 7.11. Summary of Calibration and QC Procedures for GC Method SW8015M- Glycols

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria
Initial Calibration Of Glycols	Initial Calibration prior to sample analysis. 1. RSD $\leq$ 20% 2. Linear – least squares regression $r \geq$ 0.995. 3. Non-linear regression $r^2 \geq$ 0.99. (6 points shall be used for second order)	$r \geq 0.995$, RSD $\leq$20%, $r^2 \geq$0.990, mean RSD $\leq$ 20%	Correct system and recalibrate. Criteria must be met before sample analysis may begin.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL
Initial Calibration Verification (ICV)	After initial calibration	80-120%	If ICV falls outside QC criteria, reanalysis must take place.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Continuing Calibration Verification (CCV)	Every twelve hours or every twenty samples injections (after10 sample injections is recommend) and at the end of the sequence.	Difference $\leq$20%	If CCV falls outside QC criteria, reanalysis must take place. If CCV still fails, it may be appropriate to repeat the initial calibration curve or to qualify.	Apply Q-flag to all results for the specific analyte(s) >20 %D for all samples associated with the calibration verification.
Retention Time Window (RTW)	Retention Times are updated with each new ICAL using the midpoint and at beginning CCV of the analytical shift.	Retention times are 3x Standard Deviation the absolute retention time, if the default standard deviation is employed, width of the window will be 0.03 minutes	Analytes outside the retention time window, the gas chromatograph must be either adjusted so that the second injection of the standard has acceptable RTs, or a new calibration curve is required and new RTW are established.	For CCVs, apply a "Q" to all results for analytes outside the retention time window.
Method Blank (MB)	1 per sample prep batch $\leq$ 20 samples.	Analytes must not he higher than the highest of the following: 1/2 MRL, or 5% of the regulatory limit, or	If sample is available and within holding times, sample associated with method blank needs to be reprepped. If no	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance Section 8.2.1.4

		5% of the associated sample concentration, or client specified conditions.	sample is available, qualify the data with a "B" to all associated positives when less than 5X blank concentration	
Laboratory Control Sample (LCS)	1 per sample prep batch ≤ 20 samples.	70-130%	If LCS fails percent recoveries. Re-analyze the LCS. If LCS recoveries are still outside QC control limits, if there is sample remaining and within holding times, the sample batch must be reprepped. Qualify the failing analytes with a "Q".	Qualify the failing analytes with a "Q".
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	70-130%	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if; (1)%R for MS or MSD > UCL (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
MRL Level Verification Check standard at Reporting Limit.	Beginning and End of 12 hr. sequence or program specified.	70-130%	For results > 130% apply J only. For a result marginally less than the LL (65-70%), apply J/UJ. For recovery more than marginally out (<65%), apply J/R. If MDL check was run at the end and acceptable do not reject data.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.

MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Table 7.6. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

7.2.4 Method SW8260B – Volatile Organics

Volatile (or purgeable) organic compounds in water and soil samples are analyzed using Method SW8260B. This method uses a capillary column GC/MS for separation and detection of compounds of interest. Volatile compounds are introduced into the GC by purge and trap (SW5030B or SW5035). An inert gas is bubbled through the water samples (or soil-water slurry for soil samples) to transfer the purgeable organic compounds from the liquid to vapor phase. The vapor is then swept through a sorbent trap where the purgeable organics are trapped. The trap is backflushed and heated to desorb the purgeable organics onto a capillary GC column, where they are separated and then detected with a mass spectrometer. The analytes and RLs (using a 25-mL purge) for this method are listed in Table 7-12. Soil samples with higher contaminant levels can be extracted using methanol before purging. However, the RLs arising from the use of this preparatory method will be higher than those listed in Table 7-12, and the accuracy and precision requirements listed in Table 7-13 will not be met as well. Project-specific quality objectives and analytical protocols will need to be established if this preparatory method is used.

Tuning - The mass spectrometer must be hardware tuned to give an acceptable spectrum for 4-bromoflurobenzene (BFB). The tuning acceptance criteria are given in the following list in terms of ion abundances for each specified mass:

mass 50	15 – 40 percent of mass 95
mass 75	30 – 60 percent of mass 95
mass 95	base peak, 100 percent relative abundance
mass 96	5 – 9 percent of mass 95
mass 173	less than 2 percent of mass 174
mass 174	greater than 50 percent of mass 95
mass 175	5 – 9 percent of mass 174
mass 176	greater than 95 percent, but less than 101 percent of mass 174
mass 177	5 –9 percent of mass 176

These criteria must be demonstrated each 12-hour shift during which samples are analyzed. No analyses may begin until these criteria are met.

The IS method is used for quantitation of analytes of interest. For quantitation, response factors (RFs) are calculated from the base ion peak of a specific IS that is added to each calibration standard, blank, QC sample, and sample. Table 7-13 provides acceptance criteria for accuracy of spiked analytes and ISs, precision of duplicate/replicate analyses, and recommended IS associations. Also included in Table 7-13 are the marginal exceedance limits taken from the DoD QSM. Table 7-14 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

Table 7-12 Reporting Limits for Method SW8260B Volatile Organics

Analyte	Water		Soil	
	RL	Units	RL[a]	Units
1,1,1,2-Tetrachloroethane	1.1	µg/L	0.003	mg/kg
1,1,1-Trichloroethane	1.0	µg/L	0.005	mg/kg
1,1,2,2-Tetrachloroethane	0.5	µg/L	0.003	mg/kg
1,1,2-Trichloroethane	1.0	µg/L	0.005	mg/kg
1,1-Dichloroethane	1.0	µg/L	0.005	mg/kg
1,1-Dichloroethene	1.0	µg/L	0.006	mg/kg
1,1-Dichloropropene	1.0	µg/L	0.005	mg/kg
1,2,3-Trichlorobenzene	1.0	µg/L	0.005	mg/kg
1,2,3-Trichloropropane	1.0	µg/L	0.005	mg/kg
1,2,4-Trichlorobenzene	1.0	µg/L	0.005	mg/kg
1,2,4-Trimethylbenzene	1.0	µg/L	0.006	mg/kg
1,2-Dichloroethane	0.5	µg/L	0.003	mg/kg
1,2-Dichlorobenzene	1.0	µg/L	0.005	mg/kg
1,2-Dibromo-3-chloropropane	2.0	µg/L	0.010	mg/kg
1,2-Dichloropropane	1.0	µg/L	0.005	mg/kg
1,2-Dibromoethane (EDB)	1.0	µg/L	0.005	mg/kg
1,3,5-Trimethylbenzene	1.0	µg/L	0.005	mg/kg
1,3-Dichlorobenzene	1.0	µg/L	0.006	mg/kg
1,3-Dichloropropane	0.4	µg/L	0.002	mg/kg
1,4-Dichlorobenzene	1.0	µg/L	0.002	mg/kg
1-Chlorohexane	1.0	µg/L	0.005	mg/kg
2,2-Dichloropropane	1.0	µg/L	0.005	mg/kg
2-Chlorotoluene	1.0	µg/L	0.005	mg/kg
4-Chlorotoluene	1.0	µg/L	0.005	mg/kg
Acetone	14	µg/L	0.050	mg/kg
Benzene	0.4	µg/L	0.002	mg/kg
Bromobenzene	1.0	µg/L	0.005	mg/kg
Bromochloromethane	1.0	µg/L	0.005	mg/kg
Bromodichloromethane	0.5	µg/L	0.002	mg/kg
Bromoform	1.0	µg/L	0.006	mg/kg
Bromomethane	3.0	µg/L	0.010	mg/kg
Carbon Disulfide	1.5	µg/L	0.003	mg/kg
Carbon tetrachloride	1.0	µg/L	0.005	mg/kg
Chlorobenzene	0.5	µg/L	0.002	mg/kg
Chloroethane	1.0	µg/L	0.005	mg/kg

Analyte	Water		Soil	
	RL	Units	RL[a]	Units
Chloroform	0.44	µg/L	0.002	mg/kg
Chloromethane	1.0	µg/L	0.005	mg/kg
cis-1,2-Dichloroethene	1.0	µg/L	0.005	mg/kg
cis-1,3-Dichloropropene	0.5	µg/L	0.003	mg/kg
Dibromochloromethane	0.5	µg/L	0.003	mg/kg
Dibromomethane	1.0	µg/L	0.005	mg/kg
Dichlorodifluoromethane	1.0	µg/L	0.005	mg/kg
Ethylbenzene	1.0	µg/L	0.005	mg/kg
n-Hexane	3.7	µg/L	0.21	mg/kg
Hexachlorobutadiene	0.6	µg/L	0.003	mg/kg
Isopropylbenzene	1.0	µg/L	0.005	mg/kg
Isopropyl ether	1.7	µg/L	0.0016	mg/kg
Methylene chloride	1.0	µg/L	0.005	mg/kg
Methyl t-butyl ether (MTBE)	5.0	µg/L	0.020	mg/kg
MEK (2-Butanone)	10	µg/L	0.020	mg/kg
MIBK (methyl isobutyl ketone)	10	µg/L	0.020	mg/kg
Naphthalene	1.2	µg/L	0.005	mg/kg
n-Butylbenzene	1.0	µg/L	0.005	mg/kg
n-Propylbenzene	1.0	µg/L	0.005	mg/kg
m,p-Xylene	2.0	µg/L	0.005	mg/kg
o-Xylene	1.0	µg/L	0.005	mg/kg
p-Isopropyltoluene	1.0	µg/L	0.006	mg/kg
sec-Butylbenzene	1.0	µg/L	0.005	mg/kg
Styrene	1.0	µg/L	0.005	mg/kg
Trichloroethene (TCE)	1.0	µg/L	0.005	mg/kg
tert-Butylbenzene	1.0	µg/L	0.005	mg/kg
Tetrachloroethene	1.0	µg/L	0.005	mg/kg
Tetrahydrofuran	10	µg/L	0.026	mg/kg
Toluene	1.0	µg/L	0.005	mg/kg
trans-1,2-Dichloroethene	1.0	µg/L	0.005	mg/kg
trans-1,3-Dichloropropene	1.0	µg/L	0.005	mg/kg
Trichlorofluoromethane	1.0	µg/L	0.005	mg/kg
1,1,2-trichloro-1,2,2-trifluoroethane	2.8	µg/L	0.11	mg/kg

[a] Low-level method with sodium bisulfate preservative.

Table 7-13 QC Acceptance Criteria for Method SW8260B Volatile Organics

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	ME Limits Water (% R)	Accuracy Soil (% R)	Precision Soil RPD (%)	ME Limits Soil (% R)	Assoc. IS
1,1,1,2-Tetrachloroethane	81–129	≤ 20	75-135	74–125	≤ 30	65-135	2
1,1,1-TCA	**67–132**	**≤ 20**	**none**	**68–130**	**≤ 30**	**none**	**1**
1,1,2,2-Tetrachloroethane	63–128	≤ 20	55-140	59–140	≤ 30	40-145	3
1,1,2-TCA	**75–125**	**≤ 20**	**none**	**62–127**	**≤ 30**	**none**	**1**
1,1-DCA	**69–133**	**≤ 20**	**none**	**73–125**	**≤ 30**	**none**	**1**
1,1-DCE	**68–130**	**≤ 20**	**none**	**65–136**	**≤ 30**	**none**	**1**
1,1-Dichloropropene	73–132	≤ 20	65-140	70–135	≤ 30	60-145	1
1,2,3-Trichlorobenzene	67–137	≤ 20	45-155	62–133	≤ 30	50-145	3
1,2,3-Trichloropropane	73–124	≤ 20	65-130	63–130	≤ 30	50-140	3
1,2,4-Trichlorobenzene	66–134	≤ 20	55-145	65–131	≤ 30	55-140	3
1,2,4-Trimethylbenzene	74–132	≤ 20	65-140	65–135	≤ 30	55-145	3
1,2-DCA	**69–132**	**≤ 20**	**none**	**72–137**	**≤ 30**	**none**	**1**
1,2-DCB	71–122	≤ 20	60-130	74–120	≤ 30	65-125	3
1,2-Dibromo-3-chloropropane	50–132	≤ 20	35-145	49–135	≤ 30	25-150	3
1,2-Dichloropropane	75–125	≤ 20	65-135	71–120	≤ 30	65-125	1
1,2-EDB	80–121	≤ 20	75-125	70–124	≤ 30	60-135	2
1,3,5-Trimethylbenzene	74–131	≤ 20	65-140	65–133	≤ 30	55-145	3
1,3-DCB	75–124	≤ 20	65-130	72–124	≤ 30	65-135	3
1,3-Dichloropropane	73–126	≤ 20	65-135	76–123	≤ 30	70-130	2
1,4-DCB	74–123	≤ 20	65-130	72–125	≤ 30	65-135	3
1-Chlorohexane	70–125	≤ 20	60-135	60–135	≤ 30	45-150	2
2,2-Dichloropropane	69–137	≤ 20	60-150	67–134	≤ 30	55-145	1
2-Chlorotoluene	73–126	≤ 20	65-135	69–128	≤ 30	60-140	3
4-Chlorotoluene	74–128	≤ 20	65-135	73–126	≤ 30	65-135	3
Acetone	40–135	≤ 20	20-160	40–141	≤ 30	10-180	1
Benzene	**81–122**	**≤ 20**	**none**	**73–126**	**≤ 30**	**none**	**1**
Bromobenzene	76–124	≤ 20	70-130	66–121	≤ 30	55-130	3
Bromochloromethane	65–129	≤ 20	55-140	71–127	≤ 30	60-135	1
Bromodichloromethane	76–121	≤ 20	70-130	72–128	≤ 30	60-135	1
Bromoform	69–128	≤ 20	60-140	66–137	≤ 30	45-150	2
Bromomethane	30–141	≤ 20	10-165	45–141	≤ 30	10-180	1

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	ME Limits Water (% R)	Accuracy Soil (% R)	Precision Soil RPD (%)	ME Limits Soil (% R)	Assoc. IS
Carbon Tetrachloride	**66–138**	**≤ 20**	**none**	**67–133**	**≤ 30**	**none**	**1**
Chlorobenzene	81–122	≤ 20	75-130	75–123	≤ 30	65-130	2
Chloroethane	58–133	≤ 20	50-145	41–141	≤ 30	20-175	1
Chloroform	69–128	≤ 20	50-150	72–124	≤ 30	65-135	1
Chloromethane	56–131	≤ 20	25-140	51–129	≤ 30	40-140	1
cis-1,2-DCE	**72–126**	**≤ 20**	**none**	**67–125**	**≤ 30**	**none**	**1**
cis-1,3-Dichloropropene	69–131	≤ 20	60-140	72–126	≤ 30	65-135	1
Dibromochloromethane	66–133	≤ 20	45-145	66–130	≤ 30	55-140	2
Dibromomethane	76–125	≤ 20	65-135	73–128	≤ 30	65-135	1
Dichlorodifluoromethane	30–153	≤ 20	10-175	34–136	≤ 30	15-155	1
Ethylbenzene	**73–127**	**≤ 20**	**none**	**74–127**	**≤ 30**	**none**	**2**
Hexachlorobutadiene	67–131	≤ 20	35-160	53–142	≤ 30	40-155	3
Isopropylbenzene	75–127	≤ 20	65-135	77–129	≤ 30	70-140	3
m,p-Xylene	**76–128**	**≤ 20**	**none**	**79–126**	**≤ 30**	**none**	**2**
Methylene chloride	**63–137**	**≤ 20**	**none**	**63–137**	**≤ 30**	**none**	**1**
Methyl t-butyl ether (MTBE)	**65–123**	**≤ 20**	**none**	**50–135**	**≤ 30**	**none**	**1**
MEK (2-Butanone)	49–136	≤ 20	10-170	40–135	≤ 30	10-180	1
MIBK (methyl isobutyl ketone)	58–134	≤ 20	45-145	47–147	≤ 30	30-165	1
n-Butylbenzene	69–137	≤ 20	55-150	65–138	≤ 30	50-150	3
n-Propylbenzene	72–129	≤ 20	65-140	63–135	≤ 30	50-145	3
Naphthalene	**54–138**	**≤ 20**	**none**	**51–135**	**≤ 30**	**none**	**3**
o-Xylene	**80–121**	**≤ 20**	**none**	**77–125**	**≤ 30**	**none**	**2**
p-Isopropyltoluene	73–130	≤ 20	65-140	75–133	≤ 30	65-140	3
sec-Butylbenzene	72–127	≤ 20	65-135	63–132	≤ 30	50-145	3
Styrene	65–134	≤ 20	55-145	74–128	≤ 30	65-135	2
TCE	**70–127**	**≤ 20**	**none**	**77–124**	**≤ 30**	**none**	**1**
tert-butylbenzene	70–129	≤ 20	60-140	65–132	≤ 30	55-145	3
Tetrachloroethene	**66–128**	**≤ 20**	**none**	**67–139**	**≤ 30**	**none**	**2**
Toluene	**77–122**	**≤ 20**	**none**	**71–127**	**≤ 30**	**none**	**1**
trans-1,2-DCE	**63–137**	**≤ 20**	**none**	**66–134**	**≤ 30**	**none**	**1**
trans-1,3-Dichloropropene	59–135	≤ 20	40-155	65–127	≤ 30	55-140	1
Trichlorofluoromethane	57–129	≤ 20	45-160	49–139	≤ 30	10-215	1

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	ME Limits Water (% R)	Accuracy Soil (% R)	Precision Soil RPD (%)	ME Limits Soil (% R)	Assoc. IS
Vinyl Chloride	**50–134**	**≤ 20**	**none**	**58–126**	**≤ 30**	**none**	**1**
Carbon Disulfide	59-130	≤ 20	none	70-130	≤ 20	none	1
n-Hexane	70-130	≤ 20	none	70-130	≤ 20	none	1
Isopropyl Ether	58-144	≤ 20	none	70-130	≤ 20	none	1
Tetrahydrofuran	72-130	≤ 20	none	70-130	≤ 20	none	1
1,1,2-trichloro-1,2,2-trifluoroethane	70-130	≤ 20	none	70-130	≤ 20	none	1
Surrogates:							
Dibromofluoromethane	85–115	-	-	65–135	-	-	1
Toluene-*d8*	81–120	-	-	84–116	-	-	2
4-Bromofluorobenzene	76–119	-	-	84–118	-	-	3
1,2-DCA-*d4*	72–119	-	-	52–149	-	-	1
Internal Standards:							
Fluorobenzene	-	-	-	-	-	-	1
Chlorobenzene-*d5*	-	-	-	-	-	-	2
1,4-Dichlorobenzene-*d4*	-	-	-	-	-	-	3

Analytes indicated in bold font are project analytes of concern, marginal exceedences are not allowed.

Table 7-14 Summary of Calibration and QC Procedures for Method SW8260B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning check Use BFB	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description. Section 7.2.8 for SW8260B	Retune instrument and verify.	Not appropriate
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	**SPCCs:** Average RF ≥0.030 [c] (SW8260B), ≥0.050 (SW8270C) **CCCs:** % RSD for RFs ≤ 30% **and** one of the options below: *Option 1*: linear – RSD for each analyte < 15% *Option 2 linear* – unweighted linear least squares regression r ≥ 0.995 for each analyte. *Option 3 non-linear* – COD ≥ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem and then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration verification	Once per ICAL	All analytes within ± 25% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	N/A	N/A
Retention time window verified for each analyte	Each sample.	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of ICAL	Correct problem then reanalyze all samples analyzed since the last retention time check.	Apply Q-flag to all results for the specific analyte(s) in the sample which are outside the established window.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Continuing Calibration verification (CCV)	Daily, before sample analysis unless ICAL performed on same day and after every 12 hours of analysis time	**SPCCs:** average RF ≥0.30[c] (SW8260B), average RF ≥0.050 (SW8270C); **CCCs:** ≤ 20% D All analytes within ± 20% D of expected value from ICAL. **Note:** D = difference when using RFs or drift when using least squares, regression or non-linear calibration.	Correct problem and then rerun CCV. If that fails, repeat initial calibration.	Apply Q-flag to all results for the specific analyte(s) > 20% D for all samples associated with the calibration verification.
Internal Standards (ISs)	Each sample	Retention time ± 30 seconds from retention time of the IS in the ICAL mid-point std. EICP area within -50% to +100% of area from IS in ICAL mid-point standard	Inspect mass spectrometer and GC for malfunctions and corrections made as appropriate. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS unless a matrix effect can be verified, then apply M-flag.
Method blank	One per analytical batch	No analytes detected >1/2 RL For common lab contaminants, no analytes detected > RL	Assess data. Correct problem. If necessary, re-prep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance Section 8.2.1.4.
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Tables 7-13 See Section 4.4.1.2 for guidance on determining marginal exceedances.	Correct problem, then reanalyze. If still out, re-prep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Tables 7-13	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Tables 7-13	Correct problem then re-prep and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ -flag to all associated non-detects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ 1/2 the RLs in Tables 7-9 and 7-11. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid.	Run MDL verification check at higher level and set higher MDL or re-conduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

[a] All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

[b] Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

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[c] SW8260B:RF, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.

7.2.5 Method SW8330 – Explosives Residues

Method SW8330 provides HPLC conditions for the detection of ppb levels of certain explosives residues in a water, soil, and sediment matrices. Prior to using this method, appropriate sample preparation techniques must be used.

Two low-level preparatory methods exist for aqueous samples: salting out and solid phase extraction (SPE). In the salting-out method, aqueous samples are extracted by a salting-out extraction procedure with no evaporation. SPE (Method SW3535A) is a procedure for isolating organic compounds from aqueous samples using solid-phase extraction media. SPE is the preferred method due to the increased accuracy and precision it gives over salting out.

An aliquot of the extract is separated on a C-18 reverse-phase column, determined at 254 nm, and confirmed on a cyanide reverse-phase column.

In the high-level direct injection method, aqueous samples of higher concentration can be diluted, filtered, separated on a C-18 reverse-phase column, determined at 254 nm, and confirmed on a cyanide reverse-phase column. Soil and sediment samples are extracted in an ultrasonic bath and filtered before chromatography. The reporting limits are listed in Table 7.15, and Table 7.16 provides acceptance criteria for Method SW8330. The acceptance criteria for aqueous samples in Table 7.16 are based on the DoD LCS Study, which found that SPE produced significantly better results. Also included in Table 7.16 are the marginal exceedances limits taken from the DoD QSM. AFCEE has set a policy that the minimum upper acceptance limits for LCS recoveries for aqueous and soil samples are 120% and 125% respectively. For this reason, the upper LCS contol limits and marginal exceedances limits are the same for some analytes. Table 7.17 identifies the, QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

Table 7.15. Reporting Limits for Method SW8330

Analyte	Water		Soil	
	RL	Unit	RL	Unit
HMX	NA	NA	2.2	mg/kg
RDX	NA	NA	1.0	mg/kg
2,4,6- TNT	NA	NA	0.25	mg/kg
Tetryl	NA	NA	0.34	mg/kg
1,3,5- TNB	NA	NA	0.25	mg/kg
1,3- DNB	NA	NA	0.38	mg/kg
2-Amino-4,6-dinitrotoluene	NA	NA	0.26	mg/kg
4-Amino-2,6-dinitrotoluene	NA	NA	0.28	mg/kg
2,4-DNT	NA	NA	0.25	mg/kg
2,6-DNT	NA	NA	0.30	mg/kg
Nitrobenzene	NA	NA	0.28	mg/kg
2-Nitrotoluene	NA	NA	0.30	mg/kg
3-Nitrotoluene	NA	NA	0.30	mg/kg
4-Nitrotoluene	NA	NA	0.26	mg/kg

Table 7.16. QC Acceptance Criteria for Method SW8330

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	ME Limits Water (% R)	Accuracy Soil (% R)	Precision Soil RPD (%)	ME Limits Soil (% R)
HMX	81–120	≤ 30	75-120	74–126	≤ 50	65-135
RDX	51–161	≤ 30	35-180	72–134	≤ 50	65-145
2,4,6-TNT	52–143	≤ 30	35-160	55–142	≤ 50	45-155
Tetryl	22–174	≤ 30	10-200	25–142	≤ 50	0-172
1,3,5-TNB	64–139	≤ 30	50-150	73-125	≤ 50	65-135
1,3-DNB	47–158	≤ 30	30-175	79–125	≤ 50	70-135
2-Amino-4,6-dinitrotoluene	50-155	≤ 30	35-170	80-125	≤ 50	75-130
4-Amino-2,6-dintrotoluene	55-155	≤ 30	40-170	80-125	≤ 50	75-130
2,4-DNT	61–135	≤ 30	50-145	80-125	≤ 50	75-130
2,6-DNT	60–137	≤ 30	50-150	77–125	≤ 50	70-130
Nitrobenzene	49–138	≤ 30	35-155	77-125	≤ 50	70-130
2-Nitrotoluene	43–133	≤ 30	30-150	80-125	≤ 50	70-130
3-Nitrotoluene	48–132	≤ 30	35-145	75-125	≤ 50	70-130
4-Nitrotoluene	48–132	≤ 30	35-145	77–125	≤ 50	70-135
Surrogate						
1,2-DNB	73–131	-	-	79–146	-	-

Table 7.17 Summary of Calibration and QC Procedures for Method SW8330

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	One of the options below: *Option 1*: linear – RSD for each analyte ≤20% *Option 2*: linear – least squares regression r ≥ 0.995 for each analyte. *Option 3*: non-linear – COD ≥ 0.99 (six points shall be used for second order, seven points shall be used for third order)not applicable for SW8082	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration verification	Once per ICAL	All analytes within ± 25% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position established for each analyte and surrogate	Each ICAL and at the beginning of the analytical shift	Position shall be set using the midpoint standard of the calibration curve or the value in the calibration verification run at the beginning of the analytical shift (ICV).	N/A	N/A
Retention time window width established for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	3 times standard deviation for each analyte retention time from 72-hour study.	N/A	N/A
Retention time window verification for each analyte and surrogate	Each calibration verification	Analyte within established window.	Correct problem then reanalyze all samples analyzed since the last acceptable retention time check.	**ICV:** Flagging criteria are not appropriate for initial verification. **CCV:** Apply Q-flag to all results for the specific analyte(s) in the sample which are outside the established window.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Continuing calibration verification: initial (ICV) and continuing (CCV)	**ICV:** Daily, before sample analysis, unless ICAL performed on same day **CCV:** After every 10 samples and at the end of the analysis sequence	All analytes within ± 20% of expected value (% D)	**ICV:** Correct problem, rerun ICV. If that fails, repeat initial calibration. **CCV:** Correct problem then repeat CCV. Reanalyze all samples since last successful calibration verification.	**ICV:** Flagging criteria are not appropriate. **CCV:** Apply Q-flag to all results for the specific analyte(s) >20 %D for all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > ½ RL	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s), as appropriate. See guidance Section 8.2.1.4.
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7.16. See Section 4.4.1.2 for guidance on determining marginal exceedances.	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Table 7.16	Correct problem then re-extract and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes. If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ -flag to all associated non-detects. If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7.16	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL
Second Column Confirmation	100% for all positive results	Same as for initial or primary analysis	Same as for initial or primary analysis	Apply J-flag if RPD > 40% from first column result. Apply Q-flag to all results for the specific analyte(s) in the sample not confirmed.
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Tables 7.2.5.1-1 and 7.2.5.2-1. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

7.2.6 Method SW6010B – Trace Elements (Metals) by Inductively Coupled Plasma Atomic Emission Spectroscopy

Samples are analyzed for trace elements or metals using Method SW6010B for water and soils. Analysis for most metals requires digestion of the sample. Following digestion, the trace elements are determined simultaneously or sequentially using ICP-AES. The elements and corresponding RLs for this method are listed in Table 7-18. Table 7-19 provides acceptance criteria for Method SW6010B. Table 7-20 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

Table 7.18 Reporting Limits for Method SW6010B

Analyte	Water		Soil	
	RL	Unit	RL	Unit
Aluminum	NA	NA	20	mg/kg
Antimony	NA	NA	10	mg/kg
Arsenic	0.03	mg/L	1.0	mg/kg
Barium	0.05	mg/L	1	mg/kg
Beryllium	NA	NA	1	mg/kg
Cadmium	0.00058	mg/L	0.5	NA
Calcium	NA	NA	100	mg/kg
Chromium	0.01	mg/L	1	mg/kg
Cobalt	NA	NA	1	mg/kg
Copper	NA	NA	2	mg/kg
Iron	NA	NA	3	mg/kg
Lead	0.005	mg/L	3	mg/kg
Magnesium	NA	NA	100	mg/kg
Manganese	NA	NA	1	mg/kg
Nickel	NA	NA	2	mg/kg
Potassium	NA	NA	200	mg/kg
Selenium	0.03	mg/L	3	mg/kg
Silver	0.01	mg/L	1	mg/kg
Sodium	NA	NA	100	mg/kg
Thallium	NA	NA	6	mg/kg
Vanadium	NA	NA	1	mg/kg
Zinc	NA	NA	2	mg/kg

NA: Not Analyzed

Table 7.19 QC Acceptance Criteria for Method SW6010B

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	Accuracy Soil (% R)	Precision Soil RPD (%)	ME Limits Soil (% R)
Aluminum	NA	NA	79–120	≤ 30	75–120
Antimony	NA	NA	80–120	≤ 30	75–120
Arsenic	80–120	≤ 20	80–120	≤ 30	80–120
Barium	80–120	≤ 20	80–120	≤ 30	80–120
Beryllium	NA	NA	80–120	≤ 30	80–120
Cadmium	80–120	≤ 20	80–120	≤ 30	80–120
Calcium	NA	NA	80–120	≤ 30	80–120
Chromium	80–120	≤ 20	80–120	≤ 30	80–120
Cobalt	NA	NA	80–120	≤ 30	80–120
Copper	NA	NA	80–120	≤ 30	80–120
Iron	NA	NA	80–120	≤ 30	80–120
Lead	80–120	≤ 20	80–120	≤ 30	80–120
Magnesium	NA	NA	80–120	≤ 30	80–120
Manganese	NA	NA	80–120	≤ 30	80–120
Nickel	NA	NA	80–120	≤ 30	80–120
Potassium	NA	NA	80–120	≤ 30	80–120
Selenium	80–120	≤ 20	80–120	≤ 30	75–120
Silver	80–120	≤ 20	75–120	≤ 30	70–120
Sodium	NA	NA	80–120	≤ 30	80–120
Thallium	NA	NA	80–120	≤ 30	80–120
Vanadium	NA	NA	80–120	≤ 30	80–120
Zinc	NA	NA	80–120	≤ 30	75–120

NA: Not Analyzed

Table 7-20 Summary of Calibration and QC Procedures for Method SW6010B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Initial calibration for all analytes (minimum one standard and a blank) (ICAL)	Daily initial calibration prior to sample analysis	If more than one standard is used, correlation coefficient must be ≥ 0.995	If applicable, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Initial calibration verification (second source) (ICV)	Daily after ICAL	All analytes within ± 10% of expected value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Calibration verification (Instrument Check Standard) (CCV)	After every 10 samples At the end of the analysis sequence	All analyte(s) within ± 10% of expected value and RSD of replicate integrations < 5%	Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) >10 %D for all samples associated with the calibration verification.
Calibration blank	Before beginning a sample run After every calibration verification	No analytes detected ≥ 2X MDL	Correct problem then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance AFCEE QAPP v .0.02 Section 8.2.1.4.
Low-level calibration check standard (at or below RL)	Daily, after initial calibration. Not required if multi-point calibration (3 or more points) with low std at or below RL is performed	All analyte(s) with ± 20% of expected value	Correct problem then reanalyze.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.
Linear range calibration (high) check standard	Every three months	Analyte within ± 10% of expected value	Correct problem then reanalyze or re-set linear range.	Apply J-flag to the specific analyte(s) for all results not within linear range.
Method blank	One per analytical batch	No analytes detected > RL	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results > MDL for the specific analyte(s) as appropriate. See guidance AFCEE QAPP v 4.0 Sec 8.2.1.4.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Interference check solution (ICS)	At the beginning of an analytical run	**ICS-A:** All non-spiked analytes < 2 x MDL (unless they are a verified trace impurity from one of the spiked analytes) **ICS-AB:** Within ± 20% of expected value	Terminate analysis; locate and correct problem; reanalyze ICS.	Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS.
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7-19	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) in all samples in the associated preparatory batch.
Dilution test	Each new sample matrix, at least once per analytical batch (only applicable for analytes with concentrations ≥50X MDL)	Fivefold (1+4) dilution must agree within ± 10% of the original determination	Perform post-digestion spike addition.	Apply J-flag to all sample results for the specific analyte from the same matrix in the batch if either of following exist: (1) dilution test not run and batch had analyte concentrations ≥50X MDL or (2) % D ≥ 10 and post-digestion spike not performed.
Post digestion spike addition	When dilution test fails or if an analyte's concentration for all samples in a batch is less than 50X MDL	Recovery within 75–125% of expected results	Check for instrumental problem then reanalyze post-digestion spike addition if appropriate.	Apply J-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition. If post-digestion spike addition recovery is < 10%, apply Q-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post-digestion spike addition.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7-19	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS or failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ 1/2 the RLs in Table 7-17. See 40 CFR, Part 136 Appendix B. Verification checks must produce a response at least 3X instrument noise level and must produce a response greater than the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

[a] All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

[b] Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

7.2.7 Methods SW7470A/SW7471A – Mercury Cold-Vapor Atomic Absorption

Water and soil samples are analyzed for mercury using Methods SW7470A and SW7471A, respectively. These methods are cold-vapor, flameless atomic absorption (AA) techniques based on the absorption of radiation by mercury vapor. Mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an AA spectrophotometer. Mercury concentration is measured as a function of absorbance. The RLs for these methods are listed in Table 7-21. Table 7-22 provides acceptance criteria for Method SW7470A/SW7471A. Table 7-23 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

Table 7-21 Reporting Limits for Methods SW7470A/SW7471A

Analyte	Water		Soil	
	RL	Units	RL	Units
Mercury	0.00028	mg/L	0.1	mg/kg

Table 7-22 QC Acceptance Criteria for Methods SW7470A/SW7471A

Analyte	Accuracy Water (% R)	Precision Water RPD (%)	Accuracy Soil (% R)	Precision Soil RPD (%)
Mercury	80-120	≤ 15	80-120	≤ 30

Table 7-23 Summary of Calibration and QC Procedures for Methods SW7470A/SW7471A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Initial multipoint calibration (minimum five standards and a blank) (ICAL)	Daily initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration check standard (ICV)	Once per ICAL	Analyte within ± 10% of expected value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Calibration blank	Before beginning a sample run, after every 10 samples and at end of the analysis sequence	No analytes detected > 2X MDL	Correct problem then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results as appropriate. See guidance Section 8.2.1.4.
Calibration verification (CCV)	After every 10 samples and at the end of the analysis sequence	Analyte within ± 20% of expected value	Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > 1/2 RL	Assess data. Correct problem. If necessary, re-prep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results as appropriate. See guidance Section 8.2.1.4.
Dilution Test	Each matrix in a analytical batch (only applicable for samples with concentrations ≥25X MDL)	Fivefold (1+4) dilution must agree within ± 10% of the original determination	None	Apply J-flag to all sample results if batch had sample(s) with concentrations ≥25X MDL and either of following exist: (1) dilution test not run or (2) % D ≥ 10
LCS	One LCS per analytical batch	Acceptance criteria: Table 7-22	Correct problem then reanalyze. If still out, re-prep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to all samples in the associated preparatory batch.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7-22	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ 1/2 the RLs in Acceptance Criteria, Table 7-23. See 40 CFR, Part 136 Appendix B. Verification checks must produce a response at least 3X instrument noise level and must produce a response greater than the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or re-conduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

[a] All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

[b] Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

8. DATA MANAGEMENT AND EVALUATION

The data reduction, verification, validation, assessment, and reporting procedures described in this section will ensure that (1) the data are reviewed and documented, (2) transcription and data reduction errors are minimized, (3) complete documentation is maintained, and (4) the reported results are accurate, or qualified if necessary. Laboratory data reduction and verification procedures are required to ensure that the data deliverable(s) meet the overall project objectives. Data reduction, whether performed by instrumentation or manually, shall follow methodologies specified in the laboratory standard operating procedures (SOPs) or approved analytical methods. Any variances from established procedures must be requested and approved in advance. Automated procedures shall be verified as required by EPA's guidance on Good Automated Laboratory Practices (GALP, EPA 1995); all software shall be tested with a sample set of data to verify its correct operation via accurate capture, processing, manipulation, transfer, recording, and reporting of data. Data shall be reported in hardcopy data package(s) and as electronic data deliverable(s) (EDDs).

8.1 Data Review Requirements for Screening Data

The screening data methods are identified in Table 6-1 of Section 6. The calibration, QC requirements, corrective action requirements, and flagging criteria required are shown in Table 6-2 in Section 6. Definitions of these data qualifiers are provided in the AFCEE QAPP, Version 4.0, Table 8.2.2.4-1. The flagging criteria should be applied when acceptance criteria are not met and corrective action was either not successful or not performed. Also, any data that have been affected by multiple qualifiers shall retain these qualifiers in the final reviewed data package.

8.2 Data Review Requirements for Definitive Data

Scientifically sound data of known and documented quality that meet PQOs are essential for use in the decision-making process. Data review is the process whereby data are examined and evaluated to varying levels of detail and specificity by a variety of personnel who have different responsibilities within the data management process. It includes verification, validation, and usability assessment.

Data verification is the first step in data review. As used here, data verification is confirmation that the specified requirements have been performed (i.e., it is a completeness check).

Data validation extends this and is confirmation that the requirements for a specific, intended use are fulfilled. Data validation is the systematic process of evaluating the compliance of the data with the pre-defined requirements of the project, including method, procedural, or contractual requirements and the comparison of the data with criteria based on the quality objectives documented in the project QAPP. The purpose of data validation is to assess the performance associated with the analysis in order to determine the quality of the data. Data validation includes a determination, to the extent possible, of the reasons for any failure to meet performance requirements, and an evaluation of the impact of such failures on the usability of the data.

The data usability assessment is an evaluation based on the results of data validation and verification in the context of the overall project DQOs and PQOs. The assessment determines whether the project execution and resulting data meet PQOs. Both the sampling and analytical activities must be considered, with the ultimate goal of assessing whether the final, qualified results support the decisions to be made with the data.

8.2.1 Laboratory Requirements

The chemistry data package must contain adequate information and be presented in a clear and concise manner. Minimum requirements include a cover sheet that identifies the project; table of contents; case narrative that summarizes samples and analyses, and discusses any issues that may affect data usability, analytical results, laboratory reporting limits, sample management records, and internal laboratory QA/QC information. The AFCEE Forms (Section 8.8) may be used for this. Equivalent formats are acceptable, provided they include all essential information. The laboratory data package should be organized such that the analytical results are reported on a per AAB basis, unless otherwise specified. This will facilitate subsequent review, validation, and assessment.

Based on the information in the data package, a reviewer should be able to determine the sensitivity and PARCC parameters of the data. An equivalent to an EPA level IV data package is required.

The standard turn-around time for delivery of data packages and electronic deliverables is 21 days from sample receipt at the laboratory, unless otherwise specified in the laboratory's statement of work.

8.2.1.1 Laboratory Data Reporting Requirements

Laboratory reports must include at a minimum all the information in this Section.

An important part of the laboratory documentation is the case narrative, which contains essential information that affords an informed evaluation of data usability. The case narrative shall include but not be limited to:

- Table summarizing samples received, correlating field sample numbers, laboratory sample numbers, and laboratory tests completed.
- Discussion of sample appearance and integrity issues that may affect data usability (temperature, preservation, pH, sample containers, air bubbles, multi-phases, etc.).
- Samples received but not analyzed and why.
- Discussion of holding time excursions for sample prep and analyses.
- Analysis of all out-of-control or discrepancies of calibrations, continuing calibrations or QC sample results (ICS, LCS, MS/MSD, serial dilutions, post-digestion spikes, etc.), raw data/chromatograms, and corrective actions taken.

- Discussion of all qualified data and definition of qualifying flags.
- Discussion and recommendations of potential data usability of qualified data including detailed discussion of conditions associated with Q-flagged data.

Reporting details:

- MDLs and sample results should be reported to one decimal place more than the corresponding RL, unless the appropriate number of significant figures for the measurement dictates otherwise.
- Soil samples shall have results reported on a dry weight basis. The laboratory shall weigh out 10 to 20 percent additional sample mass to compensate for percent moisture. For particularly wet samples, the laboratory shall determine the percent moisture of the soil samples and then adjust the sample weight to compensate for the percent moisture. The lab shall round up to the nearest 10 percent to maintain the lowest RL possible. For example, if the percent moisture is calculated to be 63.3 percent, then the lab shall round up to 70 percent and shall weigh out 3.33x the usual amount of sample.

Note that RLs and MDLs shall be adjusted for sample moisture. The laboratory should ensure that the minimum relationship between adjusted MDLs and corresponding RLs are maintained.

- If possible, samples should be analyzed undiluted and non-detects reported to the AFCEE-specified RLs. RLs for minority constituents in highly contaminated samples may have to be adjusted for dilutions.

8.2.1.2 Laboratory Data Review Requirements

All analytical data generated by the laboratory shall be verified prior to submittal to Earth Tech per the AFCEE QAPP, Version 4.0.

8.2.1.3 Laboratory Data Evaluation

The calibration, QC, corrective actions, and flagging requirements for definitive data are shown in the tables in Section 7.2. Data qualifiers shall be applied by the laboratory according to the requirements in the tables in Sections 6 and 7 as part of their validation activities. The allowable data qualifiers for definitive data are *Q, M, J, F, B, U,* and *UJ.* The definitions of the data qualifiers are provided in Table 8.2.1.5-1 of the AFCEE QAPP, Version 4.0. Flagging criteria apply when acceptance criteria are not met and corrective actions were not successful or not performed. The data qualifiers are reviewed by the supervisor of the respective analytical sections after the first- and second-level reviews of the laboratory data have been performed.

The laboratory QA section shall perform a 100-percent review of 10 percent of the completed data packages for this project, and the laboratory project representative shall complete a final review on all the completed data packages.

Earth Tech shall subsequently evaluate the flags applied by the laboratory as part of their data validation and usability assessment activities. The flags may be accepted, modified, or rejected.

For all data qualifiers that are changed, the prime contractor must provide clear justification for those modifications based on project-specific quality objectives. All Q-flagged data must be evaluated by the prime contractor and either accepted without qualification, accepted with qualification, or rejected.

8.2.1.4 Method Blank Evaluation Guidance

Method blanks shall be evaluated per Section 8.2.1.6 of the AFCEE QAPP, Version 4.0, with the exception that results are flagged if detected in the method blank at a concentration greater than the MDL. Corrective action shall be implemented if concentrations of target analytes in method blank are greater than 1/2 the RL (greater than the RL for 6010B and the following common laboratory contaminants: acetone, 2-butanone, methylene chloride, bis-2-etylhexyl phthalate, di-n-octyl phthalate, and zinc).

8.2.2 Prime Contractor Requirements

The ultimate goal of data review is to ensure that the decisions that are made as a result of the environmental data collection effort are supported by data of the type and quality suitable for their intended use. Earth Tech (the prime contractor) has overall responsibility for data quality.

8.2.2.1 Responsibility and Qualifications

The data verification/validation/usability assessment processes involves exercise of professional judgment. Data verification/validation/usability assessment shall be performed by a project chemist, under the direction of the QA Manager, or by the QA Manager.

Although discussed sequentially below, certain steps in the data review process may be performed simultaneously.

8.2.2.2 Data Verification Guidelines

Earth Tech shall perform data verification on 100 percent of the data. Data verification may be done electronically or manually, or by a combination of both, and shall include (but is not limited to):

- Sampling documentation (COC form, etc.)
- Preservation summary and technical holding times
- Presence of all analyses and analytes requested
- Use of the required sample preparation and analysis procedures
- Method detection and reporting limits evaluated against the project requirements
- The correctness of the concentration units
- Case narrative

8.2.2.3 Data Validation Guidelines

The data validation process builds on data verification. The laboratory case narrative, QC sample results, and calibrations shall be reviewed and data qualifiers removed or added in light of project knowledge for 100 percent of the data. Method-specific instrument calibration and QC parameters shall be reviewed for compliance with calibration and QC requirements specified in Section 7.

An in-depth review of the raw data to verify accuracy shall be performed on 10 percent of the data and include the following, but is not limited to:

- Instrument calibration and QC parameters (method-specific) (These shall be reviewed for compliance with the criteria specified in the applicable Summary of Calibration and QC Procedures tables, and flagged as necessary.)
- Review of raw data such as instrument print outs, preparation logs, and run logs
- Review of system performance
- Random check of calculations, including, but not limited to, sample and QC results, initial calibration response factors and relative standard deviations, calibration verification standard response factors, and percent differences or percent drifts from the expected values
- Random verification of sample results to the raw data
- Check for interference problems or system performance problems
- Estimated results (F-qualifiers)
- Resolution by the laboratory of any identified problems, as necessary

8.2.2.3.1 Data Analysis and Interpretation

This phase of the data validation process (assessment) shall be performed on 100 percent of the data and relies heavily on the QA Manager's professional judgment. It shall include, but is not limited to, all steps in Section 8.2.2.3.2 of the AFCEE QAPP, Version 4.0, as applicable.

A data validation report will be prepared summarizing the findings and discussing their impact on the overall data usability. This may be incorporated into the final usability assessment.

8.2.2.3.2 Blank Evaluation Guidelines

During the data validation process, Earth Tech shall evaluate laboratory B-qualified data, such as method blanks, as well as other blanks (equipment blanks) based on the concentration of the analyte in the samples in relation to the concentration in the blank. The B-flag may be removed and not utilized if the analyte concentrations in the samples are much higher (≥5X) than those in the blank. Any blank contamination that may impact data usability must be discussed by Earth Tech in conjunction with project-specific goals.

8.2.2.3.3 Duplicate/Replicate Evaluation Guidance

Field duplicates, MSDs, and serial dilutions shall be evaluated per Section 8.2.2.3.4 of the AFCEE QAPP, Version 4.0.

8.2.2.3.4 Matrix Interference Evaluation Guidance

In the case of matrix interference, the laboratory will follow the guidelines specified in appropriate tables in Section 7. However, Earth Tech shall apply M flags to additional samples from the same site and same matrix, as applicable.

8.2.2.4 Flagging Conventions

The allowable final data qualifiers for definitive data and the hierarchy of data qualifiers, listed in order of the most severe through the least severe, are *R*, *M*, *J*, *F*, *B*, *U*, and *UJ*. Their definitions are summarized in Table 8.2.2.4-1 of the AFCEE QAPP, Version 4.0.

Tables 8.2.2.4-2 and 8.2.2.4-3 in the AFCEE QAPP, Version 4.0, present the general guidelines for applying these data qualifiers. The tables in Section 7 should be consulted for specific details.

8.3 Quality Assurance Reports

The laboratory QA staff shall issue QA reports to the laboratory management, laboratory supervisors, and task leaders per Section 8.3 of the AFCEE QAPP, Version 4.0.

8.4 ERPIMS Electronic Data Reports

An ERPIMS submittal is not required for this project.

8.5 Archiving

Hardcopy and electronic data shall be archived in project files and in electronic format by the laboratory for the duration of the project or a minimum of 5 years, whichever is longer, or as dictated by project requirements (if longer than 5 years). The laboratory shall also provide Earth Tech and AFCEE all files associated with the project in electronic media. The data packages must be retrievable for AFCEE within 7 calendar days. In the event of laboratory closure, all applicable documents and electronic media must be immediately transferred to AFCEE.

8.6 Project Data Flow And Transfer

The data flow from the laboratory and field to the project staff and data users shall be sufficiently documented to ensure that the data are properly tracked, reviewed, and validated for use.

8.7 Record Keeping

The laboratory shall maintain electronic and hardcopy records sufficient to recreate each analytical event conducted pursuant to the SOW. The minimum records that the laboratory will keep must contain the following: (1) COC forms; (2) initial and continuing calibration records, including standards preparation traceable to the original material and lot number; (3) instrument-tuning records (as applicable); (3) method blank results; (4) IS results; (5) surrogate spiking records and results (as applicable); (6) spike and spike duplicate records and results; (7) laboratory records; (8) raw data, including instrument printouts, bench work sheets, and/or chromatograms with compound identification and quantitation reports; (9) corrective action reports; (10) other method and project required QC samples and results; and (11) laboratory-specific written SOPs for each analytical method and QA/QC function in place at the time of analysis of project samples.

8.8 Hardcopy Data Report Forms for Reporting Screening and Definitive Data

The hardcopy data reports or forms shall conform to the formats identified in this section or laboratory equivalents. Laboratory equivalent forms shall contain, at a minimum, all the information specified on the forms in the AFCEE QAPP, Version 4.0. **In addition to the forms specified below (or the laboratory equivalent forms), the hardcopy data deliverable shall also contain all raw data for samples, QC samples, instrument tunes, and calibrations, preparation bench sheets, instrument run logs, standard preparation logs, and any other data necessary to reproduce sample, QC sample, and calibration results.**

A definitive data organic report package shall consist of the following AFCEE forms: COC, O-1, O-2, O-3, O-3A, O-4, O-5, O-5A, O-6, O-7, O-8, O-9, O-10, O-11, and O-12 for each AAB with organic analyses performed.

A definitive data inorganic report package shall consist of the following AFCEE forms or laboratory equivalents: COC, I-1, I-2, I-3 **(low-level RL check standard summary and linear range summary with date, concentration, %recoveries if 2-pt calibration)**, I-3A, I-3B, I-4, I-5, I-6, I-7, I-8, I-9, I-10, I-11, I-12, **MDL study form (including MDL verification), and ICS summary form** for each AAB with inorganic analyses performed.

Exceptions to these report forms are as follows: for mercury analysis, form I-3A shall be substituted for form I-3 in the inorganic report package and for GC/MS analyses, forms O-3 and O-5 shall be used and form O-11 shall be added to the organic report package. A complete list and description of forms is provided in Table 8.8-1 of the AFCEE QAPP, Version 4.0.

9. SYSTEMS AND PERFORMANCE AUDITS, PERFORMANCE EVALUATION PROGRAMS, MAGNETIC TAPE AUDITS, AND TRAINING

In addition to the 10 percent full data review/validation described in Section 8, the following project-specific technical systems and performance audits shall be performed. Other audits described in Section 9.0 of the AFCEE QAPP, Version 4.0, may be performed at AFCEE's discretion.

9.1 Project Audits

9.1.1 State/Federal Project Audits

All laboratories shall participate in the EPA Water Supply and Water Pollution Studies programs or equivalent programs for state certifications. Satisfactory performance in the non-project-specific PT sample programs also demonstrates proficiency in methods used to analyze AFCEE samples. The laboratory shall document the corrective actions to unacceptable PT sample results to demonstrate resolution of the problems.

9.1.2 Technical Systems Audits

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activities are being performed in compliance with the project SAP specifications. Sampling, field procedures, and analytical laboratories shall be audited by the prime contractor at the beginning of the project. In addition, a laboratory systems audit may be performed by AFCEE if previous audit reports indicate corrective actions have not been completed, a recent audit has not been conducted, or quality concerns have arisen based upon the use of that laboratory for other projects. The laboratory systems audit results will be used to assess the prime contractor's oversight and to review laboratory operation and ensure the technical procedures and documentation are in place and operating to provide data that fulfill the project objectives and to ensure corrective actions have been implemented.

Critical items for a laboratory systems audit include: (1) sample custody procedures, (2) calibration procedures and documentation, (3) completeness of data forms, notebooks, and other reporting requirements, (4) data review and validation procedures, (5) data storage, filing, and record keeping procedures, (6) QC procedures, tolerances, and documentation, (7) operating conditions of facilities and equipment, (8) documentation of training and maintenance activities, (9) systems and operations overview, and (10) security of laboratory automated systems.

Critical items for field sampling systems audit include: (1) appropriate sampling plans (QAPP, FSP) (2) calibration procedures and documentation for field equipment, (3) documentation in field logbooks and sampling data sheets, (4) organization and minimization of potential contamination sources while in the field, (5) proper sample collection, storage, and transportation procedures, and (6) compliance with established COC and transfer procedures.

After each on-site audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit an audit report including observations of the deficiencies and the necessary recommendations for corrective actions to the prime contractor. Compliance with the specifications presented in the SAP will be noted and noncompliance or deviations shall be addressed in writing by the prime contractor to AFCEE with corrective actions and a time frame for implementation of the corrective actions. Follow-up audits will be performed prior to completion of the project to ensure corrective actions have been taken.

AFCEE personnel must be notified at least three weeks prior to conducting the field audit. Also, if AFCEE personnel plan to observe field activities during the audit, the prime contractor must provide the AFCEE attendee(s) with any needed personal protective equipment. This should be coordinated directly with AFCEE attendee(s).

9.2 Training

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

10. PREVENTIVE MAINTENANCE

A preventive maintenance program shall be in place to promote the timely and effective completion of a measurement effort in accordance with Section 10.0 of the AFCEE QAPP, Version 4.0.

11. CORRECTIVE ACTION

Corrective actions, if necessary, shall be completed at once. If acceptance criteria were not met and a corrective action was not successful or corrective action was not performed, the appropriate flagging criteria must be applied. Requirements and procedures for documenting the need for corrective actions are described in Section 11.0 of the AFCEE QAPP, Version 4.0.

12. QUALITY ASSURANCE REPORTS TO MANAGEMENT

QA reports to be generated for the project shall be described and example forms provided in the project QAPP. At a minimum, the QA coordinator of the laboratory shall prepare a quarterly summary report of the status of the project, of QA/QC problems, corrective actions taken, and unresolved RCAs with recommended solutions for management. The report shall also include results from all performance evaluation samples, audit findings, and periodic data quality assessments. This report shall be available for review by AFCEE auditors upon request.

13. REFERENCES

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APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

440th Air Lift Wing Air Reserve Station Site
General Mitchell Airport
College Avenue and Howell Street
Milwaukee, WI

Prepared for:

AFCEE/ACB

Prepared by:

Earth Tech, Inc.
5555 Glenwood Hills Parkway
Grand Rapids, Michigan 49512

October 3, 2007

Project No: 10271.

HEALTH AND SAFETY PLAN APPROVAL

This Health and Safety Plan (HASP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HASP for the General Mitchell Airport Air Reserve Station Site. This HASP has been written for the exclusive use of Earth Tech, Inc., its employees, and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Written by:

10/03/2007

Travis Westra

Safety Professional II

Date

Reviewed by:

10/8/07

Eric Slusser

Field Manager

Date

Approved by:

Greg McGovern

10/8/07

Greg McGovern

Project Manager

Date

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ATTACHMENTS

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) (including Attachments A-B) provides a general description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted at the General Mitchell Airport Air Reserve Station Site, located at College Avenue and Howell Street in Milwaukee, WI. This HASP also identifies chemical and physical hazards known to be associated with the Earth Tech-managed activities addressed in this document.

HASP Supplements will be generated as necessary to address any additional activities or changes in site conditions which may occur during field operations. Once generated, each Supplement will be inserted in Attachment E and reviewed/acknowledged by field personnel prior to the start of applicable work activities.

1.1 GENERAL

The provisions of this HASP are mandatory for all Earth Tech personnel engaged in fieldwork associated with the environmental services being conducted at the subject site. A copy of this HASP, any applicable HASP Supplements and the Earth Tech Safety, Health & Environmental (SH&E) Standard Operating Procedures (SOPs) shall be maintained on site and available for review at all times. Record keeping will be maintained in accordance with this HASP and the applicable SH&E SOPs. In the event of a conflict between this HASP, the SOPs and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

1.2 POLICY STATEMENT

Earth Tech has developed ten "Core Values", which form the foundation of our Safety Management System. These Core Values were developed for two basic reasons:

1. To communicate the company's basic safety tenets to Earth Tech employees, partners, and customers; and
2. To serve as a constant reminder for every Earth Tech staff member that our everyday business and operational decisions must be made in concert with these tenets.

The Core Values will be posted at the site in a common area and communicated to all employees prior to beginning work activities.

Earth Tech maintains the following goals for all operations:

- **Zero** work-related injuries or illnesses.
- **Zero** damage to property, and/or equipment from our activities.
- **Zero** releases to the environment from our ongoing projects.

1.3 REFERENCES

This HASP meets the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*).
- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction.*
- National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985.

1.3.1 Earth Tech Safety, Health and Environmental Website

Earth Tech's Safety Website is located on the Earth Tech Corporate Intranet, and is available for all Earth Tech employees as a resource for safety information, updates, and procedures. Project management and employees are encouraged to visit the website for key safety items and information, such as:

- The Earth Tech Employee Orientation,
- Contact information for Earth Tech's Safety Department staff,
- Safety Forms,
- Safety Program Manuals,
- Safety Alerts and other communications,
- Accident, Injury, and Near-Miss Reporting Requirements,
- e-Tracking
- Links to safety and regulatory information,
- Training Resources,
- Ergonomics Information, and
- A feedback link to the Earth Tech Safety Director.

The website is located at the following web address:

http://etonline.earthtech.com/etonline/healthsafety/

Please note that the website can only be accessed when connected to Earth Tech's Wide-Area Network (e.g., via ET RAS).

2.0 SITE INFORMATION AND SCOPE OF WORK

Earth Tech will conduct environmental services at the General Mitchell Airport Air Reserve Station Site. Work will be performed in accordance with the applicable Statement of Work (SOW) and associated Work Plans developed for General Mitchell Airport Air Reserve Station Site. Deviations from the listed SOW will require that a Safety Professional review and changes made to this HASP, to ensure adequate protection of personnel and other property.

The following is a summary of relevant data concerning the General Mitchell Airport Air Reserve Station Site, and the work procedures to be performed. The Work Plan, prepared by Earth Tech as a companion document to this HASP, provides significantly greater details concerning both site history and planned work operations.

2.1 SITE INFORMATION

This section provides a general description and historical information associated with the site.

2.1.1 General Description/Site History

General Mitchell ARS lies within the boundaries of General Mitchell IAP in Milwaukee, Wisconsin, and occupies approximately 102 acres of land at the southwestern corner of the airport. The station is located within the City of Milwaukee and is approximately 7 miles south of the center of the city (Figure 2-1). It is situated on relatively flat terrain consisting of paved asphalt/concrete areas, improved grounds, and semi-improved grounds. The mission of the 440 ALW is to maintain operational readiness for the airlift of airborne units, personnel, supplies and equipment into prepared or unprepared areas by landing or airdrop. The wing is currently assigned 12 C-130H Hercules aircraft. General Mitchell IAP ARS is scheduled to close on February 2, 2008 pursuant to the 2005 BRAC. None of the below mentioned sites associated with this project have been investigated in the past so there is no contamination history available.

A brief description of each of the sites where the Phase II Site Investigation will be conducted and tank cleaning tasks and oversight activities will be performed.

2.1.2 Oil-Water Separators

Fifteen OWSs have been identified at General Mitchell IAP ARS. The station's OWS management plan identifies eight active OWSs located at buildings 104 (two OWSs), 208, 217, 219, 302, 308, and 314. The eight active separators are either connected to indoor floor drains or receive rain and storm water from outdoor trenches (Corazon Mata, 2006). These OWS sites require investigation for possible releases of hazardous substances. Building 302 also requires investigation of a removed UST site for releases of hazardous substances. The WDNR requires facilities that discharge storm water from oil/water treatment devices to obtain an individual Wisconsin Pollutant Discharge Elimination System (WPDES) permit. Currently, there is an individual permit for the two OWSs located at the POL complex (facilities 308 and 314) that discharge to the storm water drainage system at outfalls 2 and 1, respectively. The remaining active OWSs discharge to the sanitary sewer system.

OWSs in locations where only petroleum products are utilized are assumed to have only received petroleum products. However, OWSs in locations where hazardous substances other than petroleum products are presently used or were known to be used in the past are assumed to have received hazardous substances. OWSs can leak and discharge petroleum products and hazardous substances to the environment. Although no evidence of a release was identified at any of the active OWSs during past site inspections, the structural integrity of the OWSs could not be confirmed without a physical inspection. Therefore, all active OWSs in locations where only petroleum products are used are considered ECP Area Type 2; these include the OWSs at buildings 308 and 314. The active OWS at buildings 104 (two OWSs), 208, 217, 219, and 302 may have received hazardous substances in addition to petroleum products and are considered ECP Area Type 7.

The eight active OWSs will be investigated after they are cleaned out during another phase of this T.O. 260 project. The OWSs that will be investigated are located both outdoors and inside buildings.

2.1.3 Aircraft Parking Apron

Past activities on the aircraft parking apron at General Mitchell IAP ARS include aircraft fueling and deicing. Although best management practices are currently followed, past activities on aircraft parking aprons have not been documented but were likely to not follow current practices and often included activities using hazardous substances that are no longer allowed, such as using degreasers to clean aircraft while on the parking apron, and the previously mentioned discharge of JP-8 from engine test activities that were formerly conducted on the apron. At some other Air Force installations, these past activities have resulted in contamination beneath the concrete apron where petroleum products and hazardous substances entered the soil through seams in the paved surface and in contamination of adjacent unpaved areas that received contaminated surface water runoff from the apron. Therefore, as a result of past activities, the parking apron at General Mitchell IAP ARS may have been the site of releases of petroleum products, such as jet fuel, commingled with hazardous substances, such as degreasers. In addition, runoff from a portion of the aircraft parking apron flows to grassy areas east of the apron (EA Engineering Science and Technology Inc., 2005). Because of the potential for releases of petroleum products and hazardous substances to the apron and the adjacent grassy area to the east, the apron (Facility 7101) and the adjacent grassy area are considered ECP Area Type 7. Prior to construction of the engine test stand in 1993, engine testing activities were conducted on the aircraft apron where JP-8 was released to the apron and may have flowed to storm drains and/or adjacent unpaved areas.

2.1.4 Flare Burn Site

The flare burn site is approximately 0.25 acres and is located within the munitions storage area. Unused Teflon-manganese anti-aircraft flares were destroyed in 1997 by burning in a trench with dimensions of 5 ft deep by 4.5 ft wide by 9 ft long based on an interview with former facility personnel. The flares were burned in a trench with approx. dimensions of 5 ft. deep, by 4.5 ft wide by 9 ft. long. The general location of the burn site is known, however the exact location is unknown.

2.1.5 Open Drainage Ditches

Earthen drainage ditches that collect runoff from both on station and from the adjacent properties are present at the ARS. Properties south and west of the ARS include those where fuels are stored in ASTs, pesticides and fertilizers may be stored and used, paved area where vehicles are parked, fueled, washed, and maintained, and paved areas where aircraft are fueled and maintained. These activities could result in surface water runoff contaminated with hazardous substances and/or petroleum products that could drain onto the ARS property. The storm water drainage system consists of open ditches and underground drain lines. The areas of the storm water drainage system of most concern consist of open ditches that receive runoff from areas both on and off station where industrial activities occur that may result in contaminated runoff. Approximately 3,000 linear feet of open drainage ditches will be investigated through shallow soil sampling.

The landscape company(ies) along A Street will be interviewed to find out what practices were routinely followed to determine whether any materials could have leached into the ditch along A Street.

2.1.6 Tank Cleaning

Cleaning of OWS, ASTs and USTs will be completed as part of this project. The cleaning will be conducted by Petroleum Equipment Co. under a subcontract to Earth Tech. No sampling will be conducted during the tank cleaning. The following tasks will be completed:

- Clean-out JP-8 Fuel Storage Tank (10,000 bbl). Subcontractor will draw down and empty remaining JP-8 fuel residue, clean-out (pressure wash with detergent) tank interior to "vapor free" condition; and empty/purge associated fueling and pipeline systems in preparation for extended shut-down.
- Clean-out two (2) 10,000 gallon and one (1) 1,000 gallon above ground storage tanks (one diesel; one gasoline; one reclaimed JP-8 fuel), clean-out (pressure wash with detergent) tank interior to "vapor free" condition; provide closure certification. Subcontractor will empty/purge associated fueling and piping systems in preparation for extended shutdown.
- Clean-out Oil/Water Separators. Draw down; empty and power wash eight (8) oil/water separators, including holding tanks and immediate adjacent piping. Caps will be provided to seal the inlets leading to Oil/Water Separators servicing shop areas where re-contamination could occur.
- Clean-out (pressure wash with detergent) tank interior to "vapor free" condition, and provide closure certification for an additional (14) State of Wisconsin registered above ground tanks.

2.2 SCOPE OF WORK

Earth Tech will perform a Phase II Site Investigation at the Oil-Water Separators (OWS) Aircraft Parking Apron, Open Drainage Ditches and Flare Burn Site and clean OWS, above ground storage tanks (ASTs) and underground ground storage tanks (USTs) located at the General Mitchell International Airport (IAP) Air Reserve Station (ARS) located in Milwaukee, WI. The investigation is being conducted to support the Base Realignment and Closure (BRAC) 2005 property disposal and transfer actions for the ARS. The scope of work (SOW) presented in this FSP is in compliance with the AFCEE SOW dated September 5, 2007.

2.2.1 Additional Work Operations

The following additional tasks will also be performed as necessary in support of planned site activities:-

Mobilization/Demobilization: Mobilization and demobilization represent limited pre and post-task activities. These activities include driving to and from the site; initial site preparations, such as trailer and toilet facilities setup; and post-work activities, such as removing files and office equipment and general housekeeping.

Equipment Decontamination: Earth Tech and subcontractor personnel will perform decontamination of equipment used to perform work within controlled work areas.

Investigative-Derived Waste (IDW) Management: IDW will be collected and categorized as non-hazardous or hazardous. Potentially hazardous IDW (purge water, and decontamination fluids, and soil cuttings [if any]) will be tested and disposed of within 90 calendar days of completing the field activities. Potentially hazardous IDW waste will be staged onsite and then delivered to an IDW storage facility for processing. Non-hazardous IDW (normal trash) will be disposed of in a timely fashion during fieldwork.

3.0 PROJECT HEALTH AND SAFETY ORGANIZATION

3.1 PROJECT MANAGER [GREG MCGOVERN]

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The specific safety responsibilities for the PM are listed in Section 4.0 of SH&E 003, *Operational Structure*. The PM will provide the site supervisor with the appropriate work plans for the site.

3.2 SITE SUPERVISOR [ERIC SLUSSER]

The site supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM may act as the site supervisor while on site.

3.2.1 Responsibilities

The site supervisor is responsible to:

- Discuss deviations from the work plan with the SSO and PM.
- Discuss safety issues with the PM, Site Safety Officer (SSO), and field personnel.
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSO with the implementation of this HASP and ensuring compliance.
- Assist the SSO with inspections of the site for compliance with this HASP and applicable SH&E SOPs.

3.2.2 Authority

The site supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP, and halt any activity which poses a potential hazard to personnel, property or the environment.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSO, the Safety Professional, and the PM.

3.2.3 Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified (see Section 4.1), the Site Supervisor is required to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4) within the past three (3) years.

3.3 SITE SAFETY OFFICER [ERIC SLUSSER]

Eric Slusser has been assigned to fulfill the duties of the Site Safety Officer (SSO). If the SSO must leave the site during field activities, an alternate SSO will be selected by name and informed of his/her duties (see below).

3.3.1 Responsibilities

The SSO is responsible to:

- Update the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the Safety Professional.
- Be aware of changes in Earth Tech Safety Policy. Changes are posted on the Earth Tech Safety Website (see Section 1.3 of this HASP).
- Monitor the lost time incidence rate for this project and work toward improving it.
- Inspect the site for compliance with this HASP and the SH&Es using the appropriate audit inspection checklist provided by an Earth Tech Safety Professional.

- Work with the PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contact the Safety Professional for technical advice regarding safety issues.
- Provide a means for employees to communicate safety issues to management in a discreet manner (i.e., suggestion box, etc.).
- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation
- Ensure that all site personnel and visitors have received the proper training and medical clearance prior to entering the site
- Establish any necessary controlled work areas (as designated in this HASP or other safety documentation)
- Initiate tailgate safety meetings and maintain attendance logs and records
- Discuss potential health and safety hazards with the site supervisor, the Safety Professional, and the PM
- Select an alternate SSO by name and inform him/her of their duties, in the event that the SSO must leave or is absent from the site.

3.3.2 Authority

The SSO has authority to:

- Verify that all operations are in compliance with the requirements of this HASP.
- Issue a "Stop Work Order" under the conditions set forth in Section 4.8 of this HASP.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the site supervisor, Safety Professional and the PM.

3.3.3 Qualifications

In addition to being HAZWOPER-qualified (see Section 4.1), the SSO is required to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

3.4 EMPLOYEES

3.4.1 Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Immediately report any injury, illness, or safety incident to the SSO or site supervisor/PM.
- Notifying the SSO, in writing or verbally, of unsafe conditions and acts.
- Understanding and abiding by the policies and procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to health and safety management relating to omissions and modifications in the HASP or other safety policies.

3.4.2 Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood.
- The right to refuse to work on any site or operation where the safety procedures specified in this HASP or other safety policies that are not being followed.
- The right to contact the SSO or the Safety Professional at any time to discuss potential concerns.

3.5 SAFETY PROFESSIONAL

The Safety Professional is the member of the Earth Tech Safety, Health and Environmental Department assigned to oversee health and safety requirements for the project and provide any needed technical support. The Safety Professional will be the first point-of-contact for all of the project's health and safety matters. Duties include the following:

- Approving this HASP and any required changes.
- Approving of the designated SSO (if site supervisor does not cover SSO duties).
- Providing sound technical safety support.
- Reviewing all personal exposure monitoring results.
- Investigating any reported unsafe acts or conditions.

3.6 SUBCONTRACTORS

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in SH&E 207, *Contractor and Subcontractor SH&E Requirements*. Each Earth Tech subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE).

Earth Tech considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to Earth Tech for review prior to the start of onsite activities, if required.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Earth Tech PM or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

3.7 VISITORS

Authorized visitors (e.g., client representatives, regulators, Earth Tech management staff, etc.) requiring entry to any work location on the site will be briefed by the RM on the hazards present at that location. Visitors will be escorted by the site supervisor or designee at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and personal protective equipment which hare required for entry to any controlled work area; visitors must comply with these requirements at all times.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

4.0 SAFETY PROGRAMS

4.1 SH&E STANDARD OPERATING PROCEDURES

SH&E standard operating procedures (SOPs) have been developed as guidance documents for specific work tasks and overall SH&E management. In the table below, SOPs containing specific information regarding tasks anticipated for this project have been identified. A copy of the SH&E SOP Manual must accompany this HASP.

Table 4-1. Applicable SOPs

	SOP #	TOPIC
SH&E 000 Series		
☒	001	SH&E Policy Statement
☒	002	SH&E Dept. Structure & Responsibilities
☒	003	Operational SH&E Structure & Responsibilities
☒	004	SH&E Administration Support
☒	005	Review of Safety Manual
SH&E 100 Series		
☒	101	Injury, Illness, & Near Miss Reporting
☒	102	Incident Investigation and Review
☐	103	Regulatory Agency Inspections
☒	104	SH&E Audits, Inspections, and Corrective Actions
☒	105	SH&E Procedure Variance
☒	106	Drug-Free Workplace Program
☐	107	Modified Duty Program
☒	108	Medical Monitoring & Surveillance
☒	109	Hearing Conservation Program
☐	110	Fetal Protection Program
☒	111	Employee Exposure Monitoring Program
☒	112	Respiratory Protection Program
☒	113	Personal Protective Equipment (PPE)
☒	114	Safety Training Programs
☒	115	Hazard Communication Program
☒	116	Driver and Vehicle Safety
☐	117	Commercial Vehicle Program
☒	118	Confined Space Entry Program
☒	119	Lock-Out / Tag-Out Program
☐	120	Fall Protection Program
☒	121	Electrical Safety Program
☐	122	Environmental Compliance Program
☒	123	Ergonomics Program
☒	124	Heat Stress Prevention Program
☒	125	Cold Stress Prevention Program
☐	126	Radiation Safety Program
☐	127	Radiation Protection Plans
☐	128	Radiological Exposure Assessment
☐	129	ALARA
☐	130	Non-Ionizing Radiation
☐	131	Safety Assessment Program
☒	132	Competent Persons

	SOP #	TOPIC
SH&E 200 Series		
☒	201	General Safety Rules
☒	202	Safety Meetings
☒	203	Accident Prevention Program – Requirements for SH&E Documentation
☒	204	Task Hazard Analysis
☒	205	Emergency Action Planning & Prevention
☒	206	Stop Work Authority
☒	207	Contractor & Subcontractor SH&E Requirements
☒	208	General Housekeeping, Hygiene, and Sanitation
☒	209	Disciplinary Actions/Accountability
☒	210	Walking-Working Surfaces Protection
SH&E 300 Series		
☒	301	Hazardous Waste Operations (HAZWOPER)
☐	302	Office Safety
☒	303	OE and UXO Operations (not anticipated)
☐	304	Landfill Quality Assurance and Operations
☐	305	Demolition Operations
☐	306	Structural Steel Operations
☐	307	Underground Construction & Tunneling
☐	308	Rail Operations
☐	309	Marine Operations - Working On/Near Water
☒	310	Overhead Electrical Lines
☐	311	Blasting and Use of Explosives
SH&E 400 Series		
☐	401	Clearing & Grubbing
☐	402	Excavation & Trenching
☒	403	Drilling
☒	404	Manual Lifting
☐	405	Handling Drums & Large Containers
☐	406	Drum Sampling
☒	407	Tank & Large Container Sampling
☐	408	Unknown Hazardous Waste Drum Handling
☒	409	Tank Cleaning
☐	410	Tank Removal & Demolition
☐	411	Welding, Cutting, & other Hot Work
☐	412	Line Entry
☐	413	Cylinder Disposition & Decommissioning
☐	414	Pile Driving
☐	415	Abrasive Blasting

APPLICABLE STANDARD OPERATING PROCEDURES
(continued)

	SOP #	TOPIC		SOP #	TOPIC
		SH&E 500 Series			**SH&E 400 Series (continued)**
☐	501	Ladders	☐	416	Concrete & Masonry Work
☐	502	Scaffolding	☐	417	Automotive Service Operations
☒	503	Machine Guarding	☐	418	Spray Finishing & Dip Tanks
☐	504	Woodworking and Metalworking Machines	☐	419	Cleanup of Bird Excrement/Amplified Fungal Growth
☒	505	Powered Hand Tools			**SH&E 600 Series**
☒	506	Manual Hand Tools	☒	601	Hazardous Materials Shipping
☐	507	Powder-Actuated Tools	☐	602	Process Safety Management
☒	508	Fire Extinguishers	☐	603	Chemical Hygiene Plan
☐	509	Refuse Packer Units	☒	604	Decontamination
☒	510	High Pressure Washers	☒	605	Protection from Solvents
☐	511	All Terrain Vehicles	☒	606	Flammable & Combustible Materials
☐	512	Forklifts	☒	607	Chemical and Biological
☒	513	Heavy Equipment	☒	608	Blood-Borne Pathogens
☐	514	Manlifts	☐	609	Asbestos
☐	515	Cranes, Lifting Devices & Rigging Requirements	☐	610	Lead
☐	516	Equipment Safety Cards	☐	611	Cadmium
☒	517	Traffic Safety	☐	612	Compressed Gases

4.2 HAZWOPER QUALIFICATIONS

Personnel performing work art the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific THAs or by the SSO), and must meet the medical monitoring and training requirements specified in the following safety procedures:

- SH&E 108, *SH&E Medical Monitoring and Surveillance.*
- SH&E 301, *Hazardous Waste Operations (HAZWOPER)*

Personnel must have successfully completed training meeting the provisions established in 29 CFR 1910.120 (e)(2) and (e)(3) (40-hour initial training). As appropriate, personnel must also have completed annual refresher training in accordance with 29 CFR 1910.120 (e)(8); each person's most recent training course must have been completed within the previous 365 days. Personnel must also have completed a physical exam in accordance with the requirements of 29 CFR 1910.120 (f), where the medical evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. These requirements are further discussed in SH&E 301, *Hazardous Waste Operations*.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document specific to the particular materials present.

4.3 SAFETY TRAINING

The following SH&E SOPs contain specific training requirements applicable to all operations:

1. SH&E 109, *Hearing Conservation*
2. SH&E 112, *Respiratory Protection*
3. SH&E 113, *Personal Protective Equipment*
4. SH&E 114, *Safety Training Programs*
5. SH&E 115, *Hazard Communication Program*
6. SH&E 116, *Driver and Vehicle Safety*
7. SH&E 117, *Commercial Vehicle Program*
8. SH&E 118, *Confined Space Entry*
9. SH&E 119, *Lockout-Tagout*
10. SH&E 202, *Safety Meetings*
11. SH&E 204, *Task Hazard Analyses*
12. SH&E 204, *Emergency Action Planning and Prevention*
13. SH&E 601, *Hazardous Materials Shipping*

For this project, the training required to perform work includes:

1. HAZWOPER 40-hour and current 8-hour refresher,
2. 8-hour Supervisor (at least one person on site),
3. Hearing Conservation,
4. Respiratory Protection,
5. Site-Specific training/orientation (See Below),
6. First Aid/CPR training (at least one person on site), and
7. Confined Space Entry.

The SSO (or designee) will confirm that all appropriate training requirements have been achieved and maintained appropriately. Refer to Section 4.3.1 below for site specific training requirements.

4.3.1 Site-Specific Training/Orientation

In addition to the general health and safety training programs, personnel will be provided with a site-safety orientation to include:

1. HASP: Instructed on the contents of applicable portions of this HASP and THAs developed for the tasks to be performed.
2. Hazard Communication: Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
3. Hazards and Recognition: Made aware of task-specific physical, chemical, biological hazards and other hazards that may be encountered during site work. This includes any potential confined space and lockout/tagout procedures.
4. Air Monitoring: Made aware of air monitoring requirements, including where to locate action levels.

5. Emergency Response Plan: Made aware of emergency response procedures.

The orientation will be documented by the signing-off of the HASP once all of the above topics have been reviewed by the employee and RM.

4.4 HAZARD COMMUNICATION

Section 5.2 provides information concerning the materials that may be encountered as environmental contaminants during the work activities. In addition, any organization wishing to bring any hazardous material onto any Earth Tech-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSO for approval and filing (the SSO will maintain copies of all MSDSs on site). MSDSs may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of SH&E 115, *Hazard Communication Program*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

Attachment B provides copies of MSDSs for those items planned to be brought on site at the time this HASP is prepared. This information will be updated as required during site operations.

4.5 CONFINED SPACE ENTRY

The following confined spaces have been identified at the General Mitchell Airport Air Reserve Station Site:

- Various storage tanks, both above and below ground. Earth Tech does not anticipate any entry into the tanks. In the event entry becomes necessary to fulfill the scope of work, the Midwest District Safety Manager shall be contacted

The SSO/site supervisor shall identify all potential hazards associated with each individual confined space in accordance with SH&E 118, *Confined Space Entry*. In addition, the SSO/site supervisor will inform all employees of the location of confined spaces and their associated hazards. Confined space entry procedures and training requirements are listed in SH&E 118.

Confined space entry procedures and training requirements are listed in SH&E 118.

4.6 HAZARDOUS, SOLID, OR MUNICIPAL WASTE

If hazardous, solid and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, and/or local regulations.

4.7 GENERAL SAFETY RULES

All site personnel shall adhere to SH&E 201, *General Safety Rules*, during site operations. In addition, the housekeeping and personal hygiene requirements listed below will also be observed.

4.7.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.7.2 Smoking, Eating, or Drinking

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any Earth Tech site.

4.7.3 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

> *Potable Water* - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.
>
> *Non-Potable Water* - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:
>
> ***Non-Potable Water***
> ***Not Intended for Drinking Water Consumption***

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel on site, with separate toilets maintained for each sex except where there are less than 5 total personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.

Washing Facilities: Employees will be provided appropriate washing facilities at each work location. The use of water and hand soap (or similar substance, such as wipes) will required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

4.7.4 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for Earth Tech personnel. Under no circumstances will any employee be present alone in a controlled work area.

4.7.5 Heat and Cold Stress

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. For additional requirements, refer to SH&E 124, *Heat Stress*, and SH&E 125, *Cold Stress*.

4.7.5.1 Solar Protection

To protect against exposure to solar radiation, workers will observe the following requirements:

1. All workers will wear sunglass-type safety glasses (Z87.1 approved) at all times when working outdoors during daylight hours.
2. Workers will utilize a commercial sunblock with a minimum solar protection factor (SPF) of 15.

4.8 STOP WORK AUTHORITY

All employees have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSO is authorized and required to stop work, which shall be immediately binding on all affected Earth Tech employees and subcontractors.

Upon issuing the stop work order, the SSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Safety Professional has concurred that workplace conditions meet acceptable safety standards.

4.9 CLIENT SPECIFIC SAFETY REQUIREMENTS

The client has specified no additional health and safety requirements.

5.0 HAZARD ASSESSMENT

5.1 TASK HAZARD ANALYSIS

Task hazard analysis (THA) is a technique used to identify hazards and hazard controls associated with a specific job function. THAs focus on the relationship between the workers, the task, the resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level.

Section 2.2 lists the work activities anticipated during this project. Individual THAs for the tasks associated with this work can be found in Attachment A. Refer to SH&E 204, *Task Hazard Analyses* for additional THA requirements.

5.1.1 Unanticipated Work Activities/Conditions

Operations at the site may require additional tasks not identified in Section 2.2 or addressed in Attachment A, THAs. Before performing any task not covered in this HASP a THA must be prepared, and approved by the Safety Professional.

5.2 ENVIRONMENTAL CONTAMINANT EXPOSURE HAZARDS

The following is a discussion of the hazards presented to worker personnel during this project from on-site chemical and radiological hazards known or suspected to be present on site. Hazards associated with chemical products brought to the site during work operations are addressed separately, under the Hazard Communication process described in Section 4.3.

Exposure symptoms and applicable first aid information for each suspected site contaminant listed in Section 2 are located in the following subsections. Additional data is provided in Chemical Safety Cards, located in Attachment C.

5.2.1 BTEX

Due to the petroleum refining process, the following materials can be found as trace components in refined fuels.

Benzene

Benzene is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, and the ACGIH TLV is 0.5 ppm.

Toluene

Exposure to vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, tearing, and a sensation of prickling, tingling, or creeping on the skin that has no objective cause. Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria. In severe cases, exposure to toluene may cause unconsciousness and death. The liquid is irritating to the eyes and the skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. Toluene may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause irreversible liver and kidney injury. Both the OSHA PEL and the ACGIH TLV are 50 ppm.

Ethyl Benzene

Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the CNS characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it poses a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are suspected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The established PEL is set well below this intolerable level. The OSHA PEL and the ACGIH TLV are both 100 ppm.

Xylene

Liquid xylene is a skin irritant that causes itching, dryness, and defatting. Prolonged contact may cause blistering. Inhaling xylenes can depress the CNS; ingesting xylenes can result in gastrointestinal disturbance and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. Both the OSHA PEL and the ACGIH TLV are 100 ppm.

5.2.2 Diesel/Gasoline

Like gasoline, diesel fuel is a complex mixture of hydrocarbons. It is manufactured through refining of middle distillate crude oil components, and thus is somewhat less volatile than gasoline (which comes from light stocks). Exposure to diesel fuels can produce intoxication and other central nervous system (CNS) depression effects in cases of acute exposure, and can lead to defatting of skin and contact dermatitis in case of contact exposure. Like gasoline, diesel fuel contains some small quantities of volatile hydrocarbon additives, including BTEX members. There are no established exposure standards from either OSHA or ACGIH for diesel fuel, however action levels should be developed that reflect the potential presence of BTEX (particularly benzene) when diesel fuels are present. Control of inhalation exposure to diesel fuel (and its various constituents) can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (chemically-protective gloves, etc.) is required when handling potential or confirmed diesel-contaminated materials.

5.2.3 Petroleum Hydrocarbons (Generic)

Hydrocarbon fuels (including gasoline, diesel fuel and jet fuel) are complex mixtures of hydrocarbons and additives. The constituents of hydrocarbon fuels posses a range of vapor pressures. For highly volatile components, chronic exposures or exposures to a high concentration may cause unconsciousness, coma, and possible death from respiratory failure. Exposure to low concentrations of vapor may produce flushing of the face, slurred speech, and mental confusion. Fuels are also irritating to the skin, and may cause drying and dermatitis as a result of prolonged contact.

Various components and additives of the fuels can themselves present significant additional hazards. The aromatic compounds benzene, toluene, ethylbenzene and xylene (BTEX) are of greatest concern in relation to site investigation activities, and are addressed separately below. However some additives used for performance enhancement (e.g., methyl tert-butyl ether - MTBE), oxygenation (e.g., alcohols and MTBE) and water scavenging (e.g., ethylene glycol methyl ether - EGME) can also present significant hazards as a result of prolonged inhalation or skin exposure. In the past tetra-ethyl and tetra-methyl lead, both of which have been identified as carcinogens and present moderate skin contact hazards, were added to gasoline for anti-knock control.

There are no set limits for petroleum hydrocarbons, however, gasoline guidelines may be used instead. Both the OSHA PEL and ACGIH TLV for gasoline are 300 ppm. Control of inhalation exposure to gasoline (and its various constituents and additives) can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (i.e., chemically-protective gloves) is required when handling gasoline-contaminated materials.

5.2.4 JP 8 Fuel

This Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 85F. Do not get in eyes, on skin, or on clothing. Do not breathe vapor or fumes. Do not breathe mist. Do not taste or swallow. Wash thoroughly after handling.

Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator. Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice. Wear protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Polyvinyl Alcohol (PVA) (Note: Avoid contact with water. PVA deteriorates in water.), Viton. Determine if airborne concentrations are below the recommended exposure limits. If not, wear a NIOSH approved respirator that provides adequate protection from measured concentrations of this material, such as: Air-Purifying Respirator for Organic Vapors

Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known or other circumstances where air-purifying respirators may not provide adequate protection.

5.2.5 Magnesium

Magnesium is known for a long time as the lighter structural metal in the industry, due to it's low weight and to it's capability of forming mechanically resistant alloys.

Magnesium is very chemically active, it takes the place of hydrogen in boiling water and a great number of metals can be produced by thermic reduction of its salts and oxidized forms with magnesium. It joins together with most non-metals and almost every acid. Magnesium reacts only slightly or not at all with most of the alkalis and many organic substances, like hydrocarbons, aldehides, alcohols, phenols, amines, esters and most of the oils. Used as a catalyst, magnesium promotes organic reactions of condensation, reduction, addition and dehalogenization.

Magnesium has not been tested, but it's not suspected of being carcinogenic, mutagenic or teratogenic. Exposure to magnesium oxide fume subsequent to burning, welding or molten metal work can result in metal fume fever with the following temporary symptoms: fever, chills, nausea, vomiting & muscle pain. These usually occur 4-12 hours after exposure & last up to 48 hours. Magnesium oxide fume is a by-product of burning magnesium. Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.
Chemical dangers: The substance may spontaneously ignite on contact with air or moisture producing irritating or toxic fumes. Mg reacts violently with strong oxidants and many other substances causing fire and explosion hazard, also reacts with acids and water forming flammable hydrogen gas, causing fire and explosion hazard.
First Aid: Inhalation: remove to fresh air. Eyes: flush eyes with water thoroughly. Consult a physician. Skin: wash with soap & water thoroughly to remove particles.

5.3 PHYSICAL HAZARDS

The following physical hazards may be encountered during operations at the General Mitchell Airport Air Reserve Station Site:

- Working around equipment
- Pinch Points
- Slips trips and falls

5.4 BIOLOGICAL HAZARDS

Biological hazards present a unique obstacle to personnel performing operations involving bio-hazardous materials or working in environments that contain biological hazards. Protection must be identified and provided when biological hazards are anticipated. Specific SH&E requirements can be found in the following SOPs:

1. SH&E 201, *General Safety Requirements*
2. SH&E 419, *Clean Up of Bird Excrement and Amplified Fungal Growth*
3. SH&E 607, *Biohazards*
4. SH&E 608, *Blood-borne Pathogens*

Contact with bodies of water, animals, insects, and plants can cause injury and illness to personnel. Care must be taken to ensure that these types of injuries are avoided. Some examples of biological hazards include:

- Natural and artificial bodies of water (e.g., lakes, rivers, ponds, lagoons, etc.) may contain a variety of microorganisms. Microorganisms, in particular, present a significant hazard to personnel who may come into contact with water bodies. Contact with microorganisms in water may result in dermatitis, infection (i.e., in cuts/lacerations), digestive distress, and other diseases. Always be aware of areas that may contain excessive amounts of microorganisms. Such areas may include areas of standing water; areas of warm water (i.e., cooling tower effluents, etc.); and areas downstream of municipal wastewater treatment. To prevent exposure to microorganisms in water, always adhere to the following:
  - Wear protective gloves (i.e., Nitrile, etc.) and other appropriate PPE to prevent skin contact with water.
  - Never drink from natural or artificial bodies of water. Such water is considered non-potable and is not safe for drinking.
- Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies). Avoid the animals whenever possible. If bitten, go to the nearest medical facility.
- Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). Whenever you will enter areas that provide a habitat for insects (e.g., grass areas, woods), wear light-colored clothing, long pants and shirt, and spray exposed skin areas with a DEET-containing repellent. Keep away from high grass wherever possible. Keep your eyes and ears open for bee and wasp nests. If bitten by insects, see a doctor if there is any question of an allergic reaction.
- Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water.

6.0 ACTIVITY SPECIFIC REQUIREMENTS

6.1 SUPPLEMENTAL SAFETY PROCEDURES

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, and biological hazards. The requirements for the control of many of these hazards these hazards is discussed in SH&E SOP Manual. Specifically, the 300, 400, 500, and 600 series of the SH&E SOP Manual provide specific information regarding hazard control and the requirements necessary to complete tasks in a safe manner.

6.1.1 Utilities

Various forms of underground/overhead utility lines or pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SSO and an Earth Tech SH&E Professional will be notified immediately. Work will be suspended until the applicable utility agency is contacted and the appropriate actions for the particular situations can be taken. For this site, the applicable agency is located in the emergency contact table. The phone number is also provided in the Emergency Contacts list found in Section 8. For additional requirements, refer to SH&E 402, *Excavation & Trenching*; SH&E 403, *Drilling*; and SH&E 310, *Overhead Electrical Lines*.

6.1.2 Manual Lifting

Most materials associated with investigation and remedial activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use at least two people to lift, or roll/lift with your arms as close to the body as possible. Under no circumstances should any one person lift more than 49 pounds unassisted. For additional requirements, refer to SH&E 404, *Manual Materials Handling*.

6.1.3 Heavy Equipment and Vehicle Operations

Heavy equipment and site vehicles present serious hazards site personnel. Blind spots, failure to yield, and other situations may cause heavy equipment/vehicles to come into contact with personnel. To reduce the possibility of contact between equipment/traffic and personnel, always adhere to the following:

- Personnel must wear a high visibility, reflective safety vest at all times when working near heavy equipment and/or other vehicle traffic.
- Personnel must always yield to equipment/vehicle traffic and stay at least 100 feet away from all equipment/vehicle traffic. Always maintain eye contact with operators.
- When feasible, place barriers between work areas and equipment/vehicle traffic.
- Always ensure reverse warning alarms are working and louder than surrounding noise. Personnel must report inoperative reverse warning alarms.

For additional requirements, refer to SH&E 513, *Heavy Earth Working Equipment*.

6.1.4 Slips, Trips, Falls, and Protruding Objects

A variety of conditions may exist that may result in injury from slips, trips, falls, and protruding objects. Slips and trips may occur as a result of wet, slippery, or uneven walking surfaces. To prevent injuries from slips and trips, always keep work areas clean; keep walkways free of objects and debris; and report/clean up liquid spills. Serious injuries may occur as a result of falls from elevated heights. Always wear fall protection while working at heights of 6 feet or greater above the next lower level. Protruding objects are any object that extends into the path of travel or working area that may cause injury when contacted by personnel. Always be aware of protruding objects and when feasible remove or label the protruding object with an appropriate warning.

6.1.5 Electrical and Powered Equipment

Electrical and powered equipment may be used during a variety of site activities. Injuries associated with electrical and powered equipment include electric shock, cuts/lacerations, eye damage (from flying debris), and burns. To reduce the potential of injury from the hazards associated with electrical and powered equipment, always comply with the following:

- Wear ANSI-approved (Z87.1) safety glasses. Faceshields may be required to provide additional face protection from flying debris.
- Wear appropriate work gloves. Work gloves may reduce the severity of burns and cuts/lacerations.
- Use ground fault circuit interrupters (GFCIs) when using electrical powered tools/equipment. GFCIs prevent electrical shock by detecting the loss of electricity from a power cord and/or electrical device.
- Use lockout/tagout procedures when performing maintenance or repairs on equipment.

6.1.6 Noise

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

Refer to SH&E 109, *Hearing Conservation Program* for requirements regarding hazardous noise and hearing protection.

6.1.7 Excavations and Trenches

Excavations and trenches present workers with a variety of hazards. If not properly sloped, shored, or boxed, trench walls may collapse and trap workers under the weight of the soil. Soil contaminants and other chemical hazards (e.g., carbon monoxide from equipment/vehicles) may result in a hazardous atmosphere. Confined space entry procedures may need to be followed if the potential for a hazardous atmosphere exists. Buried utilities may exist where excavations/trenches will be placed. Always contact the local utility locator service prior to beginning excavations. Refer to SH&E 402, *Excavation & Trenching* for additional requirements.

6.1.8 Spill Prevention

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. The following procedures will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.

At least one spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (i.e. fuels) shall be properly labeled.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- For drums/containers, follow the procedures in SH&E 405, *Handling of Drums and Large Containers*, to minimize spillage.

6.1.9 Hotwork

Hotwork activities may result in severe burns, eye damage, and/or an explosion. Refer to SH&E 411, *Welding, Torch Cutting, and Other Hotwork* prior to initiating hotwork activities.

6.2 EXPOSURE MONITORING PROCEDURES

Monitoring procedures will be employed during site characterization activities to assess employee exposure to chemical and physical hazards. Monitoring will consist primarily of onsite determination of various parameters (e.g., airborne contaminant concentrations and heat stress effects), but may be supplemented by more sophisticated monitoring techniques, if necessary. Refer to SH&E 111, *Employee Exposure Monitoring* and SH&E 301, *Hazardous Waste Operations* for additional requirements.

6.2.1 Real-Time Exposure Measurement

Monitoring shall be performed within the work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in each THA (Attachment A) as work is performed.

Table 6-1specifies the real-time monitoring equipment which will be used for this project.

Table 6-1. Monitoring Parameters and Equipment

INSTRUMENT	MANUFACTURER/MODEL*	SUBSTANCES DETECTED
Photo Ionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model Hnu (min. 10.2 eV bulb)	Petroleum hydrocarbons Organic Solvents
Multi or 4 Gas Detectors	RAE Systems Multi-RAE	Lower Explosive Limit Oxygen (O_2) Carbon Monoxide (CO) Hydrogen Sulfide (H_2S) Cyanide Gases (CN^-)
Particulate Monitor	MIE Model PDM-3 mini-RAM	Aerosols, mist, dust, and fumes
Colorimetric Detector Tubes	Sensidyne Draeger	Benzene 0.5–10 ppm

6.2.1.1 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO or the Safety Professional.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.

- Change in work task that will reduce exposure to hazardous materials.

Table 6-2. Monitoring Procedures and Action Levels

PARAMETER	LOCATION AND INTERVAL	RESPONSE LEVEL (Meter units/ppm above background)	RESPONSE
Hydrocarbons (Total by PID)*	Prior to initial entry in to impacted areas and then at least every 30 minutes afterwards in the worker's breathing zone or in the immediate work area.	< 1	Level D work and continue monitoring (not applicable for initial assessment of unknown drums or containers.
		≥ 1 – 5 (Sustained for more than 5 minutes)	Contact the SSO, and if no potential for change in conditions exist (drum/container activities increasing airborne levels), don Level C (GMA/P100 cartridges or equivalent chemical cartridge combined with P100) and continue monitoring.
	Confined spaces will require initial and continuous monitoring.	Initial entry or opening/sampling unknown drums/containers	Level B ensemble as listed in SH&E 301, *Hazardous Waste Operations* and per SSO and SH&E Manager.
		≥ 5 (Sustained for more than 5 minutes)	
Work Area Benzene Detector tubes (e.g., Drager 6728561, Benzene 0.5/a or equivalent)	Breathing zone, every 30 minutes where indicted by PID readings (see PID response levels above).	≥ 0.5 - < 1- ppm	Cease work, exit the area, contact the SSO/SH&E Manager and upgrade to Level C PPE (minimum GMA/P100 cartridges or equivalent chemical cartridge combined with P100). Continue to monitor for benzene.
		≥ 10 ppm	Cease work, exit the area, contact the SSO/SH&E Manager and upgrade to Level B.
Dust, Mist, Aerosols (Total by Mini-Ram)*	At least every 30 minutes in the worker's breathing zone during intrusive activities involving impacted materials. In addition, site perimeter monitoring may be initiated by the SSO based on elevated air monitoring results.	Initial excavation or disturbance of unknown materials	Level C ensemble as listed in this HASP and per SSO and SH&E Manager.
		< 1 mg/m^3 (Sustained for more than 5 minutes)	Continue Level D work and continue monitoring.
		≥ 1 mg/m^3 (Sustained for more than 5 minutes)	Upgrade to Level C PPE. Contact the PM and SSO, implement mitigation measures, and continue Level C (minimum GMA/P100 cartridges or equivalent chemical cartridge combined with P100) and continue monitoring.
		≥ 5 mg/m^3 (Sustained for more than 5 minutes)	Temporarily cease work operations, contact the PM and SH&E Manager to discuss improving site mitigation measures. Possible upgrade to Level B for exclusion zone workers.
Oxygen Levels (multi-gas detector or O_2 meter)	In the breathing zone/work area within the confined space prior to and continuously during entry or in the immediate work area during intrusive activities involving impacted materials.	19.5 – 23.5 Percent (%) O_2	Continue work and monitoring. If significant changes exist in this acceptable range, contact the SSO to investigate the potential for contributing factors.
		< 19.5 or > 23.5 Percent (%) O_2	Cease work, exit the work area or confined space and contact the SSO.

Carbon Monoxide	In the breathing zone/work area prior to and during operation of equipment with combustion motors.	< 25 ppm	Continue work and monitoring. If significant changes exist in this acceptable range, contact the SSO to investigate the potential for contributing factors.
		≥25 ppm	Cease work, exit the work area or confined space and contact the SSO.
Hydrogen Sulfide (multi-gas detector or individual H_2S meter)	In the breathing zone/work area within the confined space prior to and continuously during entry or in the immediate work area during intrusive activities involving impacted materials.	< 10 ppm	Continue work activities. If significant changes exist in this acceptable range, contact the SSO to investigate the potential for contributing factors.
		≥ 10 ppm	Cease work, exit the area or confined space, and contact the SSO.
Explosive Atmospheres (multi-gas detector or CGI)	In the breathing zone/work area prior to and during entry in to container/drum, impacted work area or confined space.	< 10% LEL	Continue work activities. If significant changes exist in this acceptable range, contact the SSO to investigate the potential for contributing factors.
		≥ 10% LEL	Cease work, exit the area or confined space, and contact the SSO.

6.2.1.2 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

6.2.1.3 Personal Sampling

Should site activities warrant performing personal sampling to better assess chemical exposures experienced by Earth Tech employees, the SSO, under the direction of a Certified Industrial Hygienist (CIH), will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the project files.

Should the site activities warrant, the subcontractor will ensure its employees' exposures are quantified via the use of appropriate sampling techniques. The subcontractor shall notify the employees sampled in accordance with health and safety regulations, and provide the results to the SSO for use in determining the potential for other employees' exposure.

6.2.2 UXO

Earth Tech has been provided a letter from the 440th Air Lift Wing stating there was no explosive material in the one-time burn conducted in May 1998. The residue from the burn was removed and disposed of.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. SH&E 113, *Personal Protective Equipment*, lists the general requirements for selection and usage of PPE. Table 7-1 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are specified in the individual THAs found in Attachment A.

By signing this HASP you are agreeing that you have been properly trained in the use, limitations, care and maintenance of the protective equipment you will use at this project. If you have not received training on the proper use, care, and limitations of the PPE required for this project, please see the PM/SSO for the proper training prior to signing this HASP.

Table 7-1. Personal Protective Equipment

TYPE	MATERIAL	ADDITIONAL INFORMATION
Minimum PPE:		
Safety Vest	High-visibility	Must have reflective tape and be visible from all sides
Boots	Leather	ANSI Z41 approved safety toe
Safety Glasses w/ sideshields		ANSI Z87.1 Approved
Hard Hat		ANSI Approved
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Additional PPE:		
Hearing Protection	Ear plugs and/ or muffs (minimum 29 NRR)	In hazardous noise areas
Work Gloves	Leather, [insert additional]	If working with sharp objects or powered equipment.
Protective Chemical Gloves	Inner: Nitrile Outer: Heavy Duty Nitrile, PVC, Neoprene, Viton	
Protective Chemical Coveralls	Inner: Tyvek® or equivalent Outer: Tychem SL® or equivalent	
Protective Chemical Boots	Rubber, neoprene, PVC	
Level C Respiratory Protection	MSA (Full Face or equivalent) equipped with GMA/P100	Cartridge change out schedule: At the end of each work shift.
Level B Respiratory Protection	Self Contained Breathing Apparatus (SCBA), Airline with 5 minute escape pack.	Grade "D" Certified Air (Certificate Required). Obtain certificate of analysis from compressed gas vendor.

Face Protection	Debris/splash shield	
Body Protection	Apron, Chaps	During chainsaw operations
Welding PPE	Leathers, appropriate lens	See SH&E 411 for specific PPE
Cooling Vest		
Cold Weather Gear	Hard hat liner, hand warmers, insulated gloves, beta boots	
Fall Protection	Approved harness w/ lanyard or equivalent if no railings are present.	Required when working at heights of 6 feet or greater.

7.2 DECONTAMINATION

All requirements for performing personal and equipment decontamination may be found in SH&E 604, *Decontamination*.

7.2.1 PPE Doffing and Donning Information

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.
- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

7.2.2 Disposal of PPE & Decontamination Materials

All PPE and decontamination materials (i.e., rinsate, tubs, brushes, etc.) must be disposed of in accordance with federal, state, and local regulations. Contaminated PPE and decontamination materials may need to be disposed of as hazardous waste based on the types and degree of contamination.

8.0 SITE CONTROL

8.1 GENERAL

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made. A general example of a zone layout has been developed for site activities and is attached to this section.

8.2 CONTROLLED WORK AREAS

Each HAZWOPER controlled work area will consist of the following three zones:

- Exclusion Zone: Contaminated work area.
- Contamination Reduction Zone: Decontamination area.
- Support Zone: Uncontaminated or "clean area" where personnel should not be exposed to hazardous conditions.

Each zone will be periodically monitored in accordance with the air monitoring requirements established in this HASP. The Exclusion Zone and the Contamination Reduction Zone are considered work areas. The Support Zone is accessible to the public (e.g., vendors, inspectors).

8.2.1 Exclusion Zone

The Exclusion Zone is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable THA and Sections 4.1 and 4.2, will be allowed in an Exclusion Zone.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities. To meet this requirement, the following minimum distances will be used:

- **Direct Push Drilling Activities.** A distance of 20 feet in all directions will be cleared from the rig.
- **HSA Drilling.** Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the bore-hole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.
- **Hand Auguring.** A distance of 10 feet will be cleared in all directions from the sampling location in order to accommodate additional sampling equipment.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the Exclusion Zone and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

8.2.2 Contamination Reduction Zone

The Contamination Reduction Zone is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination. Decontamination procedures are further explained in SH&E 604.

8.2.3 Support Zone

The Support Zone is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The Support Zone shall have minimal potential for significant exposure to contaminants (i.e., background levels).

Employees will establish a Support Zone (if necessary) at the site before the commencement of site activities. The Support Zone would also serve as the entry point for controlling site access.

8.3 SITE ACCESS DOCUMENTATION

All personnel entering the site shall complete the "Site Entry/Exit Log" located at the Command Post.

If implemented by the PM, all personnel required to enter established site control zones shall complete the Exclusion and/or "Hot Zone" Log located at the decontamination area.

8.3.1 Visitor Access

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by Earth Tech documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
3. All visitors must be escorted by the PM or designee.

If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended. Until these requirements have been met, entry will not be permitted.

8.4 SITE SECURITY

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

To maintain site security during working hours:

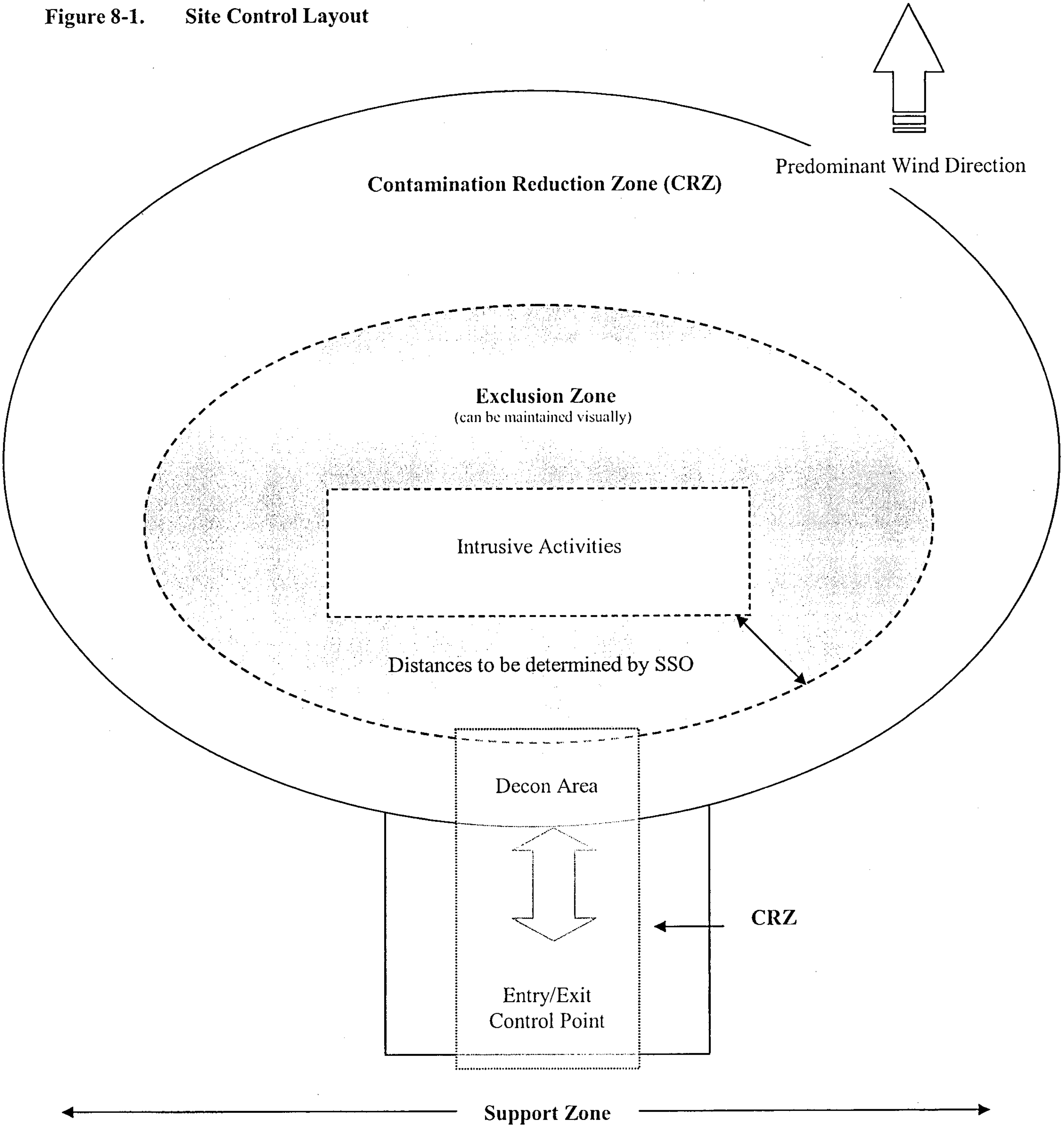
1. Maintain security in the Support Zone and at access control points.
2. Establish an identification system to identify authorized persons and limitations to their approved activities.
3. Assign responsibility for enforcing authority for entry and exit requirements.
4. When feasible, install fencing or other physical barrier around the site.
5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.

6. Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.
2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.
3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.
4. Secure the equipment.

Figure 8-1. Site Control Layout



9.0 EMERGENCY RESPONSE PLANNING

Emergencies are uncontrolled circumstances that can result in damage to personnel or property. Emergencies can be a result of the work process (e.g., hazardous material spills), or environmental conditions, such as severe weather. Once identified, response to emergencies typically occurs in three stages: communication, evacuation, and mitigation (response or control method). In addition, the emergency response procedures will vary with each situation. Table 9-2 at the end of this plan serves as a guideline for responding to emergencies at the General Mitchell Airport Air Reserve Station Site.

9.1 COMMUNICATION PROCEDURES

Communication procedures consist of the verbal, audio, and visual methods of notifying the appropriate personnel of an emergency, as well as the necessary protocols for notification. The communication of an emergency consists of three (3) phases:

1. Initial communication:
   The individual(s) who identify an emergency must immediately notify the Emergency Coordinator (EC). If necessary, the individual(s) may contact emergency services (e.g., 911) and/or order an evacuation of the work area prior to contacting the EC.
2. Evacuation:
   If necessary, the EC will notify all personnel to evacuate the work area and proceed to the appropriate muster location(s). Additional notifications will be made to subcontractors, other employers, the client, and public if necessary. See Section 1.2 below.
3. Mitigation/Control Measures:
   The EC will communicate any necessary measures to control or reduce the potential impact of the emergency to employees or emergency units. See Section 1.3 below.

Prior to performing any site activities, emergency communication and alarm methods must be developed (see Table 9-2) and communicated to ensure all site personnel are knowledgeable of protocol. When developing the alarm methods, consideration must also be given as to how the employees who hear/see the alarm will respond. For example, some alarms consist of a long, steady whistle to signify a fire, whereas two short alarm bursts, followed by a pause, followed by two short bursts, can signify that equipment shall be shut down and all personnel shall immediately proceed to the muster location(s).

In addition, personnel must be able to contact the EC and/or outside emergency units as needed. Therefore, mobile communication systems (e.g., radio, cell phone, horn, etc.) must be available to employees in the work zone. Emergency numbers are listed in Table 9-1 and must be posted at all exits of the site/project office and in all site vehicles.

Earth Tech Corporate Incident Reporting Procedures

All accidents, incidents, near-misses, and emergency situations that occur on-site during any field activity will be promptly reported to the SSO and the PM in accordance with Earth Tech Safety Procedure SH&E 101, *Injury, Illness, and Near-Miss Reporting*.

If any Earth Tech employee is injured and requires medical treatment, the PM will contact **Earth Tech's Incident Reporting Line at (800) 348-5046 immediately**. The PM will initiate a written report, using the ***Supervisor's Report of Incident*** form (see SH&E 101). The PM will complete the form and forward to the Section Manager and Corporate Safety Administrator by the following work day.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which at a minimum must include the OSHA Form 301 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

9.2 EVACUATION PROCEDURES

Evacuation of the work zone and other areas will be required if it is determined that an emergency may result in injury or illness to personnel. Specific examples include large fire/explosion, chemical spill or release, severe weather event, and security threats. The EC will determine if an evacuation is necessary based on the severity of the emergency. However, any person may order an evacuation or sound an evacuation alarm to protect the safety of site personnel.

Upon the issuance of an evacuation order or alarm, personnel must evacuate the work zone and proceed directly to the appropriate muster location(s). Muster locations must be of sufficient distance from the emergency location and/or of sufficient structure and stability to protect personnel from the hazards.

Prior to beginning site operations, the EC will identify the appropriate emergency routes and muster locations in Table 9-2. If necessary, the EC may develop evacuation routes and muster locations for various buildings or sections of the site. In addition, the EC may and is encouraged to use site specific maps to identify the appropriate evacuation routes and muster locations. Emergency routes must be posted in the appropriate work areas and communicated to personnel.

In the event that an evacuation is ordered, the following general requirements apply:

- Work activities will cease and all personnel will be evacuated from the work location. The evacuation will proceed in a direction opposite the critically affected area, with all personnel assembling in a pre-designated location outside of the site.
- A headcount will be taken of the assembled employees by the EC.
- In the event that outside response agencies must respond, an individual will be identified to meet emergency responders at the site entrance or pre-determined location.

9.3 MITIGATION & CONTROL MEASURES

The implementation of mitigation and control measures are designed to reduce and/or eliminate the potential effects of emergencies. Known control measures for emergencies will be listed in Table 9-2.

9.4 RESPONSIBILITIES & TRAINING

9.4.1 Emergency Coordinator

The RM will assume the duties of the emergency coordinator (EC). In addition, the RM will select a competent person to act as the alternate EC. The duties of the EC and the alternate EC have been specified in SH&E 205 and are listed below:

- Responsible for the completing the emergency information (e.g., signals, muster points, etc.) located in Table 9-2 *Emergency Procedures* prior to beginning site activities and updating as needed. Table 9-2 must be posted in prominent locations on site.
- Responsible for directing all actions in emergency situations, until relieved by outside emergency response units (i.e., Fire Department).
- Responsible for ensuring all Earth Tech employees on site are trained in the provisions of this plan, and the required actions.
- Designates specific communication procedures to ensure that all personnel are alerted to potential emergency conditions, and what actions are required.
- Continually reviews this plan to ensure that identified hazards and actions are adequate for the office and/or facility.
- Designates personnel to perform specific duties during emergencies, such as taking muster, and directing emergency responders to the site(s).
- Responsible for ensuring that other contractors are notified as to the potential emergencies associated with Earth Tech work, and that the contractors provide information as to potential emergencies associated with their work processes. Also, ensures that the contractor's hazards and emergency warning systems are communicated to Earth Tech employees.

- Ensures that all hazard signs (e.g., exit signs) and floor plans are posted as required. Ensures that emergency exit doors are not blocked, are labeled, and are not locked at any time.
- Establishes criteria and scheduling of emergency drills for Earth Tech employees. Critiques the drill results, and works with the supervisors to correct any observed deficiencies.
- Ensures that new employees are trained on the provisions of this plan prior to entering the work site. Ensures that visitors are either trained on the provisions of this plan, or are continually escorted by a trained employee.

9.4.2 Site Personnel

- Ensure compliance with all provisions of this plan.
- Alert the Emergency Coordinator/Supervisor to any observed conditions that can create an emergency situation.
- Notify the Emergency Coordinator/Supervisor of any change in work conditions that may impact the identified hazards in this plan.
- Do not block emergency exits or accesses.
- Participate in drills that are conducted to ensure the adequacy of the plan.

9.4.3 Subcontractors, Visitors, and Client Personnel

Subcontractors, visitors, and client personnel will follow the emergency action plans of their respective employers for the operations being performed.

Table 9-1. Emergency Contacts

Emergency Coordinators / Key Personnel

Name	**Title/Workstation**	**Telephone Number**	**Cellular Phone**
Aaron Klug	Client Contact	414-482-5601	
Greg Mc Govern	Project Manager	312-777-5432	312-636-4482
Eric Slusser	Supervisor/SSO/EC		630-222-5557
Chad Ross	District Safety Manager	859-442-2300	859-512-7774
Travis Westra	Safety Professional II	616-975-4620	616-485-0243
Incident Reporting "HOT LINE"	**Corporate Safety Administrator**	**800-348-5046**	
TBD	Secondary EC		

Organization / Agency

Name	**Telephone Number**
Police Department	911
Fire Department	911
State Police	911
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911
Poison Control Center	800-222-1222
Pollution Emergency	800-292-4706
National Response Center	800-424-8802
Chem-Trec	800-424-9300
Title 3 Hotline	800-424-9346

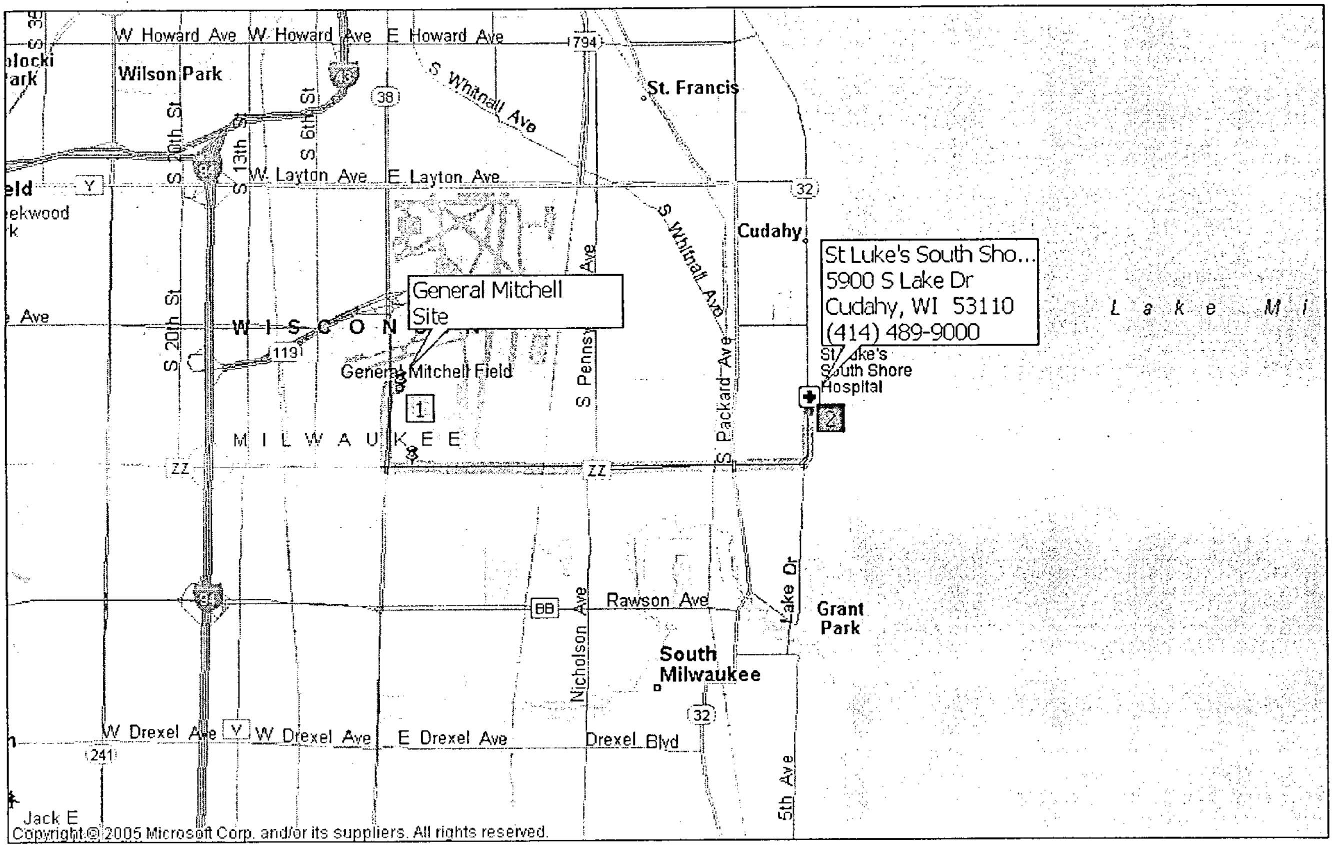
Hospital

St Luke's South Shore Hospital (Use by site personnel is only for non-emergency cases)	(414) 489-9000
Address: 5900 S Lake Dr Cudahy, WI 53110	
(Hospital Route Maps on following page)	

Public Utilities

Name	Telephone Number
Diggers Hotline: Wisconsin's One-Call Center	CALL 811 or (800) 242-8511

Figure 9-1. Site/Hospital Route/Detail Map



General Mitchell Site

St Luke's South Sho...
5900 S Lake Dr
Cudahy, WI 53110
(414) 489-9000

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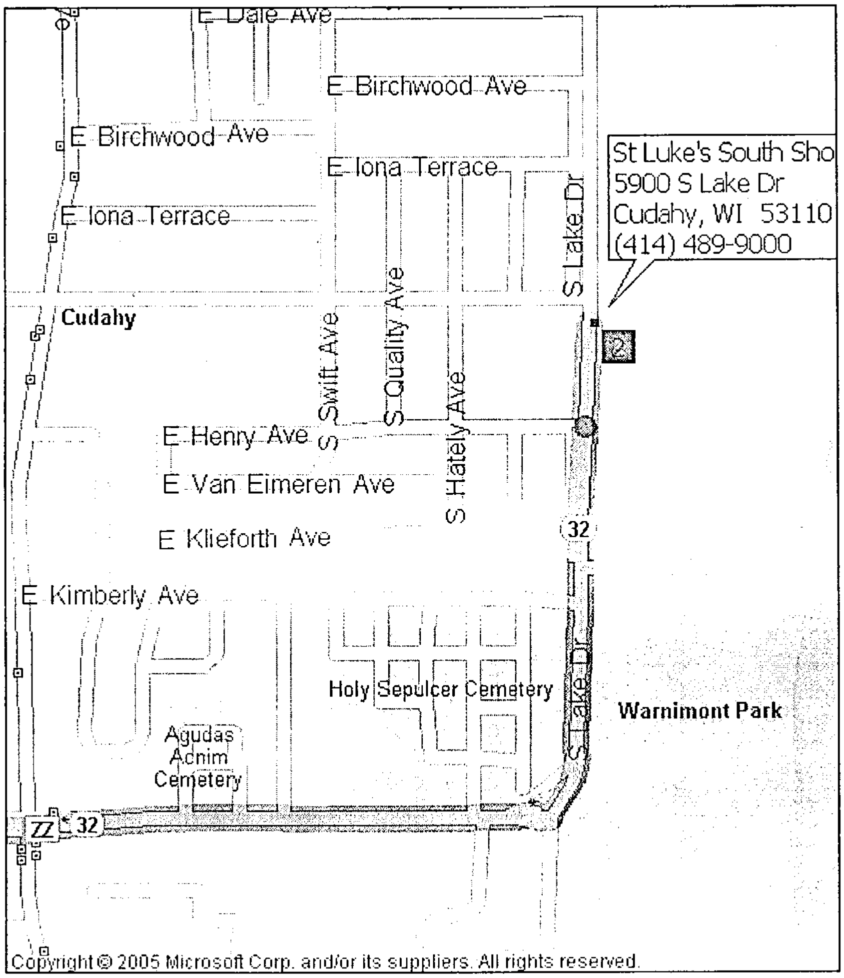

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Table 9-2. Emergency Procedures

EMERGENCY	RESPONSE PROCEDURES		
	Communication	**Mitigation/Control**	**Evacuation**
Medical Emergency	If life-threatening, **contact 911** immediately and notify PM.	If qualified, perform First Aid-CPR. Keep victim calm and watch for symptoms of shock. Emergency response personnel will transport victims to hospital.	Do not move victim unless imminent threat (e.g., fire, explosion, chemical exposure, etc.) is present.
Chemical Exposure	Report incident to PM immediately.	Refer to chemical safety card or MSDS for appropriate treatment measures.	Remove individual from danger area.
Other Incident/Near Miss	Report incident to RM immediately. PM will contact safety department.	For non-life threatening injuries or illness, transport victim to the hospital listed in Figure 9-1.	None anticipated
Severe Weather	PM will notify foreman via radio when severe weather is approaching or use the following signal:	Allow sufficient time for decontamination and shut down of operations.	**If severe weather is imminent, evacuate to the following shelter(s):**
Tornado	PM will notify foreman via radio if severe weather may result in tornado activity **or use the following signal:**	Allow sufficient time for decontamination and shut down of operations.	**Tornado shelter location(s):**
Small Fire* * *Less than the size of a small trash can.*	Notify PM/foreman to **contact 911** immediately. **Notify all personnel evacuate or use the following signal:**	Determine if fire can be safely contained with a fire extinguisher.	See evacuation route map(s). **Exit facility and muster at the following location(s):**
Large Fire/Explosion	Notify PM/foreman to **contact 911** immediately. **Notify all personnel to evacuate or use the following signal:**	None anticipated. Evacuate immediately.	See evacuation route map(s). **Exit facility and muster at the following location(s):**
Spills/Release	Notify PM. PM will contact OSC and determine if additional agencies must be notified.	Don Level B PPE (see HASP). Complete THA. Use spill kit and diking procedures to contain spill.	See evacuation route map(s). Exit facility and move upwind at least 1000 feet.
Security Threat	Notify PM. **Contact 911.**	Keep vehicles locked and valuables out of sight.	None anticipated.
Confined Space Emergency	See Permit.	See Permit.	See Permit.

10.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the Earth Tech Health and Safety Plan for the General Mitchell Airport Air Reserve Station Site site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	ORGANIZATION	DATE

Attachment A

Task Hazard Analyses

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

TASK HAZARD ANALYSIS (THA)

Evaluated by: Travis Westra

Date: October 3, 2007

TASK NAME

DRILLING (GEOPROBE®/HAND AUGER)

TASK DESCRIPTION

This task hazard analysis refers to the process of drilling (with both Geoprobe ® and hand auger methods)

CHEMICAL EXPOSURE HAZARDS

- See HASP

PPE

Modified Level D

- High-visibility reflective safety vest (when working near active roadways, heavy equipment, drill rigs, spotting).
- ANSI approved hardhat.
- ANSI approved safety glasses.
- ANSI approved steel toe safety shoes/boots.
- Protective chemical gloves (inner & outer), coveralls (tyvek$^{®}$), and rubber boots/booties

OTHER SAFETY EQUIPMENT

- Leather gloves when handling sharp object or operating powered equipment
- Hearing protection (minimum 29 NRR)
- First aid kit
- Fire extinguisher
- Eye wash station
- Face shield if there is potential for splash hazard

PHYSICAL HAZARDS

- Cuts/lacerations (handling of sharp objects, etc.)
- Heavy lifting (objects over 49 pounds)
- Equipment traffic (drill rig, etc.)
- Slips/trips/falls/protruding objects
- Heat/cold stress
- Pinch point
- Hazardous noise levels
- Utilities (overhead/below surface)
- Electrical

APPLICABLE OPERATIONAL SAFETY PROCEDURES

- SH&E 201, General Safety Rules
- SH&E 207, Contractor/Subcontractor SH&E Requirements
- SH&E 310, Overhead Electrical Lines
- SH&E 403, Drilling
- SH&E 404, Manual Materials Handling
- SH&E 505, Powered Hand Tools
- SH&E 506, Manual Hand Tools

ADDITIONAL SAFETY CONSIDERATIONS

1. Use spotters when using heavy equipment, drill rig, etc. Stand clear of these operations.
2. Maintain cleared/safe distance from rig.
3. Prior to the start of site work each day, the drilling subcontractor will inspect all drilling equipment. The inspection will be documented in the field records, and the records will be maintained at the site. If the drill rig owner or operator does not have a company-specific inspection form, use or reference the attached "Drill Rig Safety Inspection Checklist" form. The drilling equipment inspection must be repeated on a daily basis. Defective equipment shall be repaired prior to use.
4. Self retracting cutting devices are only to be used.
5. Subcontractor is to follow SH&E SOP 403 for drilling ops.

Additional Concerns/Updates:

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

TASK HAZARD ANALYSIS (THA)

Evaluated by: Travis Westra, SH&E Professional II

Date: October 3, 2007

TASK NAME

SOIL/SEDIMENT SAMPLING

TASK DESCRIPTION

Collection of Soil and sediment samples

CHEMICAL EXPOSURE HAZARDS

See HASP

PPE

Level D (see Table in HASP for upgrade/downgrade criteria)

- Nitrile inner gloves
- High-visibility reflective safety vest
- ANSI approved hardhat.
- ANSI approved safety glasses.
- ANSI approved steel toe safety shoes/boots.

OTHER SAFETY EQUIPMENT

- Face shield/chemical goggles if splash is anticipated
- Tyvek® if potential exists for contact with impacted materials.
- Leather gloves while handling sharp edges or operating powered tools/machinery.
- SPF 15 sunblock when working outdoors.
- Equipment decontamination supplies.
- First aid kit (located in vehicle)
- Fire extinguisher (located in vehicle)

PHYSICAL HAZARDS

- Manual lifting
- Slip, trip, and falls
- Heat/cold stress
- Severe weather/sunburn
- Biological
- Heavy equipment
- Hazardous noise

APPLICABLE OPERATIONAL SAFETY PROCEDURES

- SH&E 201, General Safety Rules
- SH&E 404, Manual Lifting

ADDITIONAL SAFETY CONSIDERATIONS

1. Evaluate surrounding work area for additional hazards that may be present.

MONITORING PROCEDURES

Monitor with instrumentation as referenced in the HASP.

Attachment B

Material Safety Data Sheets/Hazardous Substance Fact Sheets

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZENE**

CAS Number: 71-43-2
DOT Number: UN 1114

RTK Substance number: 0197
Date: November 1994 Revision: January 2001

HAZARD SUMMARY

- **Benzene** can affect you when breathed in and by passing through your skin.
- **Benzene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- **Benzene** can irritate the eyes and skin with drying and scaling of the skin.
- Exposure can irritate the nose and throat.
- **Benzene** can cause symptoms of dizziness, lightheadedness, headache and vomiting. Convulsions and coma, or sudden death from irregular heart beat, may follow high exposure.
- Repeated exposure can cause damage to the blood cells (aplastic anemia).
- **Benzene** is a FLAMMABLE LIQUID and a FIRE HAZARD.

IDENTIFICATION

Benzene is a colorless liquid with a pleasant odor. It is used mainly in making other chemicals and plastics, as a solvent, and is found in trace amounts in gasoline.

REASON FOR CITATION

- **Benzene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NTP, DEP, IARC, HHAG, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and **MUTAGEN** and is **FLAMMABLE**.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 61 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15 minute work period.
NIOSH:	The recommended airborne exposure limit is **0.1 ppm** averaged over a 10-hour workshift and **1 ppm**, not to be exceeded during any 15 minute work period.
ACGIH:	The recommended airborne exposure limit is **0.5 ppm** averaged over an 8-hour workshift and **2.5 ppm** as a STEL (short term exposure limit).

- **Benzene** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- A regulated, marked area should be established where **Benzene** is handled, used, or stored as required by the OSHA Standard 1910.1028.
- Wash thoroughly immediately after exposure to **Benzene** and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzene**:

* **Benzene** can irritate the eyes and skin.
* Exposure can irritate the nose and throat.
* **Benzene** can cause symptoms of dizziness, lightheadedness, headache and vomiting. Convulsions and coma, or sudden death from irregular heart beat, may follow high exposure.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzene** and can last for months or years:

Cancer Hazard

* **Benzene** is a CARCINOGEN in humans. It has been shown to cause leukemia.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* There is limited evidence that **Benzene** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Long-Term Effects

* **Benzene** can cause drying and scaling of the skin.
* Repeated exposure can cause damage to the blood cells (aplastic anemia).

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following is recommended:

* Complete blood count.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Benzene** from drums or other storage containers to process containers.
* Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standard 1910.1028.
* Before entering a confined space where **Benzene** may be present, check to make sure that an explosive concentration does not exist.
* A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Benzene**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Benzene** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Benzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Benzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Benzene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends *Butyl Neoprene, Polyvinyl Alcohol, Silver Shield,* and *Viton/Neoprene* as protective materials.

Eye Protection

* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
* Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **0.1 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **500 ppm** is immediately dangerous to life and health. If the possibility of exposure above **500 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Benzene** you should be trained on its proper handling and storage.
* A regulated, marked area should be established where **Benzene** is handled, used, or stored.
* **Benzene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); FLUORIDES; NITRIC ACID; and DIBORANE;
* Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
* Sources of ignition, such as smoking and open flames, are prohibited where **Benzene** is used, handled, or stored.
* Metal containers involving the transfer of **Benzene** should be grounded and bonded.
* Use only non-sparking tools and equipment, especially when opening and closing containers of **Benzene**.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?

A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

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The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **BENZENE**
DOT Number: **UN 1114**
NAERG Code: **130**
CAS Number: **71-43-2**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0

CARCINOGEN
FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Benzene** is a FLAMMABLE LIQUID.
- Use dry chemical, CO_2, water spray, or foam extinguishers.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Vapors may travel to a source of ignition and flash back.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
- **Benzene** floats on water and may spread fire.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Benzene** is spilled or leaked, take the following steps:

- Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Remove all ignition sources.
- Cover with an activated charcoal adsorbent and place in covered containers for disposal.
- Ventilate and wash area after clean-up is complete.
- Keep **Benzene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **Benzene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, for POISON INFORMATION call 1-800-764-7661

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention.

Breathing

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 75 mm Hg at 68°F (20°C)
Flash Point: 12°F (-11°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benzene
Other Names:
Benzol; Coal Naphtha; Phenyl Hydride

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

NEW JERSEY
DEPARTMENT
of
HEALTH
and
SENIOR SERVICES

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ETHYL BENZENE**

CAS Number: 100-41-4
DOT Number: UN 1175

RTK Substance number: 0851
Date: February 1996 Revision: April 2002

HAZARD SUMMARY

* **Ethyl Benzene** can affect you when breathed in and by passing through your skin.
* **Ethyl Benzene** can irritate the eyes, nose and throat.
* Contact with **Ethyl Benzene** can irritate the skin. Prolonged exposure can causing drying, scaling and even blistering of the skin.
* Exposure to high concentration can cause you to become dizzy, lightheaded, and to pass out. Very high levels can cause trouble breathing and even death.
* High exposure may damage the liver.
* **Ethyl Benzene** is a FLAMMABLE LIQUID and a FIRE HAZARD.

IDENTIFICATION

Ethyl Benzene is a colorless liquid. It is used in the production of *Styrene* and synthetic polymers, as a solvent, and as a component of automotive and aviation fuels.

REASON FOR CITATION

* **Ethyl Benzene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, HHAG, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift.
NIOSH:	The recommended airborne exposure limit is **100 ppm** averaged over a 10-hour workshift <u>and</u> **125 ppm**, not to be exceeded during any 15 minute work period.
ACGIH:	The recommended airborne exposure limit is **100 ppm** averaged over an 8-hour workshift <u>and</u> **125 ppm** as a STEL (short-term exposure limit).

* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Ethyl Benzene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Ethyl Benzene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Ethyl Benzene**:

* **Ethyl Benzene** can irritate the eyes, nose and throat.
* Contact with **Ethyl Benzene** can irritate the skin.
* Exposure to high concentration can cause you to become dizzy, lightheaded and to pass out. Very high levels can cause trouble breathing and even death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Ethyl Benzene** and can last for months or years:

Cancer Hazard

* There is limited evidence that **Ethyl Benzene** causes cancer in animals. It may cause cancer of the kidneys.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* There is limited evidence that **Ethyl Benzene** may damage the developing fetus.

Other Long-Term Effects

* Prolonged exposure can cause drying, scaling and even blistering of the skin.
* High exposure may damage the liver.
* This chemical has not been adequately evaluated to determine whether brain or other nerve damage could occur with repeated exposure. However, many solvents and other petroleum-based chemicals have been shown to cause such damage. Effects may include reduced memory and concentration, personality changes (withdrawal, irritability), fatigue, sleep disturbances, reduced coordination, and/or effects on nerves supplying internal organs (autonomic nerves) and/or nerves to the arms and legs (weakness, "pins and needles").

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

* Liver function tests.
* Evaluate for brain effects such as changes in memory, concentration, sleeping patterns and mood (especially irritability and social withdrawal), as well as headaches and fatigue. Consider evaluations of the cerebellar, autonomic and peripheral nervous systems. Positive and borderline individuals should be referred for neuropsychological testing.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Ethyl Benzene**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Ethyl Benzene** from drums or other storage containers to process containers.
* Before entering a confined space where **Ethyl Benzene** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Ethyl Benzene** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Ethyl Benzene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.

- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Ethyl Benzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Ethyl Benzene**, whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **Ethyl Benzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Ethyl Benzene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- ACGIH recommends *Teflon* as a protective material.

Eye Protection

- Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
- Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposure over **100 ppm**, use a NIOSH approved full facepiece respirator with an organic vapor cartridge. Increased protection is obtained from full facepiece powered-air purifying respirators.
- If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Ethyl Benzene**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **800 ppm** is immediately dangerous to life and health. If the possibility of exposure above **800 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

- Prior to working with **Ethyl Benzene** you should be trained on its proper handling and storage.
- **Ethyl Benzene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Ethyl Benzene** is used, handled, or stored.
- Metal containers involving the transfer of **Ethyl Benzene** should be grounded and bonded.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethyl Benzene**.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

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Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

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Trenton, NJ 08625-0360
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NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **ETHYL BENZENE**
DOT Number: **UN 1175**
NAERG Code: **129**
CAS Number: **100-41-4**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Ethyl Benzene** is a FLAMMABLE LIQUID.
- Use dry chemical, CO_2, alcohol or polymer foam extinguishers, as water may not be effective in fighting fires.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Vapors may travel to a source of ignition and flash back.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Ethyl Benzene** is spilled or leaked, take the following steps:

- Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Remove all ignition sources.
- Cover with an activated charcoal adsorbent and place in covered containers for disposal.
- Ventilate and wash area after clean-up is complete.
- Keep **Ethyl Benzene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **Ethyl Benzene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

<u>*For POISON INFORMATION call 1-800-222-1222*</u>

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 7.1 mm Hg at 68°F (20°C)
Flash Point: 70°F (21°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:

Benzene, Ethyl-

Other Names:

Ethylbenzol; Phenylethane

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **TOLUENE**

CAS Number: 108-88-3
DOT Number: UN 1294

RTK Substance number: 1866
Date: November 1992 Revision: August 1998

HAZARD SUMMARY

- * **Toluene** can affect you when breathed in and by passing through your skin.
- * **Toluene** should be handled as a TERATOGEN--WITH EXTREME CAUTION.
- * It may damage the developing fetus.
- * Contact can irritate the skin and eyes.
- * Breathing **Toluene** can irritate the nose and throat causing coughing and wheezing.
- * Exposure to **Toluene** can affect the nervous system causing trouble concentrating, headaches and slowed reflexes. Higher levels can cause you to feel dizzy, lightheaded, and to pass out. Death may occur.
- * Prolonged contact can cause drying of the skin and a skin rash.
- * Repeated **Toluene** exposure may cause liver, kidney and brain damage.
- * **Toluene** is a FLAMMABLE LIQUID and a FIRE HAZARD.

IDENTIFICATION

Toluene is a colorless liquid with a sweet, strong odor. It is used as a solvent, in aviation gasoline, and in making other chemicals, perfumes, medicines, dyes, explosives, and detergents.

REASON FOR CITATION

- * **Toluene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, NFPA, HHAG and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE.**
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- * **ODOR THRESHOLD = 2.9 ppm.**
- * The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **200 ppm** averaged over an 8-hour workshift, **300 ppm** not to be exceeded during any 15 minute work period <u>and</u> **500 ppm** as a 10 minute acceptable maximum peak.
NIOSH:	The recommended airborne exposure limit is **100 ppm** averaged over a 10-hour workshift <u>and</u> **150 ppm** not to be exceeded during any 5 minute work period.
ACGIH:	The recommended airborne exposure limit is **50 ppm** averaged over an 8-hour workshift.

- * **Toluene** may be a TERATOGEN in humans. All contact with this chemical should be reduced to the lowest possible level.
- * The above exposure limits are for <u>air levels only</u>. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly <u>immediately</u> after exposure to **Toluene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Toluene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Toluene**:

* Contact can irritate the skin and eyes.
* Breathing **Toluene** can irritate the nose and throat causing coughing and wheezing.
* Exposure to **Toluene** can affect the nervous system causing trouble concentrating, headaches, slowed reflexes, loss of appetite and nausea. Higher levels can cause you to feel dizzy, lightheaded, and to pass out. Death may occur.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Toluene** and can last for months or years:

Cancer Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Toluene** has been tested and has not been shown to cause cancer in animals.

Reproductive Hazard

* **Toluene** may be a TERATOGEN in humans since it has been shown to be a teratogen in animals.
* **Toulene** may damage the developing fetus.

Other Long-Term Effects

* Prolonged contact can cause drying, cracking, itching and a skin rash.
* Repeated **Toluene** exposure may cause liver, kidney and brain damage.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following is recommended before beginning work and at regular times after that:

* Urinary Hippuric acid excretion test (at the end of the shift) as an index of overexposure.

If symptoms develop or overexposure is suspected, the following may be useful:

* Exam of the nervous system.
* Liver and kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Toluene** from drums or other storage containers to process containers.
* Before entering a confined space where **Toluene** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Toluene** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Toluene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.

* On skin contact with **Toluene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Toluene**, whether or not known skin contact has occurred.

* Do not eat, smoke, or drink where **Toluene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Toluene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.

* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

* ACGIH and safety equipment manufacturers recommend *VITON* and *Polyvinyl Alcohol* as protective materials.

Eye Protection

* Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over **50 ppm**, use a MSHA/NIOSH approved full facepiece respirator with an organic vapor cartridge/canister. Increased protection is obtained from full facepiece powered air purifying respirators.

* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Toluene**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.

* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.

* Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

* Exposure to **500 ppm** is immediately dangerous to life and health. If the possibility of exposure above **500 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

HANDLING AND STORAGE

* Prior to working with **Toluene** you should be trained on its proper handling and storage.

* **Toluene** may react violently with mixtures of NITRIC and SULFURIC ACIDS.

* **Toluene** is not compatible with STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE).

* Sources of ignition, such as smoking and open flames, are prohibited where **Toluene** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

* Metal containers involving the transfer of **Toluene** should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters.

* Use only non-sparking tools and equipment, especially when opening and closing containers of **Toluene**.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q:	What are my chances of getting sick when I have been exposed to chemicals?
A:	The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
Q:	When are higher exposures more likely?
A:	Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).
Q:	Is the risk of getting sick higher for workers than for community residents?
A:	Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.
Q:	Who is at the greatest risk from reproductive hazards?
A:	Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the <u>ability</u> to have children, so both men and women of childbearing age are at high risk.
Q:	Should I be concerned if a chemical is a teratogen in animals?
A:	Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Disease and Injury Services
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Disease and Injury Services, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<

Common Name: **TOLUENE**
DOT Number: **UN 1294**
NAERG Code: **130**
CAS Number: **108-88-3**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
FLAMMABLE CONTAINERS MAY EXPLODE IN FIRE POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Toluene** is a FLAMMABLE LIQUID.
* CONTAINERS MAY EXPLODE IN FIRE.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* Use dry chemical, CO_2, or foam extinguishers. Water should be used to keep containers cool.
* Vapors may travel to a source of ignition and flash back.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Toluene** is spilled or leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Remove all ignition sources.
* Ventilate area of spill or leak.
* Absorb liquids in activated carbon absorbent and deposit in sealed containers.
* Keep **Toluene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
* It may be necessary to contain and dispose of **Toluene** as a HAZARDOUS WASTE. Contact your State Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 22 mm Hg at 68°F (20°C)
Flash Point: 40°F (4°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:

Benzene, Methyl-

Other Names:

Phenylmethane; Toluol; Methylbenzene

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **XYLENES**

CAS Number: 1330-20-7
DOT Number: UN 1307

RTK Substance number: 2014
Date: March 1992 Revision: May 1998

HAZARD SUMMARY

- **Xylenes** can affect you when breathed in and by passing through your skin.
- **Xylenes** may damage the developing fetus.
- Exposure can irritate the skin and eyes.
- Breathing **Xylenes** can irritate the nose and throat.
- **Xylenes** can cause headache, nausea, and vomiting. High levels can cause dizziness, lightheadedness, passing out and even death.
- Prolonged contact with **Xylenes** can cause dryness and cracking of the skin.
- Repeated exposure to **Xylenes** can cause poor memory and concentration.
- **Xylenes** can damage the liver and kidneys.
- **Xylenes** are FLAMMABLE LIQUIDS and FIRE HAZARDS.

IDENTIFICATION

Xylenes are similar chemicals which form a clear liquid with a strong odor. They are used as solvents, in making drugs, dyes, insecticides, lacquers and enamels, and in gasoline for airplanes.

REASON FOR CITATION

- **Xylenes** are on the Hazardous Substance List because they are regulated by OSHA and cited by ACGIH, DOT, HHAG, NIOSH, NFPA, DEP and EPA.
- These chemicals are on the Special Health Hazard Substance List because they are **FLAMMABLE**.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 0.081 to 40 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for all isomers of **Xylenes**.

OSHA:	The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift.
NIOSH:	The recommended airborne exposure limit is **100 ppm** averaged over a 10-hour workshift and **150 ppm** not to be exceeded during any 15 minute work period.
ACGIH:	The recommended airborne exposure limit is **100 ppm** averaged over an 8-hour workshift and **150 ppm** as a STEL (short-term exposure limit).

- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to **Xylenes** and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Xylenes** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Xylenes**:

* Exposure can irritate the skin and eyes.
* Breathing **Xylenes** can irritate the nose and throat causing cough and difficulty in breathing.
* **Xylenes** can cause headache, nausea and vomiting, tiredness and stomach upset. High levels can cause dizziness, lightheadedness, fatigue, confusion, passing out and even death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Xylenes** and can last for months or years:

Cancer Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Xylenes** have been tested and have not been shown to cause cancer in animals.

Reproductive Hazard

* **Xylenes** may damage the developing fetus.

Other Long-Term Effects

* Prolonged contact with **Xylenes** can cause dryness and cracking of the skin.
* Repeated exposure to **Xylenes** can cause poor memory, difficulty in concentration, and other brain effects. It can also cause damage to the surface of the eye.
* **Xylenes** can damage the liver and kidneys.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following is recommended before beginning work and at regular times after that:

* Exam of the eyes.

If symptoms develop or overexposure is suspected, the following may be useful:

* Liver and kidney function tests.
* Urine concentration of *m-Methylhippuric Acid* (at the end of the workshift) as an index of overexposure.
* Exam of the nervous system.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Xylenes**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Xylenes** from drums or other storage containers to process containers.
* Before entering a confined space where **Xylenes** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Xylenes** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Xylenes**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Xylenes**, immediately wash or shower to remove the chemicals. At the end of the workshift, wash any areas of the body that may have contacted **Xylenes**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Xylenes** are handled, processed, or stored, since the chemicals can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Xylenes**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends the use of *Polyvinyl Alcohol* as a protective material.

Eye Protection

* Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over **100 ppm**, use a MSHA/NIOSH approved full facepiece respirator with an organic vapor cartridge/canister. Increased protection is obtained from full facepiece powered-air purifying respirators.
* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Xylenes**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **900 ppm** is immediately dangerous to life and health. If the possibility of exposure above **900 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Xylenes** you should be trained on their proper handling and storage.
* **Xylenes** are not compatible with STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE).
* Sources of ignition, such as smoking and open flames, are prohibited where **Xylenes** are used, handled, or stored in a manner that could create a potential fire or explosion hazard.
* Use only non-sparking tools and equipment, especially when opening and closing containers of **Xylenes**.
* Protect storage containers from physical damage.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Disease and Injury Services
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health and Senior Services physician who can help you find the services you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<<

Common Name: **XYLENES**
DOT Number: **UN 1307**
NAERG Code: **130**
CAS Number: **1330-20-7**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE FLAMMABLE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Xylenes** are FLAMMABLE LIQUIDS.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Vapors may travel to a source of ignition and flash back.
- Use dry chemical, CO_2, or foam extinguishers.
- Water spray may be used to reduce vapors.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Xylenes** are spilled or leaked, take the following steps:

- Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Remove all ignition sources.
- Ventilate area of spill or leak.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- Keep **Xylenes** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **Xylenes** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

==

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-764-7661

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 7 to 9 mm Hg at 68°F (20°C)
Flash Point: 81 to 90°F (27° to 32°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:

Dimethylbenzenes

Xylenes is the common name for any combination of the following isomers:

1,2-Dimethylbenzene (ortho-Xylene),
CAS #95-47-6 RTK Sub. No. 2903
1,3-Dimethylbenzene (meta-Xylene),
CAS #108-38-3 RTK Sub. No. 2902
1,4-Dimethylbenzene (para-Xylene),
CAS #106-42-3 RTK Sub. No. 2904

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

Material Safety Data Sheet

JP-8 AVIATION TURBINE FUEL (Mil-T-83133)

August 3, 2001
MSDS #: 169130
Revision: 1

CHEVRON PHILLIPS CHEMICAL COMPANY LP
10001 Six Pines Drive
The Woodlands, Tx 77380

PHONE NUMBERS
EMERGENCY: (800) 231-0623 or
(510) 231-0623 (International)
EMERGENCY RESPONSE (ASIA): 800-AlertSGS
or 800-25378747 or 65-6542-9595
TRANSPORTATION (24 HR): CHEMTREC
(800)424-9300 OR (703)527-3887
Technical Services: (832) 813-4862
For Additional MSDSs: (800) 852-5530

A. Product Identification

Synonyms:	Aviation Turbine Fuel
Chemical Name:	Mixture
Chemical Family:	Hydrocarbon
Chemical Formula:	Mixture
CAS Reg. No.:	8008-20-6
Product No.:	RF3649

Product and/or Components Entered on EPA's TSCA Inventory: YES

This product is in U.S. commerce, and is listed in the Toxic Substances Control Act (TSCA) Inventory of Chemicals; hence, it may be subject to applicable TSCA provisions and restrictions.

B. Components

Ingredients	CAS Number	% By Wt.	OSHA PEL	ACGIH TLV
Kerosene includes:	8008-20-6	99.8-99.9	NE	NE
Paraffinic Hydrocarbons, includes:	Various	approx 50	NE	NE
n-Octane	111-65-9	approx 1.0	300 ppm	300 ppm
n-Nonane	111-84-2	approx 3.0	200 ppm	200 ppm

Naphthenes	Various	approx 33	NE	NE
Aromatic Hydrocarbons	Various	approx 17	NE	NE
includes				
Benzene	71-43-2	approx 0.8	10 ppm*	10 ppm
Toluene	108-88-3	approx 1.0	100 ppm	100 ppm
p-Xylene	106-42-3	approx 1.0	100 ppm	100 ppm
m-Xylene	108-38-3	approx 3.0	100 ppm	100 ppm
o-Xylene	95-47-6	approx 1.4	100 ppm	100 ppm
1,3,5-Trimethylbenzene	108-67-8	approx 1.4	25 ppm	25 ppm
1,2,4-Trimethylbenzene	95-63-6	approx 3.8	25 ppm	25 ppm
1,2,3-Trimethylbenzene	526-73-8	approx 1.0	25 ppm	25 ppm
PFA 55 MB(2-Methoxyethanol)	109-86-4	0.1-0.2	25 ppm(s)	5 ppm(s)

* Operations covered by the Benzene Standard, 29 CFR 1910.1028, will have a 1 ppm 8 hour TWA and a 5 ppm STEL.

(s) Skin Notation: Chemical is absorbed through the skin in liquid or vapor phase.

C. Personal Protection Information

Ventilation: Use adequate ventilation to control below recommended exposure levels.

Respiratory Protection: For concentrations exceeding the recommended exposure level, use NIOSH/MSHA approved air purifying respirator. In case of spill or leak resulting in unknown concentration, use NIOSH/MSHA approved supplied air respirator. If conditions immediately dangerous to life or health (IDLH) exist, use NIOSH/MSHA approved self-contained breathing apparatus (SCBA).

Eye Protection: Use safety glasses with side shields.

Skin Protection: Use neoprene or nitrile rubber gloves. Use protective garments to prevent excessive skin contact.

NOTE: Personal protection information shown in Section C is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

D. Handling and Storage Precautions

Do not get in eyes, on skin or on clothing. Do not breathe vapors, mist, fume or dust. Do not swallow, may be aspirated into lungs. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Immediately remove and launder contaminated clothing before reuse. Wash thoroughly after handling. Use only with adequate ventilation.

Keep away from heat, sparks, and flames. Store in a well-ventilated area. Store in a closed container. Bond and ground during transfer.

E. Reactivity Data

Stability: Stable
Conditions to Avoid: Not Established
Incompatibility (Materials to Avoid): Oxygen and strong oxidizing agents

Hazardous Polymerization: Will Not Occur
Conditions to Avoid: Not Established
Hazardous Decomposition Products: Carbon oxides and various hydrocarbons formed when burned.

F. Health Hazard Data

Recommended Exposure Limits:

See Section B.

Acute Effects of Overexposure:

Eye: May be mildly irritating to eyes.

Skin: May be mildly irritating to skin.

Inhalation: May cause nausea, headache and sedation.

Ingestion: May be irritating to intestines. If swallowed, may be aspirated resulting in inflammation and possible fluid accumulation in the lungs.

Subchronic and Chronic Effects of Overexposure:

Jet fuel has produced kidney damage in laboratory animals. No comparable kidney damage is known in humans. May cause blood changes possibly leading to aplastic anemia. May cause liver damage. Repeated or prolonged skin contact may be severely irritating to skin.

Contains a compound which has caused reproductive system and embryo/fetal changes in laboratory animals.

Other Health Effects:

Jet Fuels generally contain Benzene has been designated as a carcinogen by the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), and the Occupational Safety and Health Administration (OSHA). Benzene may produce blood changes which include reduced platelets, reduced red blood cells, reduced white blood cells, aplastic anemia, and acute nonlymphocytic leukemia. Benzene has produced fetal death in laboratory animals and caused chromosome changes in humans and mutation changes in cells of other organisms. Health effects attributable to Benzene are not known to occur in humans exposed to jet fuels.

Health Hazard Categories:

	Animal	Human		Animal	Human
Known Carcinogen	_X_	___	Toxic	___	___
Suspect Carcinogen	___	_X_	Corrosive	___	___
Mutagen	_X_	___	Irritant	_X_	___
Teratogen	___	___	Target Organ Toxin	_X_	_X_
Allergic Sensitizer	___	___			
Highly Toxic	___	___			

Specify - Liver Toxin; Kidney Toxin;
Nerve Toxin; Blood Toxin;
Lung-Aspiration Hazard;
Reproductive-Embryo/fetotoxin;
Organ and Function; Teratogens

First Aid and Emergency Procedures:

Eye: Flush eyes with running water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

Skin: Immediately wash skin with soap and water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

Inhalation: Remove from exposure. If breathing is difficult, give oxygen. If breathing ceases, administer artificial respiration followed by oxygen. Seek immediate medical attention.

Ingestion: Do not induce vomiting. Seek immediate medical attention.

Note to Physician: Gastric lavage using a cuffed endotracheal tube may be performed at your discretion.

G. Physical Data

Appearance: Colorless Liquid
Odor: Mild
Boiling Point: > 90F (>32C)
Vapor Pressure: 1
Viscosity: 1.98 cSt @ 68F (20C)

H. Fire and Explosion Data

Flash Point (Method Used):	115F (46C) (TCC, ASTM D56)
Flammable Limits (% by Volume in Air):	LEL - 0.7 UEL - 5.0
Fire Extinguishing Media:	Dry chemical, foam or carbon dioxide (CO2).
Special Fire Fighting Procedures:	Evacuate area of all unnecessary personnel. Shut off source, if possible. Wear appropriate safety equipment for fire fighting conditions including NIOSH/MSHA approved self-contained breathing apparatus (SCBA). Water fog or spray may be used to cool exposed containers and equipment. Do not spray water directly on fire - product will float and could be reignited on surface of water.
Fire and Explosion Hazards:	Carbon oxides and various hydrocarbons formed when burned. Combustible vapors may accumulate and flash or explode if in contact with ignition source.

I. Spill, Leak and Disposal Procedures

Precautions Required if Material is Released or Spilled:

Evacuate area of all unnecessary personnel. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Shut off source, if possible and contain spill. Protect from ignition. Keep out of water sources and sewers. Absorb in a dry, inert material (sand, clay, etc). Transfer to disposal drums using non-sparking equipment.

Waste Disposal (Insure Conformity with all Applicable Disposal Regulations):

Incinerate or place in permitted waste management facility.

J. DOT Transportation

Shipping Name: Fuel, aviation, turbine engine
Hazard Class: 3 (Flammable liquid)
ID Number: UN 1863
Packing Group: III
Marking: Fuel, aviation, turbine engine, UN 1863
Label: Flammable liquid

Placard: Flammable/1863
Hazardous Substance/RQ: Not applicable
Shipping Description: Fuel, aviation, turbine engine, 3 (Flammable liquid), UN 1863, PG III
Packaging References: 49 CFR 173.150, 173.203, 173.241

K. RCRA Classification - Unadulterated Product as a Waste

Ignitable (D001)

Prior to disposal, consult your environmental contact to determine if the TCLP (Toxicity Characteristic Leaching Procedure, EPA Test Method 1311) is required. Reference 40 CFR Part 261.

L. Protection Required for Work on Contaminated Equipment

Contact immediate supervisor for specific instructions before work is initiated. Wear protective equipment and/or garments described in Section C if exposure conditions warrant.

M. Hazard Classification

_X_ This product meets the following hazard definition(s) as defined by the Occupational Safety and Health Hazard Communication Standard (29 CFR Section 1910.1200):

_X_ Combustible Liquid
___ Compressed Gas
___ Flammable Gas
___ Flammable Liquid
___ Flammable Solid
___ Flammable Aerosol
___ Explosive
_X_ Health Hazard (Section F)
___ Organic Peroxide
___ Oxidizer
___ Pyrophoric
___ Unstable
___ Water Reactive

___ Based on information presently available, this product does not meet any of the hazard definitions of 29 CFR Section 1910.1200.

N. Additional Comments

SARA 313

This product contains the following chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

(See Section B).

Benzene
2-Methoxyethanol
Toluene
p-Xylene
o-Xylene
m-Xylene
1,2,4-Trimethylbenzene

NFPA 704 Hazard Codes - - - - - - - - Signals

Health : 1
Flammability: 2
Reactivity : 0
Special Haz.: -

Least - 0
Slight - 1
Moderate - 2
High - 3
Extreme - 4

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **GASOLINE**

CAS Number: 8006-61-9
DOT Number: UN 1203

RTK Substance number: 0957
Date: December 1996 Revision: April 2003

HAZARD SUMMARY

- * **Gasoline** can affect you when breathed in and by passing through your skin.
- * High exposures during pregnancy may damage the developing fetus.
- * Contact can irritate and burn the skin and eyes with possible eye damage.
- * Prolonged contact can cause a rash with drying and cracking of the skin.
- * Breathing **Gasoline** can irritate the nose and throat causing coughing and wheezing.
- * High levels can cause headache, nausea, dizziness, blurred vision, irregular heartbeat, poor coordination, seizures, coma, and even death.
- * Repeated high exposure may cause lung and brain damage.
- * **Gasoline** may damage the kidneys.
- * **Gasoline** is a FLAMMABLE LIQUID and a DANGEROUS FIRE HAZARD.
- * **Gasoline** often contains *Lead* and *Benzene*. *CONSULT THE NEW JERSEY HAZARDOUS SUBSTANCE FACT SHEETS ON TETRAETHYL LEAD, BENZENE* and *ETHYLENE DIBROMIDE.*

IDENTIFICATION

Gasoline is a clear liquid with a characteristic odor. It is used as a fuel for internal combustion engines and as a solvent.

REASON FOR CITATION

- * **Gasoline** is on the Hazardous Substance List because it is cited by ACGIH, DOT, NIOSH and NFPA.
- * This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

ACGIH:	The recommended airborne exposure limit is **300 ppm** averaged over an 8-hour workshift and **500 ppm** as a STEL (short term exposure limit).
NIOSH:	Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

- * The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Gasoline** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Gasoline** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Gasoline**:

* Contact can irritate and burn the skin and eyes.
* Breathing **Gasoline** can irritate the nose and throat causing coughing and wheezing.
* High levels can cause headache, nausea, dizziness, blurred vision, irregular heartbeat, poor coordination, seizures, coma, and even death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Gasoline** and can last for months or years:

Cancer Hazard

* There is limited evidence that **Gasoline** causes cancer in animals. It may cause cancer of the kidney and leukemia.
* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* High exposures during pregnancy may damage the developing fetus.

Other Long-Term Effects

* Repeated exposure can cause permanent eye damage.
* Prolonged contact can cause a rash with drying and cracking of the skin.
* Repeated high exposure may damage the lungs.
* Repeated exposure may cause poor appetite, muscle weakness, cramps, and possible brain damage.
* **Gasoline** may damage the kidneys.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

* Urinary *Lead* level.
* Chest x-ray and lung function tests.
* Kidney function tests.
* EEG.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Gasoline** from drums or other storage containers to process containers.
* Before entering a confined space where **Gasoline** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Gasoline** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Gasoline**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Gasoline**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Gasoline**, whether or not known skin contact has occurred.

- * Do not eat, smoke, or drink where **Gasoline** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Gasoline**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- * ACGIH recommends *Neoprene* and *Polyethylene* as protective materials.

Eye Protection

- * Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * Where the potential exists for exposure over **300 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

- * Prior to working with **Gasoline** you should be trained on its proper handling and storage.
- * **Gasoline** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.
- * Sources of ignition, such as smoking and open flames, are prohibited where **Gasoline** is used, handled, or stored.
- * Metal containers involving the transfer of **Gasoline** should be grounded and bonded.
- * Use only non-sparking tools and equipment, especially when opening and closing containers of **Gasoline**.
- * Wherever **Gasoline** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **GASOLINE**
DOT Number: **UN 1203**
NAERG Code: **128**
CAS Number: **8006-61-9**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Gasoline** is a FLAMMABLE LIQUID.
- Use dry chemical, CO_2, water spray, or regular foam extinguishers.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Vapors may travel to a source of ignition and flash back.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Gasoline** is spilled or leaked, take the following steps:

- Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Remove all ignition sources.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- Ventilate and wash area after clean-up is complete.
- Keep **Gasoline** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **Gasoline** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

For POISON INFORMATION call 1-800-222-1222

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Flash Point: -45°F (-43°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:

Gasoline

Other Names:

Petrol; Motor Spirits

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

UNLEADED GASOLINE

The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely reponsible for the accuracy and applicability of this information to a particular use or situation.
Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
UNLEADED GASOLINE

Product Identification: UNLEADED GASOLINE
Date of MSDS: 08/01/1989 **Technical Review Date:** 07/04/1999
FSC: 9130 **NIIN:** 00-148-7102
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: NEWFOUNDLAND DOCKYARD CORP (PROCESSING)
Post Office Box: 97
Manufacturer's Address1: JOBS BRIDGE XING
Manufacturer's Address2: ST. JOHNS, NF 00000
Manufacturer's Country: H5
General Information Telephone: 709-463-8811 (24 HRS) FAX -8058
Emergency Telephone: 709-463-8811 (24 HRS)
Emergency Telephone: 709-463-8811 (24 HRS)
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y

CAGE: 0M8E5
Special Project Code: N

Item Description

Item Name: GASOLINE,AUTOMOTIVE
Item Manager:
Specification Number: ASTM D4814
Type/Grade/Class: CL A,B,C,D,E,SPEC GR
Unit of Issue: GL
Unit of Issue Quantity: X
Type of Container: UNKNOWN

Contractor Information

Contractor's Name: NEWFOUNDLAND DOCKYAARD CORP
Post Office Box: 97
Contractor's Address1: JOBS BRIDGE CROSSING
Contractor's Address2: ST JOHNS NEW FOUNDLAND CANADA, NK 00000
Contractor's Telephone: 709-463-8811
Contractor's CAGE: 0M8E5

Section 2 - Compositon/Information on Ingredients
UNLEADED GASOLINE

Ingredient Name: GASOLINE
Ingredient CAS Number: 8006-61-9 **Ingredient CAS Code:** M
RTECS Number: LX3300000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 99
% Enviromental Weight:
Other REC Limits: NONE SPECIFIED
OSHA PEL: 300 PPM/500 STEL **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 300 PPM/500STEL;9192 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
UNLEADED GASOLINE

Health Hazards Acute & Chronic: ACUTE-INHALE:HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES,NOSE,THROAT & LUNGS.MAY CAUSE HEADACHE,DIZZINESS,SUFFOCATION,ANESTHETIC & CNS EFFECTS.EYE:IRRITATING.SKIN:FREQUENT/PROLONGED CONTACT M AY IRRITATE & CAUSE RASH.ORAL:HARMFUL/FATAL.IF ASPIRATED INTO THE LUNGS,MAY CAUSE PULMONARY EDEMA.CHRONIC-BLOOD DISORDER

Signs & Symptoms of Overexposure:
HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES, NOSE, THROAT & LUNGS. MAY CAUSE HEADACHE, DIZZINESS, SUFFOCATION, ANESTHETIC & CNS EFFECTS. EYE IRRITATING. FREQUENT OR PROLONGED SKIN CONTACT MAY IRRITATE & CAUSE RASH. HARMFUL OR FATALIF INGESTED. IF ASPIRATED INTO THE LUNGS, MAY CAUSE PULMONARY EDEMA.

Medical Conditions Aggravated by Exposure:
PERSONS WITH PRE-EXISTING SKIN DISORDERS OR IMPAIRED LIVER, KIDNEY OR RESPIRATORY FUNCTION MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THE SUBSTANCE.

LD50 LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** NO

Carcenogenicity Indicators
- **NTP:** YES
- **IARC:** YES
- **OSHA:** YES

Carcinogenicity Explanation: CONTAINS BENZENE. GASOLINE VAPORS CAUSED KIDNEY CANCER IN RATS AND LIVER CANCER IN MICE.

Section 4 - First Aid Measures
UNLEADED GASOLINE

First Aid:
GET MEDICAL ATTENTION IF SYMPTOMS PERSIST.SKIN:WASH WITH SOAP & WATER.EYE:FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.INHALED:REMOVE TO FRESH AIR & PROVIDE OXYGEN/CPR IF NEEDED.ORAL:DO NOT IN DUCE VOMITING.GET MEDICAL ATTENTION.DO NOT GIVE LIQUID.KEEP AT REST.SMALL AMOUNTS WHICH ACCIDENTALLY ENTER THE MOUTH SHOULD BE RINSED WITH WATER UNTIL TASTE OF GASOLINE IS GONE.

Section 5 - Fire Fighting Measures
UNLEADED GASOLINE

Fire Fighting Procedures:
WEAR FULL PROTECTIVE CLOTHING AND NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN THE POSITIVE PRESSURE MODE.
Unusual Fire or Explosion Hazard:
EXTREMELY FLAMMABLE. MATERIAL WILL ACCUMULATE STATIC CHARGE. DISCHARGE MAY CAUSE FIRE. FORMS SMOKE, CARBON MONOXIDE, CARBON DIOXIDE, SULFUR OXIDES.
Extinguishing Media:

USE CARBON DIOXIDE, FOAM/DRY CHEMICAL. WATER SPRAY MAY BE USED TO KEEP FIRE EXPOSED CONTAINERS COOL & FLUSH SPILLS AWAY.
Flash Point: Flash Point Text: -40F,-40C
Autoignition Temperature:
Autoignition Temperature Text: 495F
Lower Limit(s): 1.5
Upper Limit(s): 7.6

Section 6 - Accidental Release Measures
UNLEADED GASOLINE

Spill Release Procedures:
WEAR PROTECTIVE EQUIPMENT. ELIMINATE SOURCES OF IGNITION. VENTILATE THE AREA. CONTAIN THE SPILL. PICK UP LARGE SPILL WITH NON-SPARKING TOOLS; SMALL SPILLS/RESIDUE WITH INERT ABSORBENT MATERIAL. PLACE IN CONTAINERS. PREVENT ENTERING WATERWAYS/SEWERS.

Section 7 - Handling and Storage
UNLEADED GASOLINE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
UNLEADED GASOLINE

Repiratory Protection:
WHERE CONCENTRATIONS IN AIR MAY EXCEED THE OCCUPATIONAL EXPOSURE LIMITS,NIOSH-APPROVED CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED.AT HIGHER CONCENTRATION,WEAR AN ATMOSPH ERE SUPPLIED AIRLINE BREATHING APPARATUS
Ventilation:
MECHANICAL (GENERAL AND/OR LOCAL EXHAUST, EXPLOSION-PROOF) VENTILATION TO MAINTAIN EXPOSURE BELOW TLV(S).
Protective Gloves:
NEOPRENE, NITRILE, OR POLYVINYL ALCOHOL
Eye Protection: USE CHEMICAL SAFETY GOGGLES & FACESHIELD
Other Protective Equipment: EYE WASH STATION, QUICK DRENCH SHOWER AND IMPERVIOUS CLOTHING
Work Hygenic Practices: DO NOT TAKE INTERNALLY. AVOID EYE AND SKIN CONTACT. DO NOT BREATHE VAPORS.
Supplemental Health & Safety Information: N/P

Section 9 - Physical & Chemical Properties
UNLEADED GASOLINE

HCC: F1
NRC/State License Number: N/R
Net Property Weight for Ammo: N/R
Boiling Point: =25.C, 77.F **Boiling Point Text:**

Melting/Freezing Point: =-60.C, -76.F **Melting/Freezing Text:**
Decomposition Point: Decomposition Text: N/R
Vapor Pressure: 450 **Vapor Density:** 3 - 4
Percent Volatile Organic Content:
Specific Gravity: O.73 - 0.83
Volatile Organic Content Pounds per Gallon:
pH: N/R
Volatile Organic Content Grams per Liter:
Viscosity: N/K
Evaporation Weight and Reference: N/K
Solubility in Water: INSOLUBLE
Appearance and Odor: GREEN COLORED LIQUID WITH HYDROCARBON ODOR
Percent Volatiles by Volume: 100
Corrosion Rate: UNKNOWN

Section 10 - Stability & Reactivity Data
UNLEADED GASOLINE

Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZING AGENTS, PYROPHORIC MATERIALS
Stability Condition to Avoid:
HEAT, SPARKS, STATIC ELECTRICITY, HOT SURFACES, OPEN FLAMES AND OTHER SOURCES OF IGNITION
Hazardous Decomposition Products:
FUMES, SMOKE, CARBON MONOXIDE, CARBON DIOXIDE AND SULFUR OXIDES
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT APPLICABLE

Section 11 - Toxicological Information
UNLEADED GASOLINE

Toxicological Information:
N/P

Section 12 - Ecological Information
UNLEADED GASOLINE

Ecological Information:
N/P

Section 13 - Disposal Considerations
UNLEADED GASOLINE

Waste Disposal Methods:
WASTE MAY BE BURNED IN AN APPROVED INCINERATOR OR DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS.

Section 14 - MSDS Transport Information
UNLEADED GASOLINE

Transport Information:
N/P

Section 15 - Regulatory Information
UNLEADED GASOLINE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
UNLEADED GASOLINE

Other Information:
N/P

HMIS Transportation Information

Product Identification: UNLEADED GASOLINE
Transporation ID Number: 50957
Responsible Party CAGE: 0M8E5
Date MSDS Prepared: 08/01/1989
Date MSDS Reviewed: 06/30/1992
MFN: 06/30/1992
Submitter: D DG
Status Code: C
Container Information
  Unit of Issue: GL
  Container Quantity: X
  Type of Container: UNKNOWN
  Net Unit Weight: N/K
Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:

Department of Transportation Information

DOT Proper Shipping Name: GASOLINE
DOT PSN Code: GTN

Symbols:
DOT PSN Modifier:
Hazard Class: 3
UN ID Number: UN1203
DOT Packaging Group: II
Label: FLAMMABLE LIQUID
Special Provision(s): B33,B101,T8
Packaging Exception:
Non Bulk Packaging: 202
Bulk Packaging: 242
Maximimum Quanity in Passenger Area: 5 L
Maximimum Quanity in Cargo Area: 60 L
Stow in Vessel Requirements: E
Requirements Water/Sp/Other:

IMO Detail Information

IMO Proper Shipping Name: GASOLINE
IMO PSN Code: HRV
IMO PSN Modifier:
IMDG Page Number: 3141
UN Number: 1203
UN Hazard Class: 3.1
IMO Packaging Group: II
Subsidiary Risk Label: -
EMS Number: 3-07
Medical First Aid Guide Number: 311

IATA Detail Information

IATA Proper Shipping Name: MOTOR SPIRIT
IATA PSN Code: RMF
IATA PSN Modifier:
IATA UN Id Number: 1203
IATA UN Class: 3
Subsidiary Risk Class:
UN Packaging Group: II
IATA Label: FLAMMABLE LIQUID
Packaging Note for Passengers: 305
Maximum Quantity for Passengers: 5L
Packaging Note for Cargo: 307
Maximum Quantity for Cargo: 60L
Exceptions: A100

AFI Detail Information

AFI Proper Shipping Name: GASOLINE
AFI Symbols:
AFI PSN Code: MUC
AFI PSN Modifier:
AFI UN Id Number: UN1203
AFI Hazard Class: 3
AFI Packing Group: II
AFI Label:
Special Provisions: P5
Back Pack Reference: A7.3

HAZCOM Label Information

Product Identification: UNLEADED GASOLINE
CAGE: 0M8E5
Assigned Individual: N
Company Name: NEWFOUNDLAND DOCKYAARD CORP
Company PO Box: 97
Company Street Address1: JOBS BRIDGE CROSSING
Company Street Address2: ST JOHNS NEW FOUNDLAND CANADA, NK 00000 CA
Health Emergency Telephone: 709-463-8811 (24 HRS)
Label Required Indicator: Y
Date Label Reviewed: 06/30/1992
Status Code: C
Manufacturer's Label Number: UNKNOWN
Date of Label: 06/30/1992
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Slight
Fire Hazard: Severe
Reactivity Hazard: None

Safety data for magnesium

lick here for data on magnesium in student-friendly format, from the HSci project

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Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: magnesium ribbon, magnesium wire, magnesium powder
Molecular formula: Mg
CAS No: 7439-95-4
EC No: 231-104-6

Physical data

Appearance: silver or grey rod, turnings or ribbon
Melting point: 650 C
Boiling point: 1107 C
Vapour density:
Vapour pressure: 1 mm at 621 C
Specific gravity: 1.73
Flash point: 634 C (closed cup)

Explosion limits:
Autoignition temperature: 510 C

Stability

Stable. Reacts violently with halogens, chlorinated solvents, chloromethane. Air and moisture sensitive. Incompatible with acids, acid chlorides, strong oxidizing agents. Highly flammable.

Toxicology

Harmful if swallowed or inhaled. Severe irritant. Vesicant.

Risk phrases
(The meaning of any risk phrases which appear in this section is given here.)
R11 R20 R22.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Hazard class 4.1 Packing group III

Personal protection

Safety glasses.

Safety phrases
(The meaning of any safety phrases which appear in this section is given here.)
S16 S26 S33 S36 S37 S39.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

This information was last updated on May 20, 2005. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

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The MSDS format adheres to the standards and regulatory requirements
of the United States and may not meet regulatory requirements
in other countries.

DuPont
Material Safety Data Sheet

"Teflon" Advanced
10110PP Revised 16-FEB-2001

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"Teflon" is a registered trademark of DuPont.

Corporate MSDS Number : DU007357

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS
Product Information : 1-800-441-7515 (outside the U.S. 302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S. 703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S. 302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
Fluorinated Polyurethane (NJ Trade Secret Registry # 00850201001-5418P)		3-5
Acrylic Copolymer (NJ Trade Secret Regisstry # 00850201001-5516P)		1-2
Hexylene Glycol	107-41-5	1-4
Water	7732-18-5	89-95

HAZARDS IDENTIFICATION

Potential Health Effects

Skin contact may cause skin irritation with discomfort or rash. The product diluted 1:4 with water was not a skin irritant or a skin sensitizer in human patch testing.

Eye contact with the product may cause eye irritation with discomfort, tearing, or blurring of vision.

Inhalation may cause irritation of the upper respiratory passages or lung irritation effects with cough, discomfort,

(HAZARDS IDENTIFICATION - Continued)

difficulty breathing, shortness of breath, or pulmonary edema (body fluid in the lungs). Symptoms may be modest initially followed in hours by severe shortness of breath requiring prompt medical attention.

Ingestion may cause nonspecific discomfort, such as nausea, headache, or weakness, heartburn, vomiting, or diarrhea. Ingestion of Hexylene glycol may cause temporary nervous system depression with anaesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

In case of contact, immediately wash skin with soap and water. Wash contaminated clothing before reuse.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

If swallowed, do not induce vomiting. Immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

Activated charcoal mixture may be administered. To prepare activated charcoal mixture, suspend 50 grams activated charcoal in 400 mL water and mix thoroughly. Administer 5 mL/kg, or 350 mL for an average adult.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : Extinguishes flame

Hazardous decomposition products including carbon dioxide, carbon monoxide, hydrogen fluoride, toxic gases or particles may be formed during combustion. These products may cause severe eye, nose, and throat irritation or toxic effects.

Extinguishing Media

Suitable for combustibles in the area.

Fire Fighting Instructions

Evacuate personnel to a safe area. Wear self-contained breathing apparatus.

Avoid breathing decomposition products.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Initial Containment

Prevent material from entering sewers, waterways, or low areas.

Spill Clean Up

Soak up with sawdust, sand, oil dry or other absorbent material. Shovel or sweep up.

Accidental Release Measures

Place in container for disposal. Flush spill area with water.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapors or mist. Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling. Do not store or consume food, drink, or tobacco in areas where they may become contaminated with this material. Avoid circumstances that produce respirable particles unless suitable ventilation and respirator

(HANDLING AND STORAGE - Continued)

are used.

Storage

Keep container tightly closed.

Perishable if frozen. Keep away from open flames and heated surfaces above 200 degC (392 degF).

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Keep container tightly closed. Use only with adequate ventilation. Vent heated extruder or dryer fumes outside work area. Do not aerosolize. In spray applications, use airless type pressure spray equipment at less than 60 psi, and exhaust ducts, drip pans, or other design features to minimize worker exposure to mists and overspray.

Personal Protective Equipment

EYE/FACE PROTECTION

Wear coverall chemical splash goggles.

RESPIRATORS

Wear NIOSH approved respiratory protection as appropriate.

PROTECTIVE CLOTHING

Where there is potential for skin contact have available and wear as appropriate, impervious gloves, apron, pants, and jacket.

Exposure Guidelines

Applicable Exposure Limits
Hexylene Glycol
PEL (OSHA) : None Established
TLV (ACGIH) : 25 ppm, 121 mg/m3, Ceiling
AEL * (DuPont) : None Established

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

(Applicable Exposure Limits - Continued)

Exposure Guideline Comments

No AEL has been established for this product. Other products with fluorinated material components have an AEL of 0.1 mg/m3 to 1 mg/m3 (8 hour TWA) for respirable size aerosol particles.

Air monitoring studies conducted at customer sites indicates that the use of the recomended low pressure (less than 60 psi) airless type, garden type or deck specific hand pump sprayer with spray tip orifice minimum of 0.031 inches in diameter does not produce respirable size aerosol particle concentrations near the AEL.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: 100 C (212 F)
Freezing Point	: 0 C (32 F)
% Volatiles	: 94-97 WT%
Solubility in Water	: Dispersible
pH	: 5.5-6.5
Odor	: Faint
Form	: Liquid
Color	: Off-White.
Specific Gravity	: 1

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

Incompatibility with Other Materials

None reasonably foreseeable.

Decomposition

Hazardous decomposition products including carbon dioxide, carbon monoxide, hydrogen fluoride, toxic gases or particles may be formed during combustion. These products may cause severe eye, nose, throat, and lung irritation or toxic effects.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

"Teflon" Advance:

Oral ALD:	>11,000 mg/kg in rats

Hexylene Glycol:

Dermal LD50:	7.88 g/kg in rabbits
Inhalation 8 hour ALC:	>18,000 ppm in rats

The product is a mild transient eye irritant and a slight skin irritant in animals. No animal test reports are available to define carcinogenic, mutagenic, developmental or reproductive hazards.

A product containing 15-35% NJ Trade Secret Registry #00850201001-5418P is moderately toxic by inhalation (Inhalation 4 hour ALC, 590 mg/m3 in rats). A single inhalation exposure to this product produced slight weight loss, nasal and ocular discharge, labored breathing, and lethargy.

Repeated exposure to Hexylene Glycol by ingestion caused increased liver and kidney weights and decreased adrenal weights. No animal data are available to define the carcinogenicity of Hexylene glycol. Animal data show developmental effects only at exposure levels producing other toxic effects in the adult animal. Tests in animals demonstrate no reproductive toxicity. Hexylene glycol does not produce genetic damage in bacterial cell cultures. In mammalian cell cultures it was positive in one test and negative in one test. Hexylene glycol has not been tested in animals for genetic toxicity.

ECOLOGICAL INFORMATION

Ecotoxicological Information

96 hour LC50, fathead minnows : 32 mg/L.

DISPOSAL CONSIDERATIONS

Waste Disposal

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Do not burn.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO/IATA
Proper Shipping Name : Not Regulated

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : No
Pressure : No

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating
Health : 2
Flammability : 0
Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS : MSDS Coordinator
DuPont Chemical Solutions Enterprise
Address : Wilmington, De. 19898
Telephone : 800-441-7515

# Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS

Imperial

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MSDS 5523

Fluorel

5523: Diesel Fuel Cond & Anti-Gel
5524: Diesel Fuel Cond & Anti-Gel
MSDS Last updated: 06/06/2007

CRC Industries, Inc.
885 Louis Drive
Warminster, Pennsylvania 18974

You may connect to CRC On-Line 24 hours a day, 7 days a week by dialing (215- 442-6260)

For Electronic versions of MSDS and TDS go to www.crcindustries.com and search by part number. All documents can be viewed online or downloaded.

Web Site: www.crcindustries.com
crcwebmaster@crcindustries.com

Main Switchboard	(215) 674-4300
Customer Service	
Automotive/Marine	(800) 272-8963
Electrical/Industrial/Aviation:	(800) 272-4620
Technical Support	(800) 521-3168
Fax	(800) 272-4560

SECTION 1: PRODUCT & COMPANY IDENTIFICATION

Product Name: Diesel Fuel Therapy® Fuel Injector Cleaner w/Anti-Gel
Product Number(s): 05412
Manufactured By:

CRC Industries, Inc.	General Information	(215) 674-4300
885 Louis Drive	Technical Assistance	(800) 521-3168
Warminster, PA 18974	Customer Service	(800) 272-8963
www.crcindustries.com	24-Hr Emergency (CHEMTREC)	(800) 424-9300

SECTION 2: HAZARDS IDENTIFICATION

Emergency Overview

Appearance & Odor: Dark amber liquid, petroleum odor

DANGER
Combustible. Harmful or Fatal if Swallowed.

As defined by OSHA's Hazard Communication Standard, this product is hazardous.

Potential Health Effects:

EYE: Contact with liquid or vapor may cause mild irritation.

SKIN: May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following a single exposure.

INHALATION: Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.

INGESTION: Ingestion may cause gastrointestinal disturbance, including irritation, nausea, vomiting and diarrhea. The major health threat of ingestion occurs from the danger of aspiration of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia, severe lung damage and even death.

CHRONIC EFFECTS: Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

TARGET ORGANS: Central nervous system.

Medical Conditions Aggravated by Exposure:

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis

See Section 11 for toxicology and carcinogenicity information on product ingredients.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	% by Wt.
Petroleum Distillate	68476-34-6	60 - 70
Stoddard Solvent	8052-41-3	15 - 25
Petroleum Naphtha	64742-94-5	5 - 10
Naphthalene	91-20-3	0.73
Additive blend	Trade secret	5 - 10

SECTION 4: FIRST AID MEASURES

Eye Contact: Immediately flush with plenty of water for 15 minutes. Call a physician if irritation persists.

Skin Contact: Remove contaminated clothing and wash affected area with soap and water. Call a physician if irritation persists. Wash contaminated clothing prior to re-use.

Inhalation: Remove person to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Call a physician.

Ingestion: Do NOT induce vomiting. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Mouth can be rinsed to dissipate the taste.

Note to Physicians: Treat symptomatically.

SECTION 5: FIRE-FIGHTING MEASURES

Flammable Properties: In accordance with OSHA definitions, this product is a Class II combustible liquid.

Flash Point:	133 F (TCC)	Upper Explosive Limit:	7.5
Auto ignition Temperature:	494 F	Lower Explosive Limit:	0.6

Suitable Extinguishing Media: Use extinguishers rated for Class B Fires, such as dry Chemical, Halon, fire fighting foam or CO2.

Products of Combustion: Oxides of carbon.

Protection of Fire-Fighters: Firefighters should wear self-contained, NIOSH-approved Breathing apparatus for protection against suffocation and possible toxic decomposition products. Proper eye and skin protection should be provided. Use water spray to keep fire-exposed containers cool and to knock down vapors which may result from product decomposition.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use personal protection recommended in Section 8.

Environmental Precautions: Take precautions to prevent contamination of ground and surface waters. Do not flush into sewers or storm drains.

Methods for Containment & Clean-up: Remove all sources of ignition. Dike area to contain spill. Ventilate the area with fresh air. If in confined space or limited air circulation area, clean-up workers should wear appropriate respiratory protection. Recover or absorb Spilled material using an absorbent designed for chemical spills. Place used absorbents into proper waste containers.

SECTION 7: HANDLING AND STORAGE

Handling Procedures: Keep away from heat, sparks and open flame. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion. Provide adequate ventilation during use. Do not breathe vapors. Wash hands after use.

Storage Procedures: Store in a cool dry area out of direct sunlight. Store in a well ventilated area. Keep out of reach of children.

Aerosol Storage Level: NA

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines:

	OSHA		ACGIH		OTHER	
COMPONENT UNIT	TWA	STEL	TWA	STEL	TWA	SOURCE
Petroleum Distillate	5	NE	100	NE	NE	mg/m3
Stoddard Solvent	500	NE	100	NE	NE	ppm
Petroleum Nephtha	NE	NE	NE	NE	NE	
Naphthalene	10	15(v)	10(s)	15	NE	ppm
Additive blend	25(v)	NE	25	NE	NE	ppm

N.E. - Not Established © - ceiling (s) - skin (v) - vacated

Engineering Controls: Area should have ventilation to provide fresh air. Use local exhaust to prevent accumulation of vapors. Use mechanical means if necessary to maintain vapor levels below the exposure guidelines. If working in a confined space, follow applicable OSHA regulations

Respiratory Protection: None required for normal work where adequate ventilation is provided. Use NIOSH-approved self-contained positive pressure respirators in low circulation areas and for emergencies.

Eye/face Protection: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear splash-proof goggles.

Skin Protection: Use protective gloves such as nitrile, neoprene or PVC.

Also, use full protective clothing if there is prolonged or repeated contact of liquid with skin.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Dark amber
Odor:	Petroleum
Specific Gravity:	0.846
Initial Boiling Point:	320 F
Freezing Point:	ND
Vapor Pressure:	ND
Vapor Density:	> 1 (air = 1)
Evaporation Rate:	< 1 (ether = 1)
Solubility:	Negligible in water
pH:	NA
Volatile Organic Compounds:	wt %: 56.28 g/L: 476.1 lbs./gal: 3.97

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable

Conditions to Avoid: temperature extremes, sources of ignition

Incompatible Materials: Strong oxidizers, Viton®, Fluorel®

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, non-combusted Hydrocarbons (smoke)

Possibility of Hazardous Reactions: No

SECTION 11: TOXICOLOGICAL INFORMATION

Long-term toxicological studies have not been conducted for this product. The following information is available for components of this product.

ACUTE EFFECTS

Component	Test	Result	Route	Species
Petroleum Distillate	LD50	9 ml/kg	Oral	Rat
Naphthalene	LD50	490 mg/kg	Oral	Rat
Naphthalene	LD50	> 20 g/kg	Dermal	Rabbit
Petroleum Distillate	LD50	> 5 ml/kg	Dermal	Rabbit

CHRONIC EFFECTS

Carcinogenicity:

	Component	Result
OSHA:	Naphthalene	Hazard Communication Carcinogen
IARC:	Naphthalene	2B - Possibly Carcinogenic
NTP:	Naphthalene	Reasonably Anticipated to be a Carcinogen

Mutagenicity: Petroleum Distillate This material has been positive in a mutagenicity study.

SECTION 12: ECOLOGICAL INFORMATION

Ecological studies have not been conducted for this product. The following information is available for components of this product.

Ecotoxicity:	Naphthalene - 48 Hr EC50 water flea: 2.16 mg/L
Persistence / Degradability:	No information available
Bioaccumulation / Accumulation:	No information available
Mobility in Environment:	Spills may penetrate the soil causing

groundwater contamination. This material may accumulate in sediments.

SECTION 13: DISPOSAL CONSIDERATIONS

Disposal: This product is a RCRA hazardous waste for the toxicity Characteristic: D018 (7.3 mg/L Benzene). (See 40 CFR Part 261.20 - 261.33)

All disposal activities must comply with federal, state and local regulations. Local regulations may be more stringent than state or national requirements.

SECTION 14: TRANSPORT INFORMATION

Proper shipping description:

US DOT (ground): Not Regulated

Special Provisions: This product is reclassed as combustible, but no markings or Placarding are required per 49 CFR 173.150(f)(2).

SECTION 15: REGULATORY INFORMATION

U.S. Federal

Toxic Substances Control Act (TSCA):

All ingredients are either listed on the TSCA inventory or are exempt.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):

Reportable Quantities (RQ's) exist for the following ingredients: Naphthalene (100 lbs)

Spills or releases resulting in the loss of any ingredient at or above its RQ require immediate notification to the National Response Center (800-424-8802) and to your
Local Emergency Planning Committee.

Superfund Amendments Reauthorization Act (SARA) Title III:

Section 302 Extremely Hazardous Substances (EHS): None

Section 311/312 Hazard Categories:

Fire Hazard	Yes
Reactive Hazard	Yes
Release of Pressure	No
Acute Health Hazard	Yes
Chronic Health Hazard	Yes

Section 313 Toxic Chemicals: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and reauthorization Act of 1986 and 40 CFR Part 372:
Naphthalene (0.73%)

Clean Air Act:
Section 112 Hazardous Air Pollutants (HAPs): Naphthalene

State Regulations

California Safe Drinking Water and Toxic Enforcement Act (Prop 65):

This product may contain the following chemicals known to the state of California to cause cancer, birth defects or other reproductive harm:

Naphthalene (0.73%)
Benzene (? 7.3 ppm)

State Right to Know:

New Jersey: 91-20-3, 25551-13-7, 95-63-6, 800967-5478P, 800967-5453P, 800967-5503P
Pennsylvania: 91-20-3, 25551-13-7, 95-63-6
Massachusetts: 91-20-3, 25551-13-7, 95-63-6
Rhode Island: 91-20-3, 25551-13-7

Additional Regulatory Information: This diesel fuel additive complies with the federal ultra-low sulfur content requirements for use in all diesel motor vehicles and non-road engines.

SECTION 16: OTHER INFORMATION

NFPA: Health: 2 Flammability: 2 Reactivity: 0
HMIS: Health: 2 Flammability: 2 Reactivity: 0 PPE: B

Prepared By: Michelle Rudnick
CRC #: 637N
Revision Date: 7/19/2006

Changes since last revision: Formula change to comply with 15 ppm sulfur standard.

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials.
This information is accurate to the best of CRC Industries' knowledge or obtained from sources believed by CRC to be accurate. Before using any product, read all warnings and directions on the label.

CAS:	Chemical Abstract Service	NA:	Not Applicable
ppm:	Parts per Million	ND:	Not Determined
TCC:	Tag Closed Cup	NE:	Not Established
PMCC:	Pensky-Martens Closed Cup	g/L:	grams per Liter
PPE:	Personal Protection Equipment	lbs./gal:	pounds per gallon
TWA:	Time Weighed Average	STEL:	Short Term Exposure Limit
OSHA:	Occupational Safety and Health Administration		
ACGIH:	American Association of Governmental Industrial Hygienists		
NIOSH:	National Institute of Occupational Safety & Health		

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