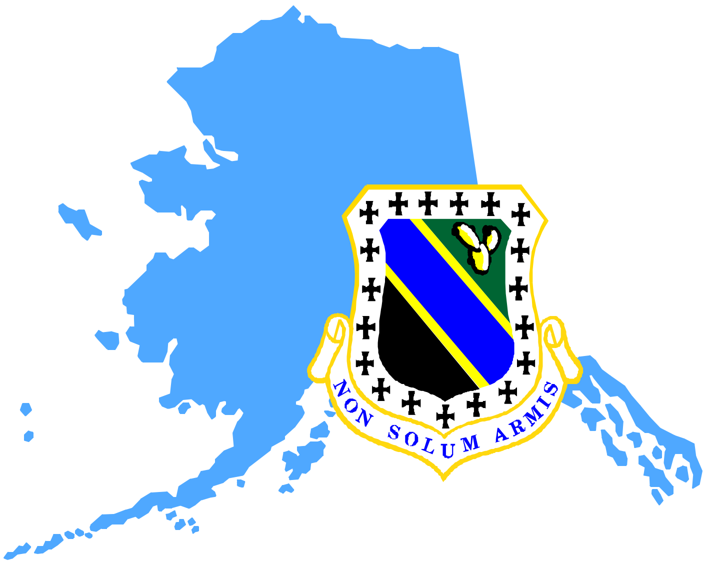


UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SS83 REMOVAL ACTION WORK PLAN

FINAL

JULY 2004

TABLE OF CONTENTS

SECTION **PAGE**

ACRONYMS AND ABBREVIATIONS iii
1.0 INTRODUCTION 1-1
1.1 WORK PLAN ORGANIZATION 1-1
1.2 SS83 SITE LOCATION AND HISTORY 1-1
1.2.1 Previous Investigations 1-5
1.3 ENVIRONMENTAL SETTING 1-6
1.3.1 Climate 1-6
1.3.2 Topography 1-7
1.3.3 Geology and Soils 1-7
1.3.4 Hydrogeology 1-9
1.3.5 Surrounding Land Use 1-9
2.0 BASELINE SCHEDULE 2-1
3.0 CLEANUP LEVELS 3-1
4.0 DETAILED FIELD INVESTIGATION APPROACH 4-1
4.1 GENERAL SITE ACTIVITIES 4-1
4.1.1 UXO Awareness Training 4-1
4.1.2 Utility Locates 4-1
4.2 AREA-SPECIFIC DESCRIPTIONS 4-2
4.2.1 Drum Bunker Area 4-2
4.2.2 Large Foundation Area 4-5
4.2.3 Motor Pool Area 4-8
4.2.4 Small Foundation Area 4-8
4.2.5 Bermed Bunker Area 4-8
4.2.6 Lookout Pad Area 4-11
4.3 DEMOBILIZATION 4-11
4.4 SITE RESTORATION 4-11
5.0 REPORTING 5-1
6.0 REFERENCES 6-1

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

TABLES

Table 3-1 SS83 EE/CA Site Cleanup Levels 3-1
Table 4-1 2004 Field Activities by Area 4-2
Table 4-2 2004 Analytical Samples 4-4

FIGURES

Figure 1-1 SS83 Site Location Map........ 1-2
Figure 1-2 SS83 Site Boundary........ 1-4
Figure 1-3 Regional Groundwater Flow Patterns 1-8
Figure 2-1 Project Schedule........ 2-2
Figure 4-1 Drum Bunker Area Proposed 2004 Excavation Location........ 4-3
Figure 4-2 Large Foundation Area Proposed 2004 Excavation Location........ 4-6
Figure 4-3 Motor Pool Area Proposed 2004 Excavation Location........ 4-9
Figure 4-4 Small Foundation Area and Bermed Bunker Area Proposed 2004 Excavation Locations........ 4-10
Figure 4-5 Lookout Pad Proposed 2004 Excavation Location 4-12

APPENDICES

Appendix A Sampling and Analysis Plan
Part I - Field Sampling Plan
Part II - Quality Assurance Project Plan
Part III - Investigation – Derived Waste Management Plan
Appendix B Health and Safety Plan
Appendix C Responses to Comments

ACRONYMS AND ABBREVIATIONS

AAA	anti-aircraft artillery
ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
AOC	area of concern
AUE	Area Under Evaluation
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
DRO	diesel-range organics
EE/CA	Engineering Evaluation/Cost Analysis
EOD	explosive ordnance disposal
GRO	gasoline-range organics
HSP	Health and Safety Plan
mm	millimeter
msl	mean sea level
PAH	polycyclic aromatic hydracarbon
PCB	polychlorinated biphenyl
POI	point of interest
POL	petroleum, oil, and lubricants
QPP	Quality Program Plan
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
SAP	Sampling and Analysis Plan
SI	site investigation
SVOC	semivolatile organic compound
USAF	United States Air Force
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
°F	degrees Fahrenheit

(intentionally blank)

1.0 INTRODUCTION

This work plan outlines the cleanup activities that will be performed at SS83 on Elmendorf Air Force Base (AFB), Alaska during 2004. This project includes:

- Excavation, transportation, and treatment of petroleum, oil, and lubricants (POL)-contaminated soil;
- Removal of concrete foundations (if required) to access POL-impacted soil;
- Removal, cleaning and recycling of two underground storage tanks (USTs);
- Investigation and removal of a drain pipe (if found) believed to be located on the northern edge of the Large Foundation Area.

The aforementioned remedies are described in a Decision Document signed by the U.S. Air Force (USAF) and the Alaska Department of Environmental Conservation (ADEC) in 2003 (ADEC 2003).

1.1 WORK PLAN ORGANIZATION

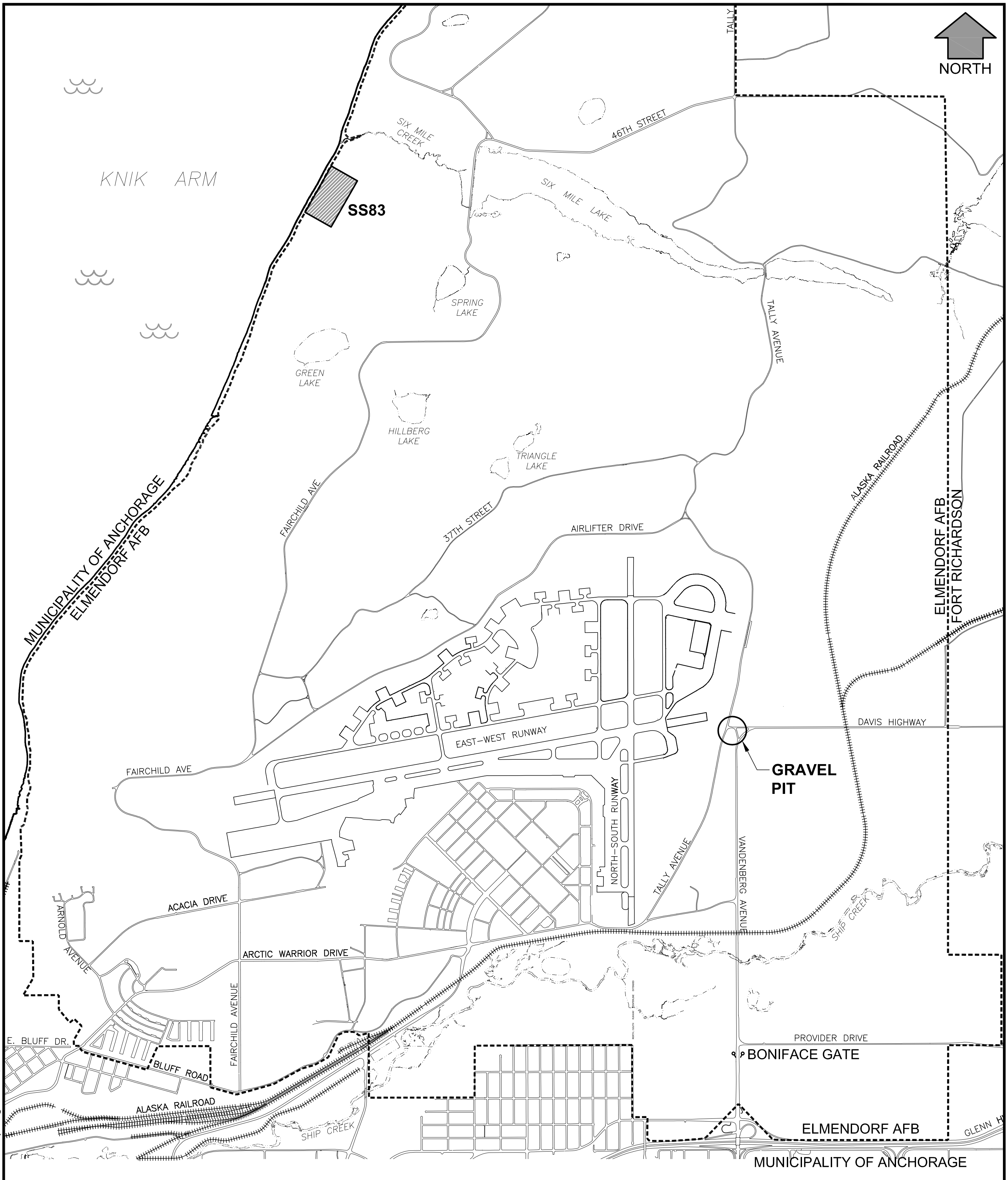
This work plan is organized into the following sections:

- Section 1.0 is an introduction that summarizes SS83 site historical information, previous site investigations (SIs), and physical site characteristics.
- Section 2.0 presents the anticipated project schedule.
- Section 3.0 presents the cleanup levels as determined by the 2000 Engineering Evaluation/Cost Analysis (EE/CA) (USAF 2002).
- Section 4.0 summarizes the planned 2004 field activities at SS83 and describes the technical approach.
- Section 5.0 describes the reporting requirements.
- Section 6.0 presents the references.

The two-part Quality Program Plan (QPP), provided in this document as appendices, includes specific procedures that will be followed during this project. Part 1 of the QPP is the Health and Safety Plan (HSP) and Part 2 is the Sampling and Analysis Plan (SAP), which consists of a Field Sampling Plan, Quality Assurance Project Plan, and Waste Management Plan. This document refers to the QPP extensively to avoid repetition and to enhance consistency.

1.2 SS83 SITE LOCATION AND HISTORY

Elmendorf AFB is located in South-central Alaska, along the head of the Knik Arm of Cook Inlet and adjacent to the City of Anchorage (Figure 1-1). Elmendorf AFB comprises 13,130 acres, and is bordered to the north and west by Cook Inlet, to the east by Fort Richardson, and to the south by the City of Anchorage.



LEGEND:

---- ELMENDORF AIR FORCE BASE BOUNDARY

0 1500 3000 6000

SCALE IN FEET

SS83 SITE LOCATION MAP

ELMENDORF AFB, ALASKA

PROJECT MANAGER:	FILE NAME:	DATE:
T. Tompkins	Location Map.dwg	July 29, 04
	LAYOUT TAB: Location Map	FIGURE NO. : 1-1
JE DRAWN BY: BJP	FILE LOCATION: Elmendorf \ 05Z02101 \ 2004 WP	

G:\Autocad\Elmendorf\05Z02101\2004 WP\Location Map.dwg Jul 29,2004 -BPeratro

The SS83 site is located in the northwestern portion of the base, between Six Mile Lake and Knik Arm (Figure 1-1). The site is located in an area that is currently used as the Rosette Antenna Site operated by the Elmendorf AFB 3rd Communications Squadron. Except for site workers, security forces, and other authorized personnel, access to the site is restricted. As shown on Figure 1-2, gates were previously installed at two access points to prevent vehicular access to the area. Figure 1-2 also shows the SS83 site in relation to nearby features. The entire SS83 site encompasses approximately 20 acres.

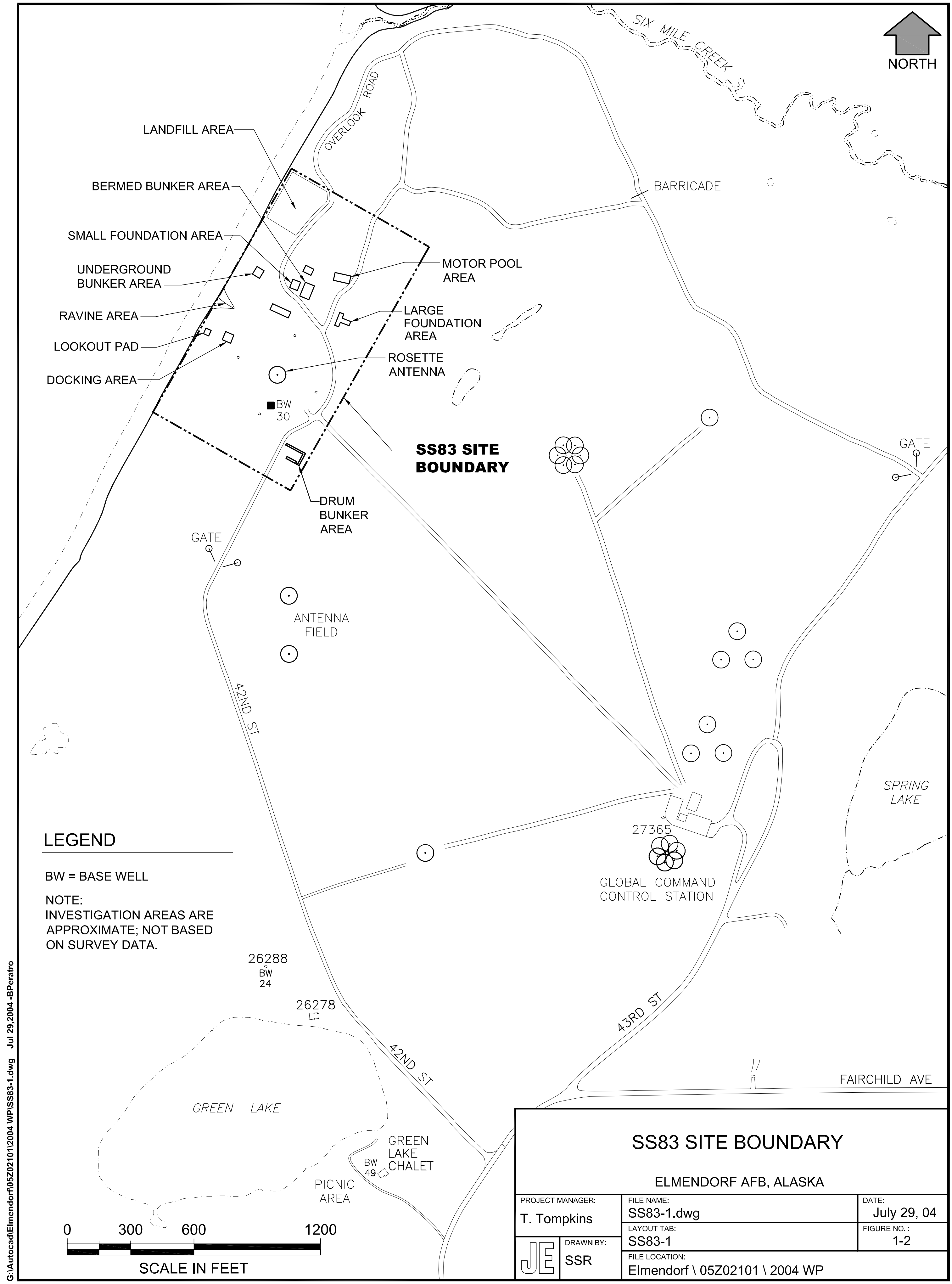
Records from 1949 indicate five small buildings (log structures) were located at the site that was then called Search Light Area No. 4. Base plans from 1951 revealed 24 buildings existing at this site designated as “Alaska Scouts Combat Intelligence” and labeled as “Battery D 96th Anti-Aircraft Artillery (AAA)”. The AAA battery was under the command of the U.S. Army, which was responsible for ground and anti-aircraft defense in Alaska (USARAL 1972). Other activities may also have occurred at the site. The SS83 site was decommissioned in the 1960s.

Historical information suggests that AAA batteries and garrisons were constructed in accordance with standardized designs. The AAA battery would have included 12 Quonset huts for a garrison and a battery headquarters building (two joined Quonset huts). The Quonset huts were lined up in an orderly fashion, creating a small camp. Usually, a short distance away was a splinter-proof radar shelter constructed of 55-gallon drums filled with soil. Also nearby were revetments for the 90-millimeter (mm), and later, 120-mm guns. Between the radar and gun emplacements was a semi-underground ordnance shop. Two ammunition magazines and a fuse storage shelter completed the facility (USAED-AK 1994).

For the purpose of investigation, SS83 was divided into 10 areas (see Figure 1-2):

- Landfill Area
- Bermed Bunker Area
- Underground Bunker Area
- Small Foundation Area
- Large Foundation Area
- Motor Pool Area
- Ravine Area
- Lookout Pad
- Docking Area
- Drum Bunker Area

The scope of work for this project does not include activities at the Landfill Area, Underground Bunker Area, Ravine Area, or the Docking Area. These areas were addressed in the 2000 EE/CA and the 2003 Landfill Site Investigation Report, and the remedy selected for all was no further action.



SS83 SITE BOUNDARY

ELMENDORF AFB, ALASKA

PROJECT MANAGER:	FILE NAME:	DATE:
T. Tompkins	SS83-1.dwg	July 29, 04
DRAWN BY: SSR	LAYOUT TAB: SS83-1	FIGURE NO.: 1-2
	FILE LOCATION: Elmendorf \ 05Z02101 \ 2004 WP	

1.2.1 Previous Investigations

The following text is a synopsis of the previous investigations conducted at SS83.

1.2.1.1 Area Under Evaluation Study

Beginning in 1996, the SS83 site was incorporated into the Area Under Evaluation (AUE) discovery process undertaken by Elmendorf AFB as part of restoration activities conducted under the Air Force's Installation Restoration Program (USAF 1997). The AUE program was designed to identify and evaluate areas of potential environmental concern that had not been previously identified and/or addressed under any other environmental source discovery efforts at Elmendorf AFB. Areas having suspicious historical activities as ascertained using aerial photographs, were designated points of interest (POIs). POIs were then considered for Category One No Further Response Action Planned determinations. POIs considered to have potential residual environmental impacts were designated as AUEs, and a preliminary conceptual site model was developed to illustrate potential contaminant sources, potential migration pathways, and potential sensitive receptors. AUEs that could pose a potential risk to human or ecological receptors were recommended for further environmental actions and were redesignated as candidate areas of concern (AOCs).

A preliminary site visit was conducted at SS83 in 1996 to observe the current site conditions and to note any indications that contamination might exist. During the site visit, building foundations and what appeared to be several standpipes near the buildings—possibly associated with USTs—were observed. There was some evidence of stressed vegetation adjacent to the building foundations. The field team recommended further investigation to confirm or deny the presence of USTs and to evaluate the area around the building structures for contamination.

The SS83 site was originally designated POI 1. Based on the evaluation process outlined above, the site was subsequently redesignated AUE 1. After a historical record review, preliminary site visit, and the development of a conceptual site model, it was determined that the site should be considered a candidate AOC and investigated further.

1.2.1.2 Limited Field Investigation of SS83

Elmendorf AFB conducted a limited field investigation at SS83 in 1997; the site was further investigated in 1998. The investigation included additional review of historical records, as-built drawings, and aerial photographs, as well as interviews conducted with Elmendorf AFB personnel and a military historian. A preliminary investigation/ SI report documented the results of the limited field investigation (USAF 1999b).

The limited field investigation identified and investigated several areas of possible contamination: the Large Foundation Area, the Motor Pool Area, the Small Foundation Area, the Bermed Bunker Area, the Underground Bunker Area, the Ravine Area, and the Docking Area. Hand borings and small test pits were excavated in these areas.

The limited field investigation report recommended that SS83 be designated an AOC because the site has several distinct areas where evidence of contamination exists, including the Motor Pool, Small Foundation, Large Foundation, and Docking Areas.

1.2.1.3 SS83 EE/CA

The SS83 EE/CA was conducted in 2000 to address contamination within the approximately 20-acre SS83 site. The purpose of the EE/CA was to evaluate removal action alternatives to address hazardous substances identified at various areas of investigation located within the main portion of the SS83 site. The SS83 EE/CA field investigation, conducted in the summer of 2000, originally focused on the seven areas of investigation identified in the SI report as being where historical hazardous substance releases were possible: the Large Foundation Area, the Motor Pool Area, the Small Foundation Area, the Bermed Bunker Area, the Underground Bunker Area, the Ravine Area, and the Docking Area. In addition to these seven areas, the EE/CA also investigated two additional areas discovered during site activities: the Drum Bunker Area and the Lookout Pad Area. The complete SS83 EE/CA results can be found in the *EE/CA SS83* report (USAF 2002).

1.2.1.4 SS83 Decision Document

A Decision Document signed by the USAF and ADEC in 2003 requires the removal and transportation of POL-contaminated soil from six areas within SS83 (Drum Bunker Area, Large Foundation Area, Motor Pool Area, Small Foundation Area, Bermed Bunker Area, and the Lookout Pad) to an off-base facility for thermal desorption treatment, as well as confirmatory sampling to ensure removal. In addition, the Decision Document requires that the two USTs located at the Large Foundation Area be removed.

1.3 ENVIRONMENTAL SETTING

The following discussion presents local conditions such as climate, geology and hydrology.

1.3.1 Climate

The climate of Elmendorf AFB is greatly affected by local and regional geographic features. Cook Inlet moderates the climate seasonally, while the four surrounding mountain ranges protect the area from Gulf of Alaska storms and extreme winter temperatures from the northern interior (USFWS 1983).

The temperature and precipitation data summarized here for Elmendorf AFB was collected from 1951 through 1997 (USAF 2001). The average summer temperatures range from 41 to 64 degrees Fahrenheit (°F) and winter temperatures range between 6 and 44°F. The average annual precipitation on Elmendorf AFB is 16.15 inches, with a range of 13 to 20 inches. The majority of the precipitation falls from July through September when the wind is from the southwest. Annual snowfall averages 77 inches (USFWS 1983).

1.3.2 Topography

The SS83 site is located on the Elmendorf ground moraine, which is characterized by smooth-surfaced elongate hills, linear valleys, and small lakes. The ground moraine is an area of relatively low relief that seldom exceeds 50 to 75 feet in elevation. Several SS83 site features have been surveyed and the elevation of the site is on average 43 to 51 feet above mean sea level (msl). Elevation gradually increases to the east. The west side of the SS83 site is located 25 to 35 feet above msl along the bluff of Knik Arm. The slope of the bluff ranges from approximately 25 degrees at the base above the beach interface to nearly vertical at the top edge of the bluff.

As part of the SS83 EE/CA (USAF 2002), a bluff erosion rate was estimated using aerial photographs and the relative position of fixed site features (i.e., gun revetments) to the bluff in different years. Revetments that were approximately 30 to 40 feet from the bluff in 1962 were approximately 1 to 2 feet from the bluff in 2000, which translates to an average bluff erosion rate of approximately 1 foot per year over 38 years. Further, based upon observations made during the 2000 SS83 field investigation and discussions with engineers familiar with the Knik Arm bluff, a bluff regression of 2 feet per year was estimated (USAF 2002). Observations at the site, including growth of vegetation along the bluff and erosion rates witnessed during 2002-2003, indicate that these erosion rates may overestimate current site conditions.

1.3.3 Geology and Soils

From north to south, Elmendorf AFB can be geologically divided into three areas: the Elmendorf ground moraine, the Elmendorf end moraine, and the outwash plain (Figure 1-3).

The SS83 site is located on the Elmendorf ground moraine. Surficial soils at the SS83 site were likely composed of silty loam and were generally well drained. Previous excavations at the Landfill Area site have resulted in discovery of a variety of surface soils currently overlying the landfill debris. The Bootlegger Cove clay formation underlies the site. Soils (above the Bootlegger Cove clay) between 42nd Street and Knik Arm are mapped as having high to very

SOURCE:

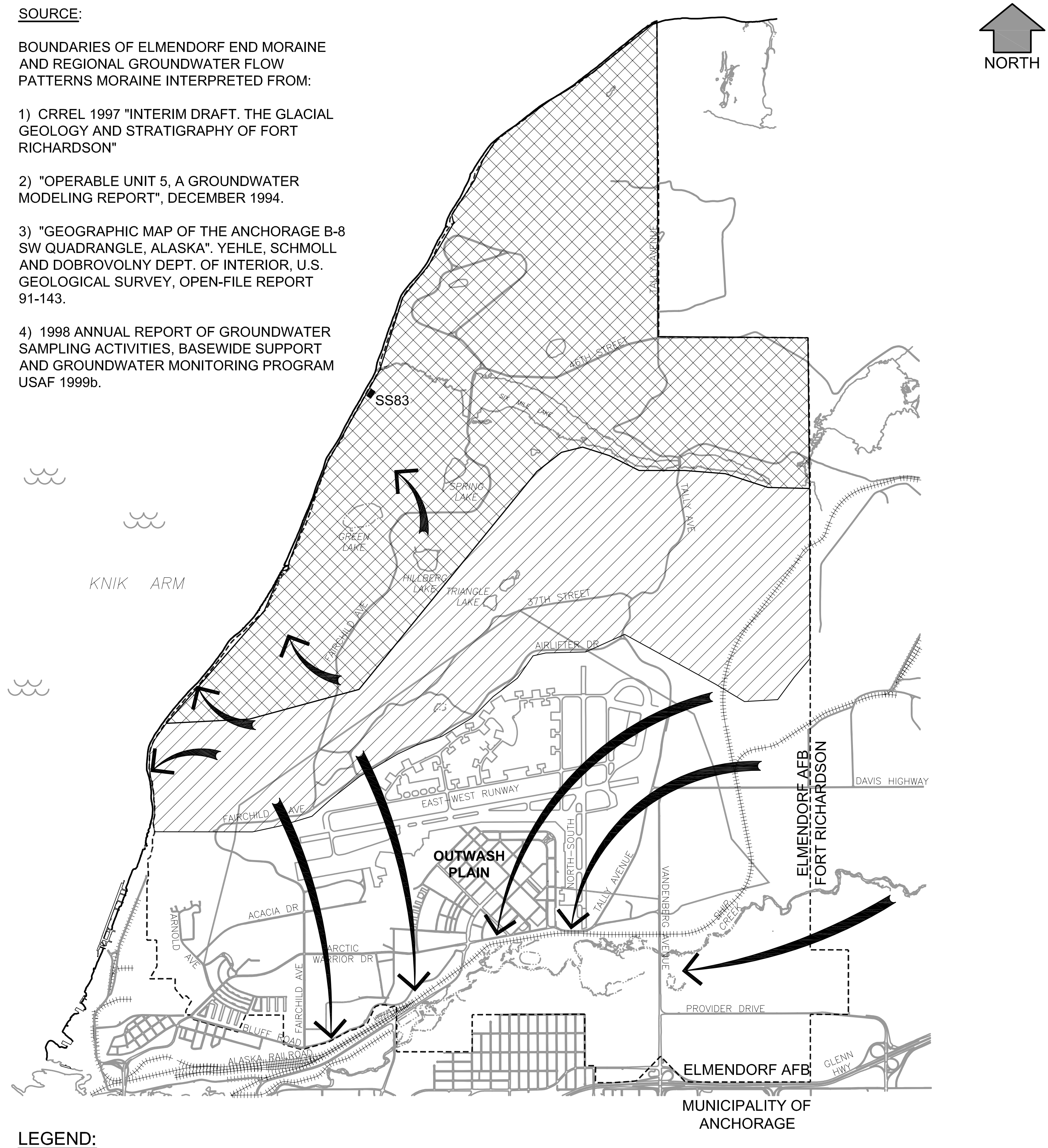
BOUNDARIES OF ELMENDORF END MORAINE AND REGIONAL GROUNDWATER FLOW PATTERNS MORAINE INTERPRETED FROM:

1) CRREL 1997 "INTERIM DRAFT. THE GLACIAL GEOLOGY AND STRATIGRAPHY OF FORT RICHARDSON"

2) "OPERABLE UNIT 5, A GROUNDWATER MODELING REPORT", DECEMBER 1994.

3) "GEOGRAPHIC MAP OF THE ANCHORAGE B-8 SW QUADRANGLE, ALASKA". YEHLE, SCHMOLL AND DOBROVOLNY DEPT. OF INTERIOR, U.S. GEOLOGICAL SURVEY, OPEN-FILE REPORT 91-143.

4) 1998 ANNUAL REPORT OF GROUNDWATER SAMPLING ACTIVITIES, BASEWIDE SUPPORT AND GROUNDWATER MONITORING PROGRAM USAF 1999b.



LEGEND:

ELMENDORF GROUND MORAINE

APPROXIMATE LOCATION OF ELMENDORF END MORAINE

ELMENDORF AIR FORCE BASE BOUNDARY

GENERAL GROUNDWATER FLOW DIRECTION

0 2500 5000 10000

SCALE IN FEET

REGIONAL GROUNDWATER FLOW PATTERNS

ELMENDORF AFB, ALASKA

PROJECT MANAGER:	FILE NAME:	DATE:
T. Tompkins	Groundwater Flow.dwg	July 29, 04
	LAYOUT TAB: Groundwater Flow	FIGURE NO.: 1-3
JE DRAWN BY: BJP	FILE LOCATION: Elmendorf \ 05Z02101 \ 2004 WP	

G:\Autocad\Elmendorf\05Z02101\2004 WP\Groundwater Flow.dwg Jul 29,2004 -BPeratro high relative permeability (USGS 1976). These soils are typical of moraine deposits and include a mix of clay, sand, silt, and gravel.

Naptowne till is discontinuous along the bluff of Knik Arm, where stratified sand and gravel extends from the Bootlegger Cove clay to the ground surface. At the SS83, the Bootlegger Cove clay is overlain by approximately 18 to 35 feet of till. Some of this material is advance outwash deposited in front of the advancing Wisconsin Glacier (USGS 1959). Boring logs and test pit logs from the SS83 EE/CA field investigation confirm the presence of stratified sand and gravel advance outwash deposits directly overlying the Bootlegger Cove clay.

West of the site, morainal sediments outcrop along a steep escarpment (bluff) overlooking Knik Arm. This escarpment was caused by the rebound of the ground surface after glacial retreat and erosion of the moraine from glacial melt-water. At the base of the escarpment, a sandy beach horizon has developed. The beach horizon is composed primarily of well-sorted littoral sands, as the tidal range of the Knik Arm periodically covers the entire beach.

1.3.4 Hydrogeology

The Elmendorf terminal (end) moraine traverses Elmendorf AFB northeast to southwest (Figure 1-3). A groundwater divide closely matches the crest of the terminal moraine. SS83 is located north of the moraine and groundwater in this area generally flows west, toward Knik Arm (USAF 1999a).

Two aquifers have been identified in the SS83 investigative area: a shallow unconfined system and a deep confined system. The presence of the shallow aquifer is based on lithologic data collected from borings and test pits, as well as water-level data collected from the shallow water table monitoring wells installed during the EE/CA field investigation. The shallow, unconfined aquifer beneath the SS83 site occurs in stratified sand and gravel advance outwash deposits from the Naptowne glaciation. The Bootlegger Cove clay forms an aquaclude between the shallow and deep aquifers. Groundwater in the unconfined shallow aquifer occurs between 11 and 32 feet below ground surface (bgs) and flows northwesterly, toward the bluff, as shown on Figure 1-3. Discharge of the unconfined aquifer can be observed along the bluff west of the SS83 investigative area, where numerous groundwater seeps occur at the contact between the overlying advance outwash deposits and the Bootlegger Cove clay. The shallow groundwater discharge from the bluff's side appears to be contiguous with the groundwater in the western portion of the outwash plain.

1.3.5 Surrounding Land Use

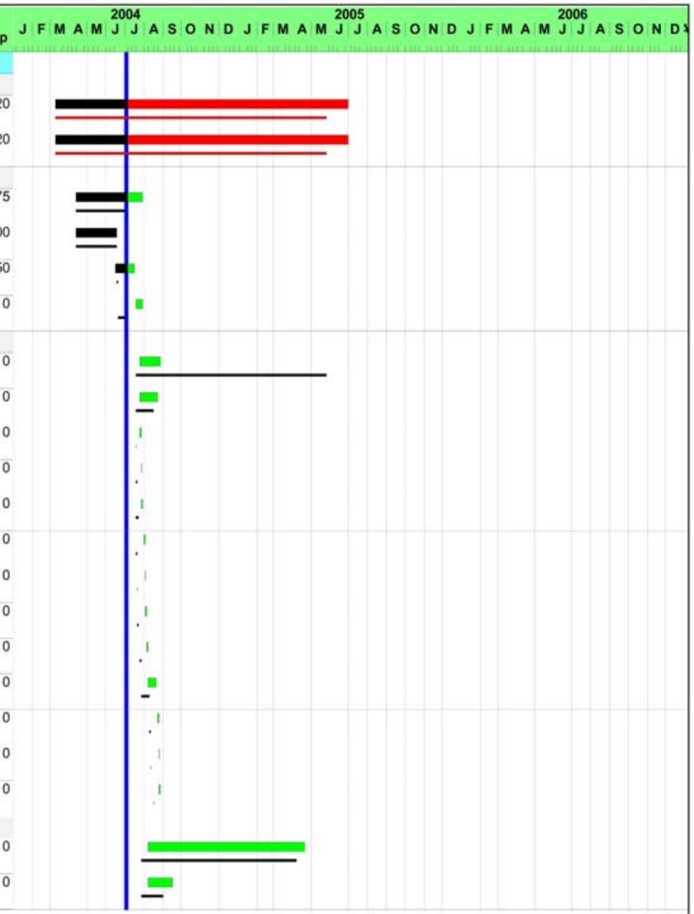
The current land use designation for the SS83 site is industrial. According to the Elmendorf AFB *Management Action Plan* (USAF 1996), the future projected land use will not be different from the current land use. The area north of the site, toward Six Mile Creek, is designated open space and is used for outdoor recreation.

2.0 BASELINE SCHEDULE

A baseline project schedule is provided as Figure 2-1. This schedule is subject to change as the project develops.

Figure 2-1 Project Schedule

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	% Comp
TO 02 - ElmendorfSS83						
Task 1 - Meeting and Planning						
A20100	Task 1 - Meetings and Planning	312	248	09MAR04A	30JUN05	20
A20101	Meetings and Planning as Required	312	248	09MAR04A	30JUN05	20
Task 2- Quality Control Plans						
A20200QCP	Task 2 - Quality Control Plans	75*	18*	12APR04A	29JUL04	75
A20201QCP	Prepare Draft Plans	32	0	12APR04A	16JUN04A	100
A20202QCP	Government and Agency Reviews	20	9	16JUN04A	16JUL04	50
A20203QCP	Prepare Final Plans	9	9	19JUL04	29JUL04	0
Task 3 - Field Work						
A20300FLD	Task 3 - Field Work	24*	24*	26JUL04	26AUG04	0
A20300HOS	Home Office Field Support	21	21	26JUL04*	23AUG04	0
A20301FLD	Mobilization	1	1	26JUL04*	26JUL04	0
A20301MPA	Motor Pool Area Excavation	1	1	27JUL04	27JUL04	0
A20301WAB	Well Abandonment	3	3	28JUL04	30JUL04	0
A20302FLD	Remove 500 gal UST and Excavate Site	1	1	02AUG04	02AUG04	0
A20303FLD	Remove 1,000 gal UST and Excavate Site	1	1	03AUG04	03AUG04	0
A20304FLD	Excavate 4 other sites and Collect Samples	2	2	04AUG04	05AUG04	0
A20305FLD	Investigate and Remove Drain Pipe	1	1	06AUG04	06AUG04	0
A20306FLD	Wait for Analytical Results and Evaluate	10	10	09AUG04	20AUG04	0
A20307FLD	Backfill Excavations	2	2	23AUG04	24AUG04	0
A20308FLD	Topsoil and Seed	1	1	25AUG04	25AUG04	0
A20309FLD	Demobilization	1	1	26AUG04	26AUG04	0
Task 4 - Technical Reports						
A20400RPT	Task 4 - Technical Reports	174*	174*	09AUG04	19APR05	0
A20401RPT	Wait for Final Data Package	26	26	09AUG04	15SEP04	0



Start Date	01MAR04
Finish Date	30JUN05
Data Date	03JUL04
Run Date	29JUL04 09:25

Early Bar
Target Bar
Progress Bar
Critical Activity

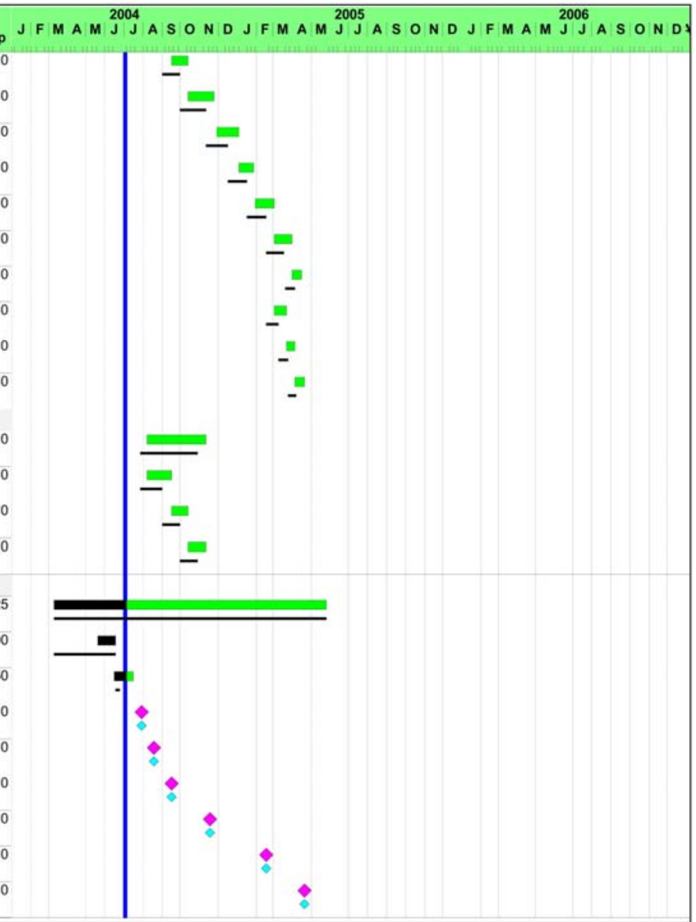
0604 - A201

AFCEE WERC TO # 2
Elmendorf SS83

Figure 2-1 Project Schedule

(continued)

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	% Comp
A20402RPT	Complete Data Evaluation	20	20	16SEP04	13OCT04	0
A20403RPT	Prepare Draft Report	30	30	14OCT04	24NOV04	0
A20404RPT	Government Review Report	22	22	30NOV04	03JAN05	0
A20405RPT	Prepare Final Report	19	19	04JAN05	28JAN05	0
A20406RPT	Prepare Draft Closure Report	22	22	31JAN05	01MAR05	0
A20407RPT	Government Review Closure Report	22	22	02MAR05	31MAR05	0
A20408RPT	Prepare Final Closure Report	11	11	01APR05	15APR05	0
A20409RPT	Prepare Fact Sheet	15	15	02MAR05	22MAR05	0
A20410RPT	Government Review Fact Sheet	10	10	23MAR05	05APR05	0
A20411RPT	Prepare Final Fact Sheet	10	10	06APR05	19APR05	0
Task 5 - Data Management						
A20500DTA	Task 5 - Data Management	66*	66*	09AUG04	10NOV04	0
A20501DTA	Wait for Analytical Data	26	26	09AUG04	15SEP04	0
A20502DTA	Complete Data Evaluation	20	20	16SEP04	13OCT04	0
A20503DTA	Complete ERPIMS Deliverables	20	20	14OCT04	10NOV04	0
Task 6 - Task Order Management						
A20600TOM	Task 6 Task Order Management	313	225	09MAR04A	26MAY05	25
A20601PPC	Submit Initial Project Planning Chart	17	0		16JUN04A	100
A20602PPC	Government Review PPC	5	9	16JUN04A	16JUL04	50
A20603MR1	CPSMR June 04	0	0		28JUL04*	0
A20603MR2	CPSMR July 04	0	0		18AUG04*	0
A20603MR3	CPSMR August 04	0	0		15SEP04*	0
A20603MR4	CPSMR October 05	0	0		17NOV04*	0
A20603MR5	CPSMR January 05	0	0		16FEB05*	0
A20603MR6	CPSMR March 05 (Final)	0	0		20APR05*	0



Start Date	01MAR04
Finish Date	30JUN05
Data Date	03JUL04
Run Date	29JUL04 09:25

Early Bar
Target Bar
Progress Bar
Critical Activity

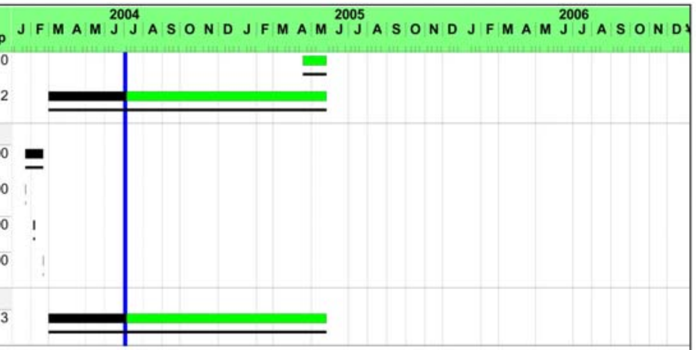
0604 - A201

AFCEE WERC TO # 2
Elmendorf SS83

Figure 2-1 Project Schedule

(continued)

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	% Comp
A20604CLS	Project Close Out	29	29	18APR05	26MAY05*	0
A20605POP	Period of Performance	311	225	02MAR04A	26MAY05	12
Task 7 - Proposal Preparation						
A20001	Task 7 - Proposal Preparation	21*	0*	23JAN04A	20FEB04A	100
A20002	Submit Draft Proposal	1	0	23JAN04A	23JAN04A	100
A20003	Conduct and Conclude Negotiations	1	0	06FEB04A	06FEB04A	100
A20004	Task Order Award	1	0	20FEB04A	20FEB04A	100
Task Z - Fees						
A2FFEE	Task Z - Fees	311	225	02MAR04A	26MAY05	13



Start Date	01MAR04	Early Bar	0604 - A201
Finish Date	30JUN05	Target Bar	AFCEE WERC TO # 2
Data Date	03JUL04	Progress Bar	Elmendorf SS83
Run Date	29JUL04 09:25	Critical Activity	

3.0 CLEANUP LEVELS

Table 3-1 presents the cleanup levels for the SS83 site for soil values based on the 2000 EE/CA, and the 2003 Decision Document.

Table 3-1
SS83 EE/CA Site Cleanup Levels

Analyte	ADEC 18 AAC 75 Tables B1 & B2 Soil Cleanup Levels[1]
	(mg/kg)
Petroleum Hydrocarbons	
Diesel Range Organics	250
Residual Range Organics	11,000
BTEXs	
Benzene	0.02

Notes:

[1] Cleanup levels are those that were determined during the 2000 EE/CA, and are presented in the 2003 Decision Document.

mg/kg = milligrams per kilograms or parts per million

(intentionally blank)

4.0 DETAILED FIELD INVESTIGATION APPROACH

Six areas at the SS83 site are scheduled for soil excavation and treatment during the 2004 field season. The excavation boundaries will be determined in the field using PetroFLAG field screening kits, and verified by a fixed analytical laboratory. In addition to the excavations, two USTs will be removed, and a drainpipe will be investigated and possibly removed from the Large Foundation Area. The UST excavations and drainpipe excavation will follow the same sampling protocol as the other excavations. Four monitoring wells (BBAWL01, LOPWL01, LOPWL02, and SFAWL03) will be decommissioned by over-drilling and grouting in order to remove all POL-impacted soil.

Excavating will begin at the Motor Pool Area, determined during the 2000 EE/CA to be the area exhibiting the highest levels of contamination. Excavated soil will be placed directly into a dumptruck for shipment to the thermal treatment facility. If clean overburden appears to be present, it will be screened using the PetroFLAG kit; if screening results indicate that the soil is not contaminated it will be left onsite pending analytical results. If analytical results indicate the soil is below site cleanup limits, it will be used as backfill. If results are above site cleanup limits the soil will be shipped offsite for treatment. Upon completion of the excavations, any waste concrete from foundations removed during excavation will be placed at the bottom of the excavations as backfill, followed by gravel from the borrow pit located at the corner of Talley Avenue and the Davis Highway (Figure 1-1). The excavation's top 6 inches will be covered with clean topsoil, and reseeded.

4.1 GENERAL SITE ACTIVITIES

4.1.1 UXO Awareness Training

The potential exists at SS83 for the presence of unexploded ordnance (UXO). All Jacobs Engineering Group Inc. and subcontractor field personnel will receive UXO and chemical warfare material awareness training, to be provided by the USAF, prior to commencement of fieldwork. UXO is not anticipated to be present at the site; however, any UXO discovered during field activities shall be reported immediately to the Base Point of Contact and Contracting Officer Representative. Elmendorf Explosive Ordnance Disposal (EOD) will respond to inspect and remove suspicious items if necessary. EOD response will be expedited to prevent delays in fieldwork. Work shall not recommence until the Contracting Officer authorizes clearance.

4.1.2 Utility Locates

The estimated location of any overhead or underground utility installations shall be determined prior to the commencement of any excavation activities via Elmendorf AFB's Base Civil Engineer Work Clearance Request. Utility clearances shall be signed off by Elmendorf AFB personnel. All intrusive work shall comply with HSP requirements and procedures.

4.2 AREA-SPECIFIC DESCRIPTIONS

This section presents brief descriptions of each SS83 area scheduled for work under this scope.

4.2.1 Drum Bunker Area

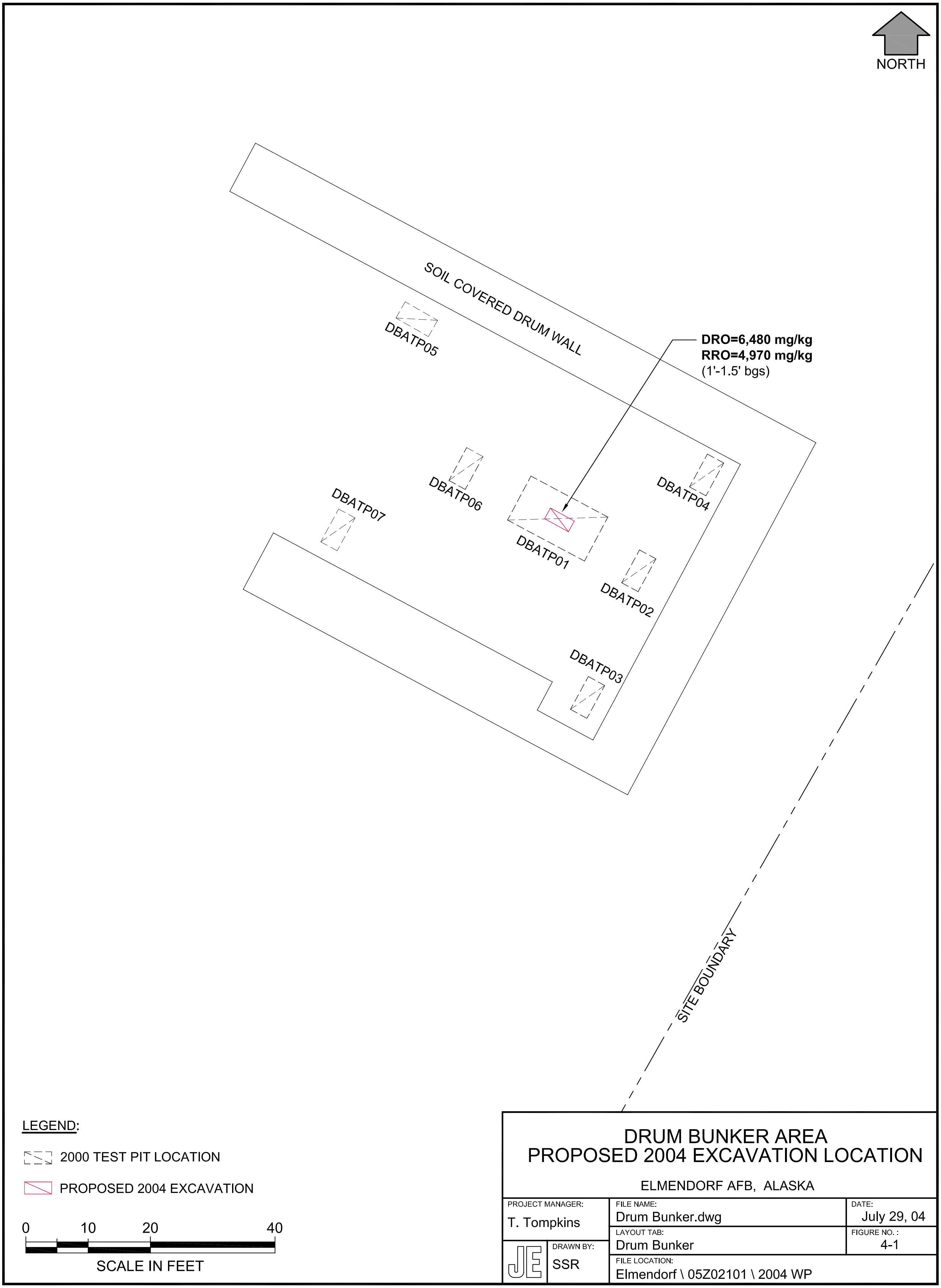
The Drum Bunker Area is located within the southeastern portion of the site on top of a small hill (see Figure 1-2). This “U” shaped structure consists primarily of soil berms and soil-filled drum walls, and was likely a gun emplacement (see Figure 4-1).

As indicated in Table 4-1, there is an estimated 5 cubic yards of POL-contaminated soil to be removed from DBATP01. Excavation confirmation samples will be collected and analyzed for diesel-range organics (DRO)/residual-range organics (RRO), and polycyclic aromatic hydrocarbons (PAHs) (see Table 4-2). Specific soil excavation and sampling field procedures are provided in Part 1, SAP, of the QPP.

Table 4-1
2004 Field Activities by Area

Area	Estimated Amount of Soil to be Excavated (cy)	Estimated Maximum Depth of Excavation (ft bgs)	Concrete Pad (ft^2)	Other Activities
Drum Bunker Area	5	15	N/A	N/A
Large Foundation Area	25	15	2,000	Possible removal of drainpipe (and an additional 10 cy of soil) and removal of 2 USTs
Motor Pool Area	10	17	1,700	N/A
Small Foundation Area	20	15	400	N/A
Bermed Bunker Area	20	15	400	N/A
Lookout Pad	20	10	300	N/A

Note:
Groundwater surface is estimated to be encountered at a depth of 17 feet bgs at the SS83 site.
cy = cubic yards
ft^2 = square feet
NA = not applicable
For additional definitions, see acronyms and abbreviations list.



G:\Autocad\Elmendorf\05Z02101\2004 WP\Drum Bunker.dwg Jul 29,2004 -BPeratro)

Table 4-2
2004 Analytical Samples

Analyte	Method	Number of Samples	Turn-Around Time
Excavation Confirmation Samples (Number of Samples per Excavation)[1]			
GRO	AK101	3	7 days
DRO/RRO	AK102/103	3	7 days
BTEX	SW8260B	3	7 days
PAHs	SW8270C	3	7 days
UST Confirmation Samples (Number of Samples per UST Excavation)			
GRO	AK101	2	7 days
DRO/RRO	AK102/103	2	7 days
BTEX	SW8260B	2	7 days
PAHs	SW8270C	2	7 days
Drain Pipe Characterization Samples (Total Number of Samples for Excavated Soil)[2]			
GRO	AK101	2	7 days
DRO/RRO	AK102/103	2	7 days
VOCs	SW8260B (medium level)	2	7 days
VOCs	SW8260B (low level)	2	7 days
SVOCs	SW8270C	2	7 days
8 RCRA Metals	SW6020/SW7471A	2	7 days
PCBs	SW8082	2	7 days
TCLP 8 RCRA Metals	SW1311/SW6010B/ SW7470A	1	7 days
Drain Pipe Confirmation Samples (Total Number of Samples for Trench)[2]			
GRO	AK101	5	7 days
DRO/RRO	AK102/103	5	7 days
VOCs	SW8260B (medium level)	5	7 days
VOCs	SW8260B (low level)	5	7 days
SVOCs	SW8270C	5	7 days
PAHs	SW8270C	5	7 days
8 RCRA Metals	SW6020/SW7471A	5	7 days
PCBs	SW8082	5	7 days
Clean Soil Stockpile Samples (Total Number of Samples)[3]			
DRO/RRO	AK102/103	4	7 days
PAHS	SW8270C	4	7 days

Table 4-2
2004 Analytical Samples
(continued)

Analyte	Method	Number of Samples	Turn-Around Time
Drain Pipe Decontamination Water (Total Number of Samples)			
Metals (RCRA Suite) (aqueous)	SW6020/SW7470A	1	7 days
VOCs (aqueous)	SW8260B	1	7 days
PCBs (aqueous)	SW8082	1	7 days

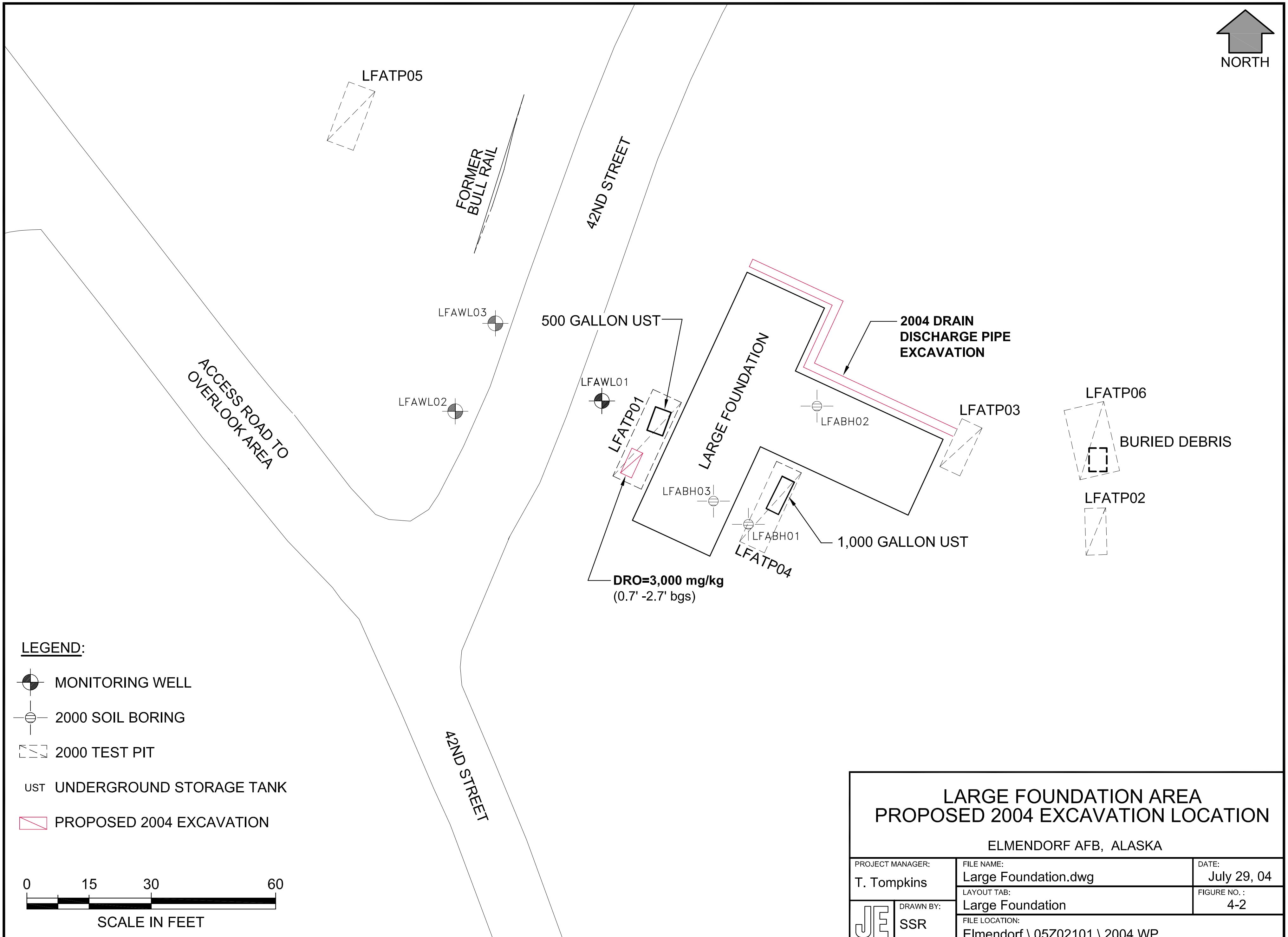
Notes:
[1]GRO and BTEX will only be analyzed at the Motor Pool Area (BTEX was found in analytical samples here during the 2000 EE/CA above cleanup levels).
[2]Samples will be sent to the laboratory for both low-level and medium-level VOC analysis, as it is unknown what concentration (if any) of VOCs will be present in the samples.
[3] It is estimated that there will only be clean stockpiles (overburden) at the Bermed Bunker Area, the small Foundation Area, and the UST and drainpipe excavations at the Large Foundation Area, as the other areas are believed to contain petroleum-impacted soil near the surface.
PCB = polychlorinated biphenyl
RCRA = Resource Conservation and Recovery Act
SVOC = semivolatile organic compound
TCLP = toxicity characteristic leaching procedure
VOC = volatile organic compound
For additional definitions, see acronyms and abbreviations list.

4.2.2 Large Foundation Area

The Large Foundation Area is located to the east of 42nd Street (formerly Mountain Road) at the eastern extent of the SS83 site (see Figure 1-2). The area consists of a concrete pad approximately 2,000 square feet in area (see Figure 4-2). This is the site of a former building suspected to have housed several transformers and a transformer maintenance area (USAF 1999b). Based on other AAA site designs and site observations at SS83, this building more likely served as the AAA Battery Headquarters building (USAF 2002).

As indicated in Table 4-1, there is an estimated 25 cubic yards of POL-contaminated soil to be removed from LFATP01. A 2,000 square foot concrete pad may require partial or complete removal in order to reach all of the POL-impacted soil. Excavation confirmation samples will be collected and analyzed for DRO/RRO and PAHs.

Two USTs, one 500-gallon (Tank 1) and one 1,000-gallon UST (Tank 2), (with all associated piping) will be removed from the Large Foundation Area. As stated in the 2000 EE/CA, it is believed that the two USTs located at the Large Foundation Area contained diesel fuel, as was indicated by analytical samples collected from the tanks. UST confirmation sample procedures will follow ADEC's *Underground Storage Tanks Procedures Manual* (ADEC 2002) as referenced in 18 AAC 75.355(d), with the exception that PetroFLAG screening will be used in place of photoionization detector screening, which is generally not accurate for diesel fuel. Therefore, confirmation samples will be analyzed for gasoline-range organics (GRO); DRO/RRO; benzene, toluene, ethylbenzene and xylenes (BTEX); and PAHs. Analytical samples will be collected from the two areas exhibiting the highest PetroFLAG readings at each UST. Table 4-2 contains a summary of the proposed UST confirmation samples.



LARGE FOUNDATION AREA
PROPOSED 2004 EXCAVATION LOCATION

ELMENDORF AFB, ALASKA

PROJECT MANAGER: T. Tompkins	FILE NAME: Large Foundation.dwg	DATE: July 29, 04
	LAYOUT TAB: Large Foundation	FIGURE NO.: 4-2
JE — DRAWN BY: SSR	FILE LOCATION: Elmendorf \ 05Z02101 \ 2004 WP	

Tank 1 is 6.2 feet long, 4.0 feet in diameter, and fabricated of single-walled steel. The tank was determined to have been nearly full, containing a fuel/water mixture of approximately 325 gallons of fuel and 150 gallons of water. A 0.15-foot diameter fill pipe extended from the tank to the northeast and terminated at the south side of the presumed location of the former building's man door. Copper feed lines and a vent pipe were present but were not connected to Tank 1; they were possibly disturbed during excavations carried out during the 2000 EE/CA.

Tank 2 is a steel UST measuring 12 feet long and 3.3 feet in diameter. The top of Tank 2 is located 1 to 1.5 feet bgs and contained approximately 25 gallons of fuel and 200 gallons of water. A 0.15-foot diameter fill- or vent-pipe extended from the edge of the foundation southwest to the UST. Copper feed lines and a vent pipe were present but were not connected to Tank 2. As with Tank 1, these may have been disturbed during the 2000 EE/CA field investigation.

The contents of both tanks were removed and properly disposed of during the 2000 EE/CA field effort. At the end of the field investigation, the tanks were covered with Visqueen and clean fill, and were left in place for future closure.

All piping and ancillary equipment are anticipated to be removed and the soil surrounding the USTs excavated, field screened, sampled and transported off base for treatment as described in the SAP, down to approximately 15 feet bgs or until groundwater is encountered (whichever comes first). During the 2000 EE/CA, petroleum-impacted soils were encountered at depths ranging from 2 to 17 feet bgs. Piping associated with the two USTs is anticipated to be minimal, as it is believed they serviced only the adjacent building.

As recommended in the 2000 EE/CA, an exploratory trench will be dug along the northern edge of the Large Foundation Area concrete foundation to a depth of 5 feet bgs to determine whether a floor drain discharge pipe extends from the side of the former building. If a pipe is encountered, it will be removed and the trench beneath the pipe screened for contamination using a PetroFLAG kit. Up to 10 cubic yards of soil may be excavated and placed in supersacks as part of this effort. It is unknown what the suspected drainpipe may have contained; therefore, the samples will be analyzed for GRO; DRO/RRO; PAH, volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs); 8 Resource Conservation Recovery Act (RCRA) metals (As, Se, Ba, Cd, Cr, Ag, Hg, Pb); and polychlorinated biphenyls (PCBs). The samples will also be analyzed for toxicity characteristic leaching procedure 8 RCRA metals only if metals are detected in the 8 RCRA metals samples at concentrations above the levels listed in Table 3-1. Upon removal of the suspected drainpipe, confirmation samples will be analyzed for GRO, DRO/RRO, VOCs, SVOCs, PAHs, 8 RCRA metals, and PCBs (refer to Table 4-2 for a listing of all analytical samples) if characterization samples indicate any of these compounds are present.

If encountered, the pipe will be dry-decontaminated on-site and further decontaminated at the Elmendorf Environmental Staging Facility by rinsing with potable water, scrubbing with an Alconox solution, and rinsing once more using potable water.

If no pipe is encountered, the exploratory trench will be backfilled with the excavated material and reseeded.

4.2.3 Motor Pool Area

The Motor Pool Area is located north of the Large Foundation Area on the west side of 42nd Street (formerly Mountain Road) (see Figure 1-2). This area consists of a concrete pad approximately 1,700 square feet in area with a mechanics pit located in the west end of the pad. The pit is approximately 4 feet wide and 12 feet long and contained soil mixed with old and new oil filters, rags, roots, and other debris (USAF 2002) (see Figure 4-3).

As indicated in Table 4-1, there is an estimated 10 cubic yards of POL-contaminated soil to be removed from MPATP01. The 1,700 square foot concrete pad may need to be partially or entirely removed in order to reach all of the POL-impacted soil. Excavation confirmation samples will be collected and analyzed for GRO, DRO/RRO, BTEX, and PAHs (see Table 4-2).

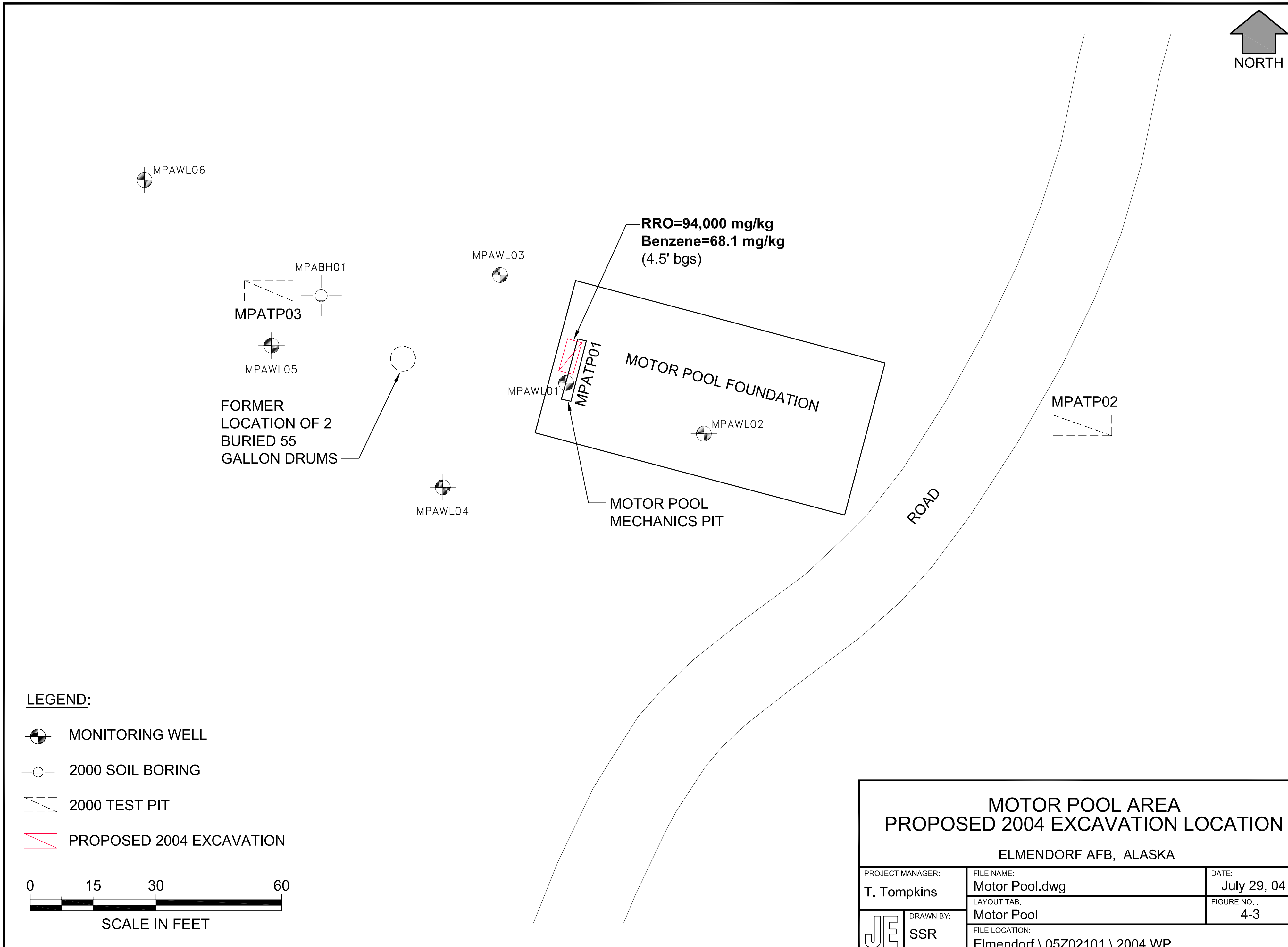
4.2.4 Small Foundation Area

The Small Foundation Area is located to the west of the Bermed Bunker Area (see Figure 1-2) and consists of a concrete pad approximately 400 square feet in area (see Figure 4-4). This location was thought to be a former generator or transformer pad (USAF 2002).

As shown in Table 4-1, there is an estimated 20 cubic yards of POL-contaminated soil to be removed from SFATP01. Excavation confirmation samples will be collected and analyzed for DRO/RRO and PAHs (refer to Table 4-2).

4.2.5 Bermed Bunker Area

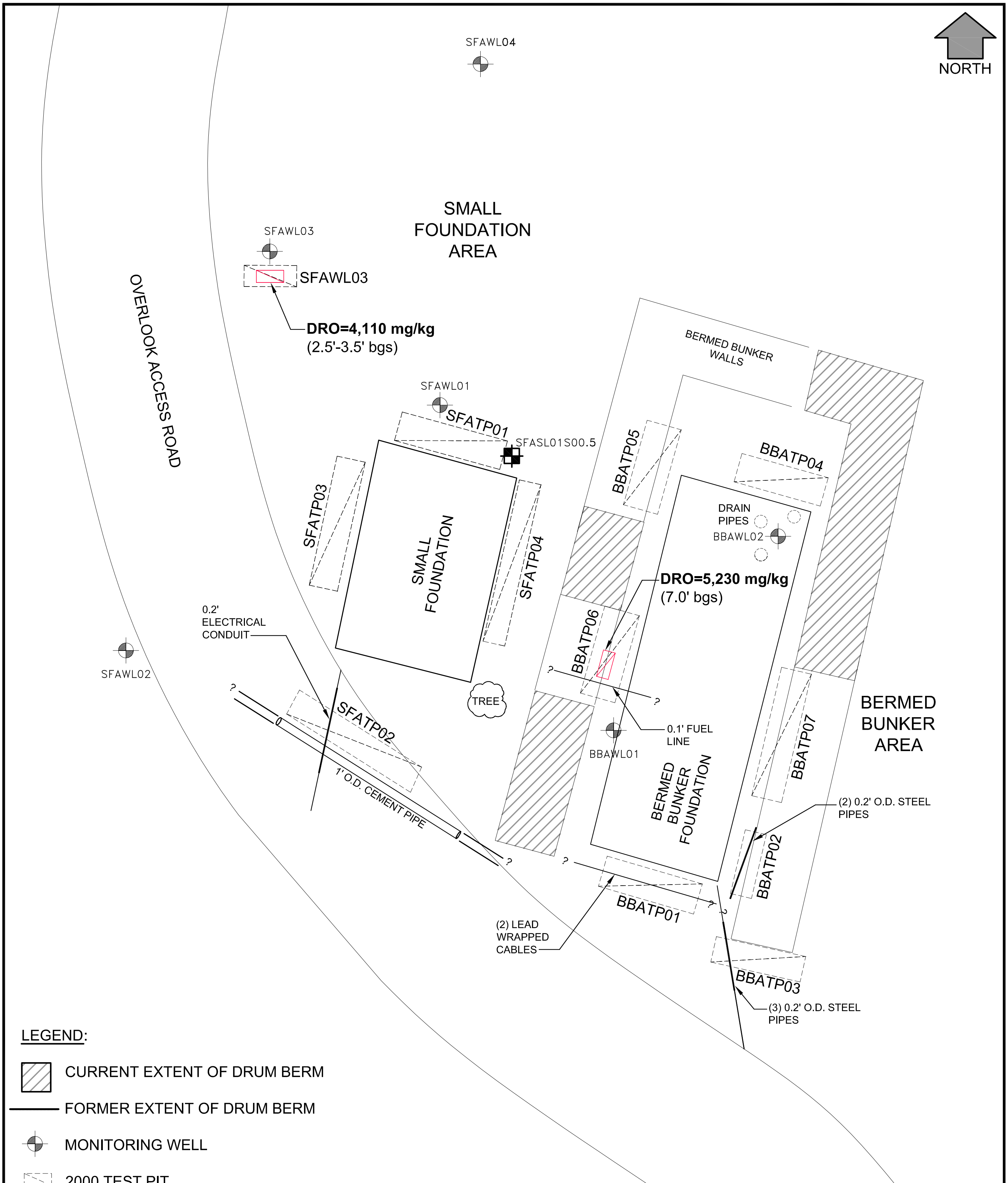
The Bermed Bunker Area consists of a 400 square foot concrete pad originally surrounded on three sides by stacked, soil-filled drums (see Figure 4-4). This area is located between the Motor Pool and the Small Foundation Area north of the overlook area access road (see Figure 1-2). The drums apparently were used as a splinter-proof retaining wall. A 6-foot-high soil berm forms the outside of the drum wall. The purpose of the Bermed Bunker Area is not known. Possible former uses for this area include POL storage, ordnance shop, generator power plant, transformer maintenance, and/or other storage/maintenance activities. The origin of the 55-gallon drums as well as the origin of materials used to fill the 55-gallon drums are not known.



MOTOR POOL AREA
PROPOSED 2004 EXCAVATION LOCATION

ELMENDORF AFB, ALASKA

PROJECT MANAGER: T. Tompkins	FILE NAME: Motor Pool.dwg	DATE: July 29, 04
	LAYOUT TAB: Motor Pool	FIGURE NO.: 4-3
JE — DRAWN BY: SSR	FILE LOCATION: Elmendorf \ 05Z02101 \ 2004 WP	



G:\Autocad\Elmendorf\05Z02101\2004 WP\Small Foundation.dwg Jul 29,2004 -BPeratro)

SMALL FOUNDATION AREA AND BERMED BUNKER AREA
PROPOSED 2004 EXCAVATION LOCATIONS
ELMENDORF AFB, ALASKA

PROJECT MANAGER:	FILE NAME:	DATE:
T. Tompkins	Small Foundation.dwg	July 29, 04
	LAYOUT TAB: Small Foundation	FIGURE NO. : 4-4
JE — DRAWN BY: SSR	FILE LOCATION: Elmendorf \ 05Z02101 \ 2004 WP	

As presented in Table 4-1, there is an estimated 20 cubic yards of POL-contaminated soil to be removed from BBATP06. A 400 square foot concrete pad may need to be removed partially or in its entirety in order to reach all of the POL-impacted soil. Excavation confirmation samples will be collected and analyzed for DRO/RRO and PAHs (see Table 4-2).

4.2.6 Lookout Pad Area

The Lookout Pad Area is located along the bluff approximately 50 feet west of the Docking Area (see Figure 1-2). A 17-by-18-foot concrete pad is present at this location (see Figure 4-5).

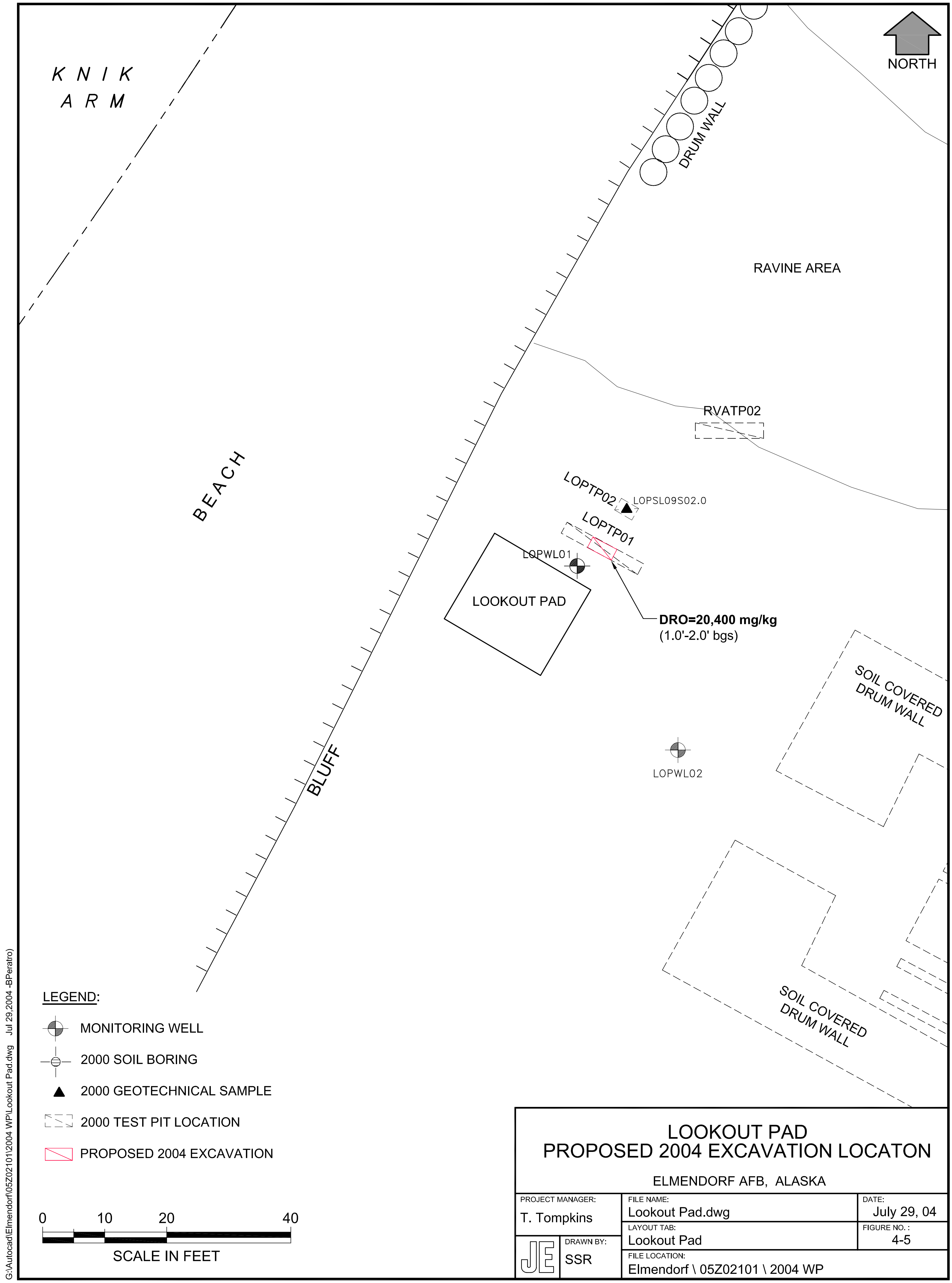
As presented in Table 4-1, there is an estimated 20 cubic yards of POL-contaminated soil to be removed from LOPTP01. A 300 square foot concrete pad may need to be removed partially or in its entirety in order to reach all of the POL-impacted soil. Excavation confirmation samples will be collected and analyzed for DRO/RRO and PAHs (refer to Table 4-2).

4.3 DEMOBILIZATION

All equipment will be dry-decontaminated before being removed from the site. When work is completed, all earth-moving equipment will be taken to the Environmental Staging Facility on Elmendorf AFB and cleaned with a potable water rise, scrubbed with an Alconox-water solution, and thoroughly rinsed. All field trash will be removed from the site and properly disposed of.

4.4 SITE RESTORATION

All excavated areas within the SS83 site will be covered with 6 inches of topsoil, compacted with the excavator, and reseeded to prevent erosion.


K N I K
A R M
NORTH
DRUM WALL
RAVINE AREA
BEACH
BLUFF
RVATP02
LOPTP02
LOPSL09S02.0
LOPTP01
LOPWL01
LOOKOUT PAD
DRO=20,400 mg/kg
(1.0'-2.0' bgs)
SOIL COVERED
DRUM WALL
LOPWL02
SOIL COVERED
DRUM WALL
LEGEND:
MONITORING WELL
2000 SOIL BORING
2000 GEOTECHNICAL SAMPLE
2000 TEST PIT LOCATION
PROPOSED 2004 EXCAVATION
0
10
20
40
SCALE IN FEET
G:\Autocad\Elmendorf\05Z02101\2004 WP\Lookout Pad.dwg Jul 29,2004 -BPeratro)
LOOKOUT PAD
PROPOSED 2004 EXCAVATION LOCATON
ELMENDORF AFB, ALASKA
PROJECT MANAGER:
T. Tompkins
FILE NAME:
Lookout Pad.dwg
DATE:
July 29, 04
LAYOUT TAB:
Lookout Pad
FIGURE NO. :
4-5
DRAWN BY:
SSR
FILE LOCATION:
Elmendorf \ 05Z02101 \ 2004 WP

5.0 REPORTING

Separate Site Project Summary and Closure Reports will be submitted to document the SS83 site removal actions. The documents will include a summary of field activities, analytical data, and recommendations and conclusions. An environmental monitoring report will also be included. An Environmental Resources Program Information Management System deliverable as well as a fact sheet are also scheduled for submittal.

(intentionally blank)

6.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2003. Decision Document for Six Areas with Petroleum Contamination within Former Anti-Aircraft Artillery Battery, Site SS83, Elmendorf AFB, AK.

ADEC. 2002. *Underground Storage Tanks Procedures Manual.*

USAED-AK (U.S. Army Engineer District-Alaska). 1994 (August). *The Cold War in Alaska: A Management Plan for Cultural Resources, 1994-1999.*

USAF (U.S. Air Force). 2002 (February). *Engineering Evaluation/Cost Analysis SS83.* Elmendorf Air Force Base, Alaska. Environmental Restoration Program. Final.

______. 2001 (January). Alaska Weather Operations Center, 11th Operational Weather Squadron, USAF, Elmendorf AFB, AK. http://www.wrcc.dri.edu/cgi-bincliRECtM.pl?akelme

______. 1999a (June). *1998 Annual Report of Groundwater Sampling Activities*, Basewide Support and Groundwater Monitoring Program. Environmental Restoration Program.

______. 1999b (March). *Preliminary Assessment/Site Investigation Report: Limited Field Investigation.* Environmental Restoration Program.

______. 1997 (January). "Area Under Evaluation Informal Technical Information Report." Environmental Restoration Program.

______. 1996 (December). *Management Action Plan*. Environmental Restoration Program, Elmendorf AFB, Alaska. Revision No. 3. Final.

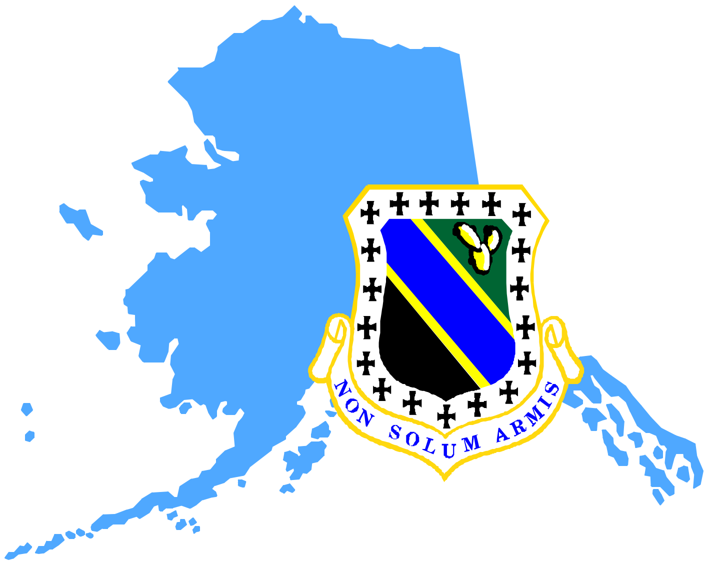
USGS (U.S. Geological Survey). 1976. "Relative Permeability of Surficial Geologic Materials, Anchorage and Vicinity, Alaska." 1:24,000. Prepared by G.W. Freethey. Folio I-787-F.

______. 1959. "Surficial Geology of Anchorage and Vicinity, Alaska." Geological Survey Bulletin 1093. Prepared by R.D. Miller and E. Dobrovolny.

USARAL (U.S. Army, Alaska). 1972 (July). "The U.S. Army in Alaska." USARAL Pamphlet No. 360-5.

USFWS (U.S. Fish and Wildlife Service, Special Studies). 1983. "Natural Resource Inventory of Elmendorf Air Force Base, Alaska." Prepared by T.C. Roth, S.H. Laninan, P.A. Martin, and G.F. Tande.

(intentionally blank)



UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SS83 REMOVAL ACTION WORK PLAN
APPENDIX A - SAMPLING AND ANALYSIS PLAN
PART 1 - FIELD SAMPLING PLAN

FINAL

JUNE 2004

TABLE OF CONTENTS

SECTION **PAGE**

ACRONYMS AND ABBREVIATIONS iii
1.0 INTRODUCTION 1-1
2.0 FIELD SAMPLING PLAN 2-1
2.1 EXCAVATION METHODS 2-1
2.2 CONCRETE FOUNDATION REMOVAL 2-3
2.3 FIELD SCREENING 2-3
2.4 SOIL SAMPLING 2-3
2.5 STOCKPILE CONSTRUCTION 2-6
2.6 EXPLORATORY EXCAVATION FOR SUSPECTED DRAINPIPE 2-6
2.7 UST REMOVAL AND EXCAVATIONS 2-7
2.8 SOIL SAMPLING FOR LABORATORY ANALYSIS 2-8
2.9 THERMAL TREATMENT 2-8
2.10 BACKFILLING 2-13
2.11 DEMOBILIZATION 2-13
2.12 SAMPLE LABELING, NUMBERING, CHAIN OF CUSTODY, STORAGE, AND TRANSPORTATION 2-13
2.12.1 Sample Labels 2-13
2.12.2 Field Sample Sheets and Logs 2-14
2.12.3 Sample Numbering 2-14
2.12.4 CoC Records 2-15
2.12.5 Sample Packaging and Shipping 2-15
2.13 SURVEYING 2-16
2.14 DECONTAMINATION 2-16
2.15 FIELD QA/QC 2-17
2.16 RECORD KEEPING 2-17
3.0 REFERENCES 3-1

TABLES

Table 2-1 2004 Field Activities by Area 2-2
Table 2-2 2004 Analytical Samples 2-4
Table 2-3 Duplicate Quality Control and Trip Blank Samples 2-9
Table 2-4 SS83 Drainpipe Cleanup Levels 2-10

TABLE OF CONTENTS
(continued)

ATTACHMENTS

Attachment 1 Field Forms

Attachment 2 Field Instrument Instructions (PetroFLAG)

ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
CoC	chain-of-custody
DRO	diesel-range organic
EE/CA	Engineering Evaluation/Cost Analysis
ESF	Environmental Staging Facility
FSP	field sampling plan
GPS	global positioning system
GRO	gasoline-range organic
IDW	Investigation Derived Waste
Jacobs	Jacobs Engineering Group Inc.
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
ppm	parts per million
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
SAP	Sampling and Analysis Plan
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
UST	underground storage tank
VOC	volatile organic compound
°C	degrees Centigrade

(intentionally blank)

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) is prepared to guide removal action field activities at SS83 on Elmendorf Air Force Base (AFB), Alaska, and is arranged as follows:

- Part One of the SAP is this Field Sampling Plan (FSP);
- Part Two is the Quality Assurance Project Plan (QAPP); and
- Part Three is the Investigation Derived Waste (IDW) Management Plan.

The SAP objectives are as follows:

- Establish guidelines for project field screening and sampling.
- Describe field screening methods.
- Describe project field procedures.
- Describe methods of collecting and documenting samples.
- Establish analytical methods, quantity, and sampling frequency and the frequency of quality assurance/quality control (QA/QC) samples.

(intentionally blank)

2.0 FIELD SAMPLING PLAN

The Field Sampling Plan (FSP) details the requirements and procedures for all fieldwork at SS83 and describes techniques that will be used to accomplish the scope of work for this project. The methods and procedures detailed in this FSP are consistent with Air Force Center for Environmental Excellence (AFCEE) guidance (AFCEE 1997).

Specific analytical methods for the analyses to be performed are presented in the QAPP, Part II of this SAP.

2.1 EXCAVATION METHODS

Six areas within the SS83 site are scheduled for soil excavation (see Table 2-1 in this FSP and Work Plan Figures 4-1 through 4-5). Excavation will be initiated at the location of highest historical contaminant concentrations within each area, as determined during the 2000 Engineering Evaluation/Cost Analysis (EE/CA) (USAF 2002) and will continue based on field screening. Visual observation and a PetroFLAG field-screening kit will be used to determine the required excavation limits.

The perimeter of each excavation and approximate sample locations will be surveyed using a global positioning system (GPS) unit and tied to local control points, such as existing monitoring wells. Excavations will be left open until confirmation sample results are received. All contaminated, soil will be transported to an approved facility for treatment and disposal. The excavator will be dry-decontaminated upon completion of each area.

All excavations will be performed by the civil subcontractor and must conform to applicable Occupational Safety and Health Administration health and safety requirements. It is not anticipated that any personnel will need to enter an excavation, with the possible exception of the excavation required to remove the suspected pipe from the Large Foundation Area. If personnel are required to enter an excavation that is 5 feet deep or deeper, the excavation will be sloped or benched at 1.5 to 1. If personnel are required to enter an excavation that is 4 feet deep or deeper, means of egress (ladders) will be provided. Prior to completion of work for the day, construction fencing will be placed at the edges of each excavation to prohibit entry. All material removed from the excavation will be placed a sufficient distance away from the edge of the excavation to eliminate the possibility of caving.

To the extent possible, all contaminated material will be loaded directly into a dump truck for shipment to Alaska Soil Recycling. If it is necessary to stockpile soil on site, the soil will be placed onto temporary liners. If the soil is not shipped off site before the end of the day, it will be covered with plastic sheeting (Visqueen) to prevent infiltration of rainwater. The soil will then be shipped off site at the beginning of the next workday.

Table 2-1
2004 Field Activities by Area

Area	Estimated Amount of Soil to be Excavated (cubic yards)	Estimated Maximum Depth of Excavation (feet)	Concrete Pad (square feet)	Other Activities
Drum Bunker Area	5	15	N/A	N/A
Large Foundation Area	25	15	2,000	Removal of 2 USTs and possible removal of drainpipe (and an additional 10 cy of soil)
Motor Pool Area	10	17	1,700	N/A
Small Foundation Area	20	15	400	N/A
Bermed Bunker Area	20	15	400	N/A
Lookout Pad	20	10	300	N/A

Notes:
Groundwater surface is estimated to be encountered at a depth of 17 feet bgs at the SS83 site.
cy = cubic yards
UST = underground storage tank

Any material that is not to be treated—such as the clean (based on screening results) overburden taken from the excavations—shall be placed on a temporary liner away from the work zone. Overburden that is determined to be clean using laboratory analysis will be used as backfill.

Excavations may exceed 15 feet in depth. Excavations are expected to continue laterally until all soil exceeding cleanup levels has been removed. Excavations will not be extended into any public right of way. Excavations will not proceed deeper than the water table surface. No excavation dewatering is expected.

All sampling of excavations shall be performed by Jacobs Engineering Group Inc. (Jacobs) personnel by using procedures described in Section 2.4. Field screening will be used to guide analytical sample locations.

Excavation records will be kept and maintained daily. Documentation will include locating screening samples, analytical samples, and excavation locations on a site figure each day. Soil removal volume estimates and the locations of soil placement will be recorded in a running log in the site logbook.

Once analytical results have been received that confirm that contaminant levels are below cleanup criteria (as listed in Work Plan Table 3-1), the excavation will be complete and may be backfilled. Table 2-1 presents a summary of field activities planned for 2004.

2.2 CONCRETE FOUNDATION REMOVAL

Some concrete foundations may need to be removed in order to access petroleum, oil and lubricants-impacted soil and underground storage tanks (USTs). Concrete foundations will only be removed if necessary to complete the excavations. The foundations are approximately 6 inches thick and will be broken into pieces using the excavator bucket or an excavator attachment. The resulting concrete pieces may be as large as 4 to 5 feet across. The concrete will not be crushed to a gravel consistency and the rebar will not be removed. Upon removal of each concrete foundation, the concrete pieces will be dry-decontaminated and stored in a designated area on site until needed for use as backfill. Table 2-1 presents the size of each of the concrete foundations.

2.3 FIELD SCREENING

Screening will be conducted as a guide for soil excavations using PetroFLAG field screening kits and following manufacturers recommended procedures (a PetroFLAG® manual is included as Attachment 2 to this FSP). In most cases, screening sample locations will be selected based on field observations and olfactory indicators. Field screening affords the field crews with the opportunity to bias the collection of samples for laboratory analysis in areas of the most prevalent contamination so that the field effort results are conservative. Based on results using PetroFLAG® field screening at other sites in Alaska, the 250 milligrams per kilogram cleanup level for diesel-range organics (DRO) corresponds to a PetroFLAG field-screening result of approximately 460 parts per million (ppm). In general, screening results greater than 400 ppm will be considered contaminated, pending receipt of analytical results. However, at the Motor Pool Foundation (contaminated with residual-range organics [RRO] and benzene) and the discharge pipe at the Large Foundation Area (contaminants unknown), a qualitative assessment of the results from PetroFLAG® field screening and photoionization detector (PID) screening will be used to determine which soils should be considered contaminated, pending receipt of analytical results.

2.4 SOIL SAMPLING

Soil samples will be collected in the locations and at the frequency indicated in Table 2-2.

Table 2-2
2004 Analytical Samples

Analyte	Method	Number of Samples	Turn-Around Time
Excavation Confirmation Samples (Number of Samples per Excavation)[1]			
GRO	AK101	3	7 days
DRO/RRO	AK102/103	3	7 days
BTEX	SW8260B	3	7 days
PAHs	SW8270C	3	7 days
UST Confirmation Samples (Number of Samples per UST Excavation)			
GRO	AK101	2	7 days
DRO/RRO	AK102/103	2	7 days
BTEX	SW8260B	2	7 days
PAHs	SW8270C	2	7 days
Clean Soil Stockpile Samples (Total Number of Samples)[2]			
DRO/RRO	AK102/103	4	7 days
PAHs	SW8270C	4	7 days
Drain Pipe Characterization Samples (Total Number of Samples for Excavated Soil)[3]			
GRO	AK101	2	7 days
DRO/RRO	AK102/103	2	7 days
VOCs	SW8260B (medium level)	2	7 days
VOCs	SW8260B (low level)	2	7 days
SVOCs	SW8270C	2	7 days
PAHs	SW8270C	2	7days
8 RCRA Metals	SW6020/SW7471A	2	7 days
PCBs	SW8082	2	7 days
TCLP 8 RCRA Metals	SW1311/SW6010B/ SW7470A	1	7 days
Drain Pipe Confirmation Samples (Total Number of Samples for Trench)[3]			
GRO	AK101	5	7 days
DRO/RRO	AK102/103	5	7 days
VOCs	SW8260B (medium level)	5	7 days
VOCs	SW8260B (low level)	5	7 days
SVOCs	SW8270C	5	7 days
PAHs	SW8270C	5	7 days
8 RCRA Metals	SW6020/SW7471A	5	7 days
PCBs	SW8082	5	7 days
Drain Pipe Decontamination Water (Total Number of Samples)			
Metals (RCRA Suite) (aqueous)	SW6020/SW7470A	1	7 days
VOCs (aqueous)	SW8260B	1	7 days
PCBs (aqueous)	SW8082	1	7 days

Notes:
[1]GRO and BTEX will only be analyzed at the Motor Pool Area (BTEX was found in analytical samples here during the 2000 EE/CA above cleanup levels) and the Lookout Pad Area (during a site walk in 2004 it was determined this area requires further investigation.
[2]It is estimated that there will only be clean stockpiles at the Bermed Bunker Area, the Small Foundation Area, and the UST and drainpipe excavation at the Large Foundation Area, as the other areas are believed to contain petroleum-impacted soil near the surface.
[3]Samples will be sent to the laboratory for both low-level and medium-level VOC analysis, as it is unknown what concentration (if any) of VOCs will be present in the samples.
For definitions, see acronyms and abbreviations.

Soil sampling from inside the excavations will follow the general procedures outlined below, and may include sampling from excavator buckets at varying depths in the excavation to an anticipated maximum depth of 17 feet. Sampling from excavator buckets will require observing safe work practices around moving equipment, including resting the bucket on the ground and turning off the excavator while a sample is being obtained, maintaining a line of site with the operator at all times, and observing safe work zones (e.g., avoiding being between the bucket and the excavation).

Samples will be collected from the center of the bucket (the least disturbed portion) using a decontaminated stainless-steel trowel or stainless-steel spoon, following these procedures:

1. Check all equipment and sample containers to ensure that the equipment has been properly decontaminated and that the sample containers are new and have been properly prepared.
2. Label the container, initiate the chain-of-custody (CoC) and complete the sample-specific data sheet (found in Attachment 1), as applicable.
3. Begin excavating. Excavations are not anticipated to be more than 17 feet deep.
4. For discrete samples:
   a. At the desired location, collect the sample for benzene, toluene, ethylbenzene and xylenes (BTEX) and gasoline-range organics (GRO) (where applicable) analysis first and transfer into appropriate sample jar.
   b. Homogenize the remaining soil by mixing with a stainless-steel spoon.
   c. Fill remaining jars with soil.
5. Note in field notebook as well as the sample summary log the interval from which the soil was collected.
6. Decontaminate the trowel or spoon as described in Section 2.14.

Generally, excavation soil sampling shall meet frequency numbers specified in Table 2-2. All sample locations shall be placed on the daily excavation figure as well as logged on the sample summary sheet.

Soil samples submitted for laboratory analysis will be packaged according to the guidelines in the QAPP. Container requirements, preservation requirements, and holding times for the samples to be collected are presented in Table 4-1 of the QAPP. A summary of all soil analyses to be performed at all sites is presented in Table 2-2.

2.5 STOCKPILE CONSTRUCTION

As soil is removed from the excavation, it will be placed in a dump truck for shipment to the thermal treatment unit. “Clean” overburden soil will be stockpiled near the excavation and be sampled as such. Soil that is determined to be clean through analytical samples will be used to backfill the excavation. Petroleum-impacted soil will be stored separately from the clean soil. If it is necessary to stockpile contaminated soil, it will be stockpiled on one of the concrete foundations with a 10 millimeter liner placed beneath the soil. If it is not possible to remove the contaminated soil by the end of the day, it will be covered with plastic sheeting to prevent the infiltration of precipitation. The stockpiled, contaminated soil will be shipped off site at the beginning of the next workday. Soil from each SS83 area will be segregated within the stockpile using Visqueen or another similar material.

A seven-day turnaround time will be requested for all excavation confirmation samples. Excavations will not be backfilled until confirmation sampling results have been received and confirmed clean.

2.6 EXPLORATORY EXCAVATION FOR SUSPECTED DRAINPIPE

As recommended in the 2000 EE/CA (USAF 2002), an exploratory trench will be dug along the northern edge of the Large Foundation Area concrete foundation to a depth of 5 feet below ground surface (bgs) to determine whether a floor drain discharge pipe extends from the side of the former building. Overburden from the excavation will be placed in a temporary stockpile to be constructed on the concrete foundation at the Large Foundation Area. The stockpile will only contain overburden from the exploratory drainpipe excavation. If a pipe is encountered, it will be removed and temporarily placed on a liner on the concrete foundation. The trench beneath the pipe will be screened for contamination using a PID and PetroFLAG kit. It is estimated that up to 10 cubic yards of soil may be excavated and placed in supersacks as part of this effort. Any pipe found will be photographed and its condition recorded in a logbook.

It is unknown what the suspected drainpipe may have contained; therefore, characterization samples will be analyzed for GRO; DRO/RRO; volatile organic compounds (VOCs); polynuclear aromatic hydrocarbons (PAH), semivolatile organic compounds (SVOCs); 8 Resource Conservation Recovery Act (RCRA) metals (As, Se, Ba, Cd, Cr, Ag, Hg, Pb); and polychlorinated biphenyls (PCBs). The samples will also be analyzed for toxicity characteristic leaching procedure (TCLP) 8 RCRA metals only if metals are detected in the 8 RCRA metals samples at concentrations above the levels listed in Work Plan Table 3-1. Upon any drainpipe removal, confirmation samples will be analyzed for GRO, DRO/RRO, VOCs, SVOCs, polynuclear aromatic hydrocarbons (PAHs), 8 RCRA metals, and PCBs (refer to Table 2-2 for a listing of all analytical samples) if characterization samples indicate any of these compounds are present.

Any pipe found will be dry-decontaminated on-site and further decontaminated at the Elmendorf Environmental Staging Facility (ESF) at the corner of 9th and Gibson by rinsing with potable water, scrubbing with an Alconox solution, and rinsing once more using potable water. Once decontaminated it will be transferred to a recycling facility.

If no pipe is encountered after trenching to 5 feet bgs, the trench will be backfilled with the excavated material and reseeded.

2.7 UST REMOVAL AND EXCAVATIONS

Two USTs, one 500-gallon (Tank 1) and one 1,000-gallon UST (Tank 2), (with all associated piping) will be removed from the Large Foundation Area. The 2000 EE/CA report concluded that the USTs probably stored diesel fuel for the former building's heating system (USAF 2002). It is assumed that the USTs are not regulated by Alaska Department of Environmental Conservation (ADEC), since they contained diesel-heating fuel. However, 18 Alaska Administrative Code (AAC) 78 will be used as guidance for the UST removals. It is estimated that approximately 25 total cubic yards of soil will be excavated around the USTs at the Large Foundation Area.

Tank 1 is 6.2 feet long, 4.0 feet in diameter, and fabricated of single-walled steel. The tank contained a fuel/water mixture consisting of approximately 325 gallons of fuel and 150 gallons of water. A 0.15-foot diameter fill pipe extended from the tank to the northeast and terminated at the south side of the presumed location of the former building's man door. Copper feed lines and a vent pipe were present but were not connected to Tank 1; they were possibly disturbed during excavations carried out during the 2000 EE/CA (USAF 2002). Tank 2 is a steel UST measuring 12 feet long and 3.3 feet in diameter. The top of Tank 2 is located 1 to 1.5 feet bgs, and contained approximately 25 gallons of fuel and 200 gallons of water. A 0.15-foot diameter fill or vent pipe extended from the edge of the foundation southwest to the UST. Copper feed lines and a vent pipe were present but were not connected to Tank 2. As with Tank 1, these may have been disturbed the 2000 EE/CA field investigation.

The contents of both tanks were removed during the 2000 EE/CA field effort. At the end of the field investigation, the tanks were covered with Visqueen and clean fill and were left in place for future closure (USAF 2002).

All piping and ancillary equipment are anticipated to be removed and the soil surrounding the USTs will be excavated, field screened, sampled and stockpiled as described previously, until all impacted soil has been removed, down to approximately 15 feet or until groundwater is encountered, whichever occurs first. During the 2000 EE/CA, petroleum-impacted soils were encountered at depths ranging from 2 to 17 feet. Piping for the two USTs is anticipated to be minimal, as it is believed they serviced only the adjacent building.

Certified personnel will be utilized to conduct all safety monitoring, ventilation, cleaning, removal and inspection of the tanks. The tanks will be removed from the excavation; the exterior will be cleaned to remove all soil; and the tank will be inspected for signs of corrosion, structural damage, or leakage. All materials coming into contact with the tank or in the vicinity of the excavation, such as shovels, slings and tools, shall be non-sparking. The tank shall be placed on a level surface at an approved location and secured with wood blocks to prevent movement during cleaning. Soil will be removed from the tank exterior, piping and associated equipment to (1) eliminate soil deposition on roadways during transportation to the cleaning and cutting site, (2) ensure markings will adhere to surfaces, and (3) simplify cutting of the tanks.

The tanks will be cleaned by scraping the sludge and scale and wiping the tanks surfaces with absorbent pads until no wet film remains. High-pressure (greater than 500 pounds per square inch), low-volume (less than 2 gallons per minute) water spray or steam-cleaning may be required to sufficiently remove the film. The interior piping surfaces shall also be cleaned, to the extent possible, using the same methods. The tanks and piping will be sufficiently cleaned for acceptance by a steel-recycling company and cut into pieces for transport and recycling. Certificates of recycling will be provided for the tanks and piping. To the extent possible, personnel will not enter tanks during cleaning. Specially designed tank cleaning equipment will be used to allow tank cleaning to be performed prior to cutting tanks into sections, without requiring personnel to enter the tanks. If less specialized equipment is used, tanks will be partially dismantled first to avoid confined space entry for cleaning.

Tanks and piping will be cleaned and cut at the ESF on Elmendorf AFB. After cleaning and disposal are complete, decontamination and waste handling will be performed in accordance with the Waste Management Plan (SAP Part Three).

2.8 SOIL SAMPLING FOR LABORATORY ANALYSIS

Excavation confirmation, UST excavation confirmation, drainpipe trench characterization and confirmation, and drainpipe decontamination water (if necessary) will be collected and analyzed at a fixed analytical laboratory. Should the characterization samples of the drainpipe excavation determine that the soil is a hazardous waste, the decontamination water will be sampled to determine appropriate disposal. Samples scheduled for collection are presented in Table 2-2. Table 2-3 presents the analyses for duplicate QC samples and trip blanks. Table 2-5 lists cleanup levels for samples associated with the drain pipe at the Large Foundation Area.

2.9 THERMAL TREATMENT

Soil will be transported daily to an approved soil treatment center at the conclusion of field activities.

Table 2-3
Duplicate Quality Control and Trip Blank Samples

Analysis	Method	Duplicate QC Samples	Trip Blanks
DRO/RRO	AK102/103	4	N/A
PAHs	SW8270C	4	N/A
GRO	AK101	3	3
BTEX	SW8260B	2	3
VOCs (LL)	SW8260B	1	3
VOCs (ML)	SW8260B	1	3
SVOCs	SW8270C	1	N/A
8 RCRA Metals	SW6020/SW7471A	1	N/A
PCBs	SW8082	1	N/A

Notes:
N/A-not applicable
For additional definitions, see acronyms and abbreviations list.

Table 2-4
SS83 Drainpipe Cleanup Levels

Analyte	ADEC 18 AAC 75 Tables B1 & B2 Soil Cleanup Levels[1]		
	Under 40-Inch Zone		
	Ingestion	Inhalation	Migration to Groundwater
	(mg/kg)		
Petroleum Hydrocarbons			
Gasoline Range Organics	1,400	1,400	**300**
Diesel Range Organics	10,250	12,500	**250**
Residual Range Organics	**10,000**	22,000	11,000
Metals			
Arsenic	6	--	**2**
Barium	7,100	--	**1,100**
Cadmium	100	--	**5**
Chromium (Total)	510	--	**26**
Lead[2]		**1,000**	
Mercury	--	18	**1.4**
Selenium	510	--	**3.5**
Silver	510	--	**21**
PCBs/Pesticides			
PCB-1016 (Aroclor 1016) [3]	**1**	**1**	--
PCB-1221 (Aroclor 1221) [3]	**1**	**1**	--
PCB-1232 (Aroclor 1232) [3]	**1**	**1**	--
PCB-1242 (Aroclor 1242) [3]	**1**	**1**	--
PCB-1248 (Aroclor 1248) [3]	**1**	**1**	--
PCB-1254 (Aroclor 1254) [3]	**1**	**1**	--
PCB-1260 (Aroclor 1260) [3]	**1**	**1**	--
VOCs			
1,1,1-Trichloroethane	--	460	**1**
1,1,2,2-Tetrachloroethane	42	5.4	**0.017**
1,1,2-Trichloroethane	150	10	**0.017**
1,1,2-Trichloro-2,2,1-Trifluoroethane	1,000,000	**4,660**	31,800
1,1-Dichloroethane	10,000	890	**12**
1,1-Dichloroethene	14	0.9	**0.03**
1,2-Dichlorobenzene	9,100	110	**7**
1,2-Dichloroethane	91	5	**0.015**
1,2-Dichloropropane	120	17	**0.017**
1,2,3-Trichloropropane	4.15	10.4	**0.002**
1,2,4-Trimethylbenzene	5,070	**92.2**	95.2
1,3-Dichlorobenzene	3,040	--	**12.1**
1,3-Dichloropropene	83	14	**0.02**
1,3,5-Trimethylbenzene	5,070	38.3	**25**
1,4-Dichlorobenzene	350	8,000	**0.8**
2-Butanone (MEK)	60,800	28,100	**60**
2-Hexanone	--	--	--
4-Methyl-2-pentanone	--	--	--
Acetone	10,000	--	**10**
Benzene	290	9	**0.02**
Bromodichloromethane	130	--	**0.35**
Bromoform	1,050	500	**0.38**
Bromomethane		--	--
Carbon disulfide	10,000	453	**17**
Carbon tetrachloride	64	3.4	**0.03**
Chlorodibromomethane	100	--	**0.2**
Chlorobenzene	2,000	110	**0.6**

Table 2-4
SS83 Drainpipe Cleanup Levels

Analyte	ADEC 18 AAC 75 Tables B1 & B2 Soil Cleanup Levels[1]		
	Under 40-Inch Zone		
	Ingestion	Inhalation	Migration to Groundwater
	(mg/kg)		
Chloroethane	--	--	--
Chloroform	1,000	3.4	**0.34**
Chloromethane	--	--	--
cis-1,2-Dichloroethene	1,000	--	**0.2**
Decane	--	--	--
Dichlorodifluoromethane	20,300	260	**60**
Ethylbenzene	10,000	89	**5.5**
Ethylene dibromide	0.1	1.2	**3.06E-05**
Ethylene glycol	203,000	--	**194**
Isopropylbenzene	10,100	585	**227**
Methylene bromide	1,010	--	**1.1**
Methylene chloride	1,100	180	**0.015**
n-Propylbenzene	--	--	--
Styrene	20,300	280	**1.3**
Tetrachloroethene	160	80	**0.03**
Toluene	20,300	180	**5.4**
trans-1,2-Dichloroethene	2,000	--	**0.4**
Trichloroethene	750	43	**0.027**
Vinyl acetate	101,000	1,500	**100**
Vinyl chloride	6	4	**0.009**
Xylenes	203,000	81	**78**
Semi-Volatiles/PAHs			
1,2,4-Trichlorobenzene	1,000	570	**2**
1-Methylnaphthalene	4,100	--	**43**
2-Methylnaphthalene	2,030	--	**60.9**
2,4,5-Trichlorophenol	10,000	--	**90**
2,4,6-Trichlorophenol	750	1,500	**0.6**
2,4-Dichlorophenol	300	--	**0.45**
2,4-Dimethylphenol	2,000	--	**4**
2,4-Dinitrophenol	200	--	**0.2**
2,4-Dinitrotoluene	12	--	**0.005**
2,6-Dinitrotoluene	12	--	**0.0044**
2-Chloronaphthalene	8,110	--	**70**
2-Chlorophenol	510	--	**1.4**
2-Methyl-4,6-dinitrophenol	--	--	--
2-Methylnaphthalene	2,030	--	60.9
2-Methylphenol (o-cresol)	5,100	--	**7**
2-Nitroaniline	--	--	--
2-Nitrophenol	--	--	--
3,3'-Dichlorobenzidine	18	--	**0.02**
3-Nitroaniline	--	--	--
4-Bromophenyl phenyl ether	--	--	--
4-Chloro-3-methylphenol	--	--	--
4-Chloroaniline	410	--	**0.5**
4-Chlorophenyl phenyl ether	--	--	--
4-Methylphenol	--	--	--
4-Nitroaniline	--	--	--
4-Nitrophenol	--	--	--
Acenaphthene	6,100	--	**210**
Acenaphthylene	6,100	--	**210**
Aniline	--	--	--

Table 2-4
SS83 Drainpipe Cleanup Levels

Analyte	ADEC 18 AAC 75 Tables B1 & B2 Soil Cleanup Levels[1]		
	Under 40-Inch Zone		
	Ingestion	Inhalation	Migration to Groundwater
	(mg/kg)		
Anthracene	30,000	--	4,300
Azobenzene	--	--	--
Benzo(a)anthracene	11	--	**6**
Benzo(a)pyrene	1	--	**3**
Benzo(b)fluoranthene	11	--	**20**
Benzo(g,h,i)perylene	3,000	--	**1,500**
Benzo(k)fluoranthene	**110**	--	200
Benzoic acid	410,000	--	**390**
Benzyl alcohol	--	--	--
Benzyl butyl phthalate	20,000	--	**5,600**
bis-(2-chloroethoxy)methane	--	--	--
bis-(2-chloroethyl)ether	8	3	**0.002**
Bis(2-chloroisopropyl)ether	--	--	--
bis-(2-ethylhexyl)phthalate	**590**	--	1,200
Chrysene	1,100	--	**620**
Dibenzo(a,h)anthracene	**1**	--	6
Dibenzofuran	203	--	**7.78**
Diethyl phthalate	81,000	--	**190**
Dimethyl phthalate	>1,000,000	--	**1,400**
Di-n-butyl phthalate	10,000	--	**1,700**
Di-n-octyl phthalate	**2,000**	--	810,000
Fluoranthene	4,100	--	**2,100**
Fluorene	4,100	--	**270**
Hexachlorobenzene	5	7	**0.73**
Hexachlorobutadiene	20	55	**8**
Hexachlorocyclopentadiene	710	**7**	130
Hexachloroethane	101	390	**1.6**
Indeno(1,2,3-cd)pyrene	**11**	--	54
Isophorone	8,700	--	**3**
Naphthalene	4,100	--	**43**
Nitrobenzene	51	90	**0.06**
n-Nitrosodimethylamine	--	--	--
n-Nitrosodi-n-propylamine	1.2	--	**0.00036**
n-Nitrosodiphenylamine	1,700	--	**3.4**
Pentachlorophenol	35	--	**0.01**
Phenanthrene	30,000	--	**4,300**
Phenol	60,800	--	**67**
Pyrene	3,000	--	**1,500**
Pyridine	--	--	--

Notes:

[1] Cleanup levels are those determined during the 2000 EE/CA and presented in the 2003 Decision Document. Where cleanup levels are not available from those sources, ADEC 18 AAC 75 Method 2 Table B Soil Cleanup Levels, updated per ADEC Technical Memorandum 01-007 (24 November 2003) are listed

[2] Lead cleanup levels are site-specific; 1,000 mg/kg is appropriate for industrial land use.

[3] Total PCBs.

Bold text represents the most stringent cleanup level for each chemical.

mg/kg = milligrams per kilograms or parts per million

PAH = polycyclic aromatic hydrocarbon

VOC = volatile organic compound

-- = ADEC has no established cleanup criteria for analyte.

2.10 BACKFILLING

Excavation backfilling will occur after analytical confirmation has been received that the excavation has reached soil below cleanup criteria (Work Plan Table 3-1).

Any broken concrete resulting from foundation dismantling will be used as backfill material in the excavations. The foundations are not painted or otherwise contaminated. Concrete foundations and reject material from the gravel pit located near the corner of Talley Avenue and Davis Highway (Work Plan Figure 4-2) can also be used to backfill the excavations, as required. Pieces of the concrete foundations will be placed in the bottom of the excavations. Gravel will then be placed on top of the concrete, to within 6 inches of the ground surface. Overburden determined to be clean will be used as backfill. Six inches of topsoil will be placed on top of the gravel where clean overburden is unavailable. Soil will be field-compacted using the excavator bucket and making passes over the site with the excavator itself. Compaction testing will not be conducted. Following compaction, the site will be reseeded.

The approximate quantity and burial depth of any concrete used as backfill will be recorded. The site survey will be used to determine burial locations. This information will be documented in the project summary report.

2.11 DEMOBILIZATION

All equipment will be dry-decontaminated before leaving the site. When work is completed, all earth-moving equipment will be taken to the ESF on Elmendorf AFB and cleaned using a potable water rise, scrubbed with an Alconox-water solution, and thoroughly rinsed. All field trash will be removed from the site and properly disposed of.

2.12 SAMPLE LABELING, NUMBERING, CHAIN OF CUSTODY, STORAGE, AND TRANSPORTATION

Sampling documentation provides the ability to trace the possession and handling of samples from the time of collection, through analysis and final disposition. This documentation is referred to as CoC. The components of this chain (i.e., sample seals, sample label with a sample number, a field log book, CoC records, and sample analysis request sheets) shall be utilized during field sampling activities. The following paragraphs describe the procedures required for adequate labeling, documentation, and shipping of samples.

2.12.1 Sample Labels

Sample labels are necessary to prevent misidentification of samples. Each sample container will have a sample label attached to it. Where necessary, the label will be protected from water and solvents with clear tape. Sample labels will include the following information:

- Project name or number
- Sampling date and time
- Sample number (CoC identification)
- Sampler's initials
- Analyses requested
- Preservatives
- Jar numbers (e.g., 1 of 2, 2 of 2)

2.12.2 Field Sample Sheets and Logs

Sample summary logs and daily activity logs will be used to record sampling activities (Attachment 1). Entries in the sample summary logs shall include the following information:

- Name of author, date, and time of entry
- Location of activity
- Names and affiliations of personnel on-site
- Sample collection or measurement methods
- Number of samples collected
- Sample identification numbers
- Sample distribution (laboratory)
- Field observations and comments

2.12.3 Sample Numbering

Sample containers will be labeled with preprinted labels that match the CoC records. At the time of sampling, appropriate sample numbers will be recorded in the field logbook. A 20-character alphanumeric sample identification system will be used.

- The first two digits represent the sampling agency (JE).
- The second two digits represent the year (04).
- The next four digits will represent the project identification code (SS83).
- The next three digits represent the area within SS83.
- The next three numbers are sequential numbers representing the sample (001, 002, 003, etc).
- The next four numbers are the depth or the date of the sample at that unique location.
- Finally, two letters will represent the matrix type.

Collection Agency	Year	Project Identification Code	Area Code	Number	Depth or Date	Matrix Description
JE	04	SS83	MPA	001	01 or MM/DD	See Key

An example would be JE04SS83 MPA001-0715-SO representing the first sample collected from the Motor Pool Area on July 15, by Jacobs in 2004.

Area codes for the SS83 site as follows:

- MPA – Motor Pool Area
- LFA – Large Foundation Area
- DBA – Drum Bunker Area
- SFA – Small Foundation Area
- BBA – Bermed Bunker Area
- LOP – Lookout Pad

Following, are matrix description examples:

- WW - Waste Water
- SO - Soil
- SH - Solid Hazardous Waste

2.12.4 CoC Records

Once a sample is collected, it will remain in the custody of the field team individual who collected the sample, or a designee, until it is shipped to the designated analytical laboratory. When the sample is transferred, a CoC form will be signed by the person(s) transferring custody of the sample containers. Samples will be placed in a cooler or other appropriate shipping container. A properly completed CoC form for the samples contained in the cooler will be placed in a self-sealing-type bag, which will then be taped to the inside lid of the cooler before sealing the cooler for shipment. A separate CoC form shall be completed for each cooler. If shipped, each cooler will be taped closed on the outside with strapping or duct tape, and sealed with signed-and-dated custody seals placed on opposite sides and diagonally across the corners of the lid. The cooler shall have a unique identification placed on the shipping label and referenced on the CoC form.

2.12.5 Sample Packaging and Shipping

All samples collected in the field will be placed into coolers for shipping. One-liter poly cubitainers, filled with water and frozen, will be used to maintain the cooler temperature at approximately 4 degrees Centigrade (°C) plus or minus 2°C for transport to the designated laboratory. Sample jars designated for shipment to the laboratory will be wrapped in bubble wrap and sealed in a self-sealing plastic bag before being placed in the cooler. The cooler will have approximately 3 inches of inert packing material (vermiculite) in the bottom. After the samples and ice are packed inside the cooler, the contents will be secured with bubble wrap.

A temperature blank (distilled water in a screw-top 500 milliliter plastic bottle labeled “Temp Blank”) will be included in each cooler to measure the approximate temperature of samples upon arrival at the laboratory. If shipped, the cooler will be sealed shut with a minimum of three complete wraps of tape at both ends, as well as a tape seal where the cooler lid seals against the cooler body. Cooler drains will be sealed with shipping tape or equivalent.

“This Side Up” labels will be placed on all four sides of the cooler and “Fragile” labels placed on at least two sides. “DO NOT FREEZE, REFRIGERATE” label will be placed on two sides of each cooler.

The laboratory will be informed of cooler shipments via telephone or facsimile message. The laboratory shall complete a cooler receipt form when samples are received and shall document all sampling and shipping discrepancies. All cooler receipt forms will be provided to the project chemist, and the project chemist will be notified of all discrepancies by the laboratory within 24 hours of cooler receipt. An oral, as well as a written report shall be provided.

Any cooler shipments containing regulated quantities of methanol will be shipped using the appropriate hazardous materials shipping procedures.

2.13 SURVEYING

The perimeter of each excavation and approximate sample locations with be surveyed with a handheld GPS and tied to local control points such as pre-existing monitoring wells.

2.14 DECONTAMINATION

All tools and equipment, such as the excavator bucket will be decontaminated with high-pressure water/Alconox solution and a high-pressure water rinse prior to leaving the site. Decontamination shall be done in the specially constructed decontamination area at the Elmendorf ESF to avoid spreading contaminants. The decontamination pad is sloped to one corner to collect all decontamination liquids, which, in turn will be collected and treated at the ESF treatment system. Waste management practices are discussed in the IDW Plan, Part 2 of Appendix A.

All equipment that may directly or indirectly contact samples will be decontaminated before each use. The following procedure shall be used to decontaminate large pieces of equipment such as the excavator and bucket, loader, etc.: wash the external surfaces of equipment using high-pressure hot water and Alconox or equivalent. If necessary, scrub until all visible dirt, grime, grease, oil, loose paint, rust flakes, etc., have been removed.

The following procedure will be used to decontaminate sampling devices such as mixing bowls and trowels:

- Scrub the equipment with a solution of potable water and Alconox or equivalent laboratory-grade detergent.
- Rinse equipment with potable water.
- Rinse with deionized water.
- Air dry equipment on a clean surface such as Teflon, stainless-steel, or aluminum. If the sampling device will not be used immediately after decontamination, wrap it in aluminum foil with shiny side out.
- Reagent-grade water will be purchased, stored, and dispensed only in glass, stainless-steel, or Teflon containers. These containers shall have Teflon caps or cap liners.

Clean, disposable gloves will be worn during and after decontamination to avoid contamination of equipment.

2.15 FIELD QA/QC

The following types of field QC procedures will be followed and samples collected during the entire investigation in accordance with frequencies and methods outlined in the QAPP:

- Trip blanks
- Field duplicate samples
- Matrix spikes

Trip blanks will be provided by the laboratory.

2.16 RECORD KEEPING

Field records will be kept on the appropriate field forms with a field logbook tracking daily activities.

The records kept for all activities conducted during the investigation will include the location, date and time, identity of people performing the activity, and weather conditions.

These records will be archived during and upon completion of the project in an easily accessible form and will be available, upon request, to ADEC, AFCEE and the U.S. Air Force.

(intentionally blank)

3.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2002 (July) *Oil and Other Hazardous Substances Pollution Control.* 18 AAC 75.

AFCEE. (Air Force Center for Environmental Excellence). 1997 (March). *AFCEE Model FSP, Version 1.1*.

USAF (United States Air Force). 2002 (February). Engineering Evaluation/Cost Analysis SS83. Final . Elmendorf Air Force Base, Alaska. Environmental Restoration Program.

(intentionally blank)

ATTACHMENT 1

Field Forms

Glassware Receipt Form
Record of Photographs
Sample Tracking Form
Waste Tracking Form
Contractor Cooler Receipt Forms
Chain-of-Custody

Glassware Receipt Form

Cooler Designation	Lab Name	Analysis	Bottle Type	Quantity

JACOBS ENGINEERING GROUP INC.

RECORD OF PHOTOGRAPHS

PROJECT NUMBER: ______________________

Film Type ______________________ **Roll No.** ______________________

ASA Number

Photo No.	Date	Time	Photographer	Weather Conditions	Location	Description of Photograph
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

____

Signature of Photographer

Sample Summary Sheet

Sample Id.	COC No.	Matrix	Date	Time	Depth	GRO	DRO	BTEX	Other	Container Size	#	Comment

POC: Tom Tompkins
(907) 751-3330

Current as of:

Container Number	Type of Waste (if Haz-waste, list codes)	Start Date/O.S.D. Date m/d/yy	Sample/ MSDS and Profile Number	Source and Process	Product Phase Description (Waste stream physical characteristics)	Type of Containers	No. of Containers	Weight Pounds

JACOBS ENGINEERING GROUP INC.

COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Program/Project Chemist within 24 hours of receiving sample.

CoC Number ______________________ **(One receipt form per cooler)**
Cooler Number on CoC ______________________
Laboratory and Location ______________________

1.	Were custody seals on outside of cooler?		**YES**	**NO**
	If yes, how many and where?	______________________		
	Were signatures and dates correct?		**YES**	**NO**
2.	Were custody papers taped to lid inside of cooler?		**YES**	**NO**
3.	Were custody papers properly filled out (ink, signed, etc.)?		**YES**	**NO**
4.	Did you sign custody papers in the appropriate place?		**YES**	**NO**
5.	Did you attach shipper's packing slip to this form?		**YES**	**NO**
6.	What kind of packing material was used?	______________________		
7.	Was sufficient ice used (if appropriate)?		**YES**	**NO**
8.	Were all bottles sealed in separate plastic bags?		**YES**	**NO**
9.	Did all bottles arrive in good condition?		**YES**	**NO**
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?		**YES**	**NO**
11.	Did all bottle labels and tags agree with custody papers?		**YES**	**NO**
12.	Were correct bottles used for the tests?		**YES**	**NO**
13.	Were VOA vials checked for absence of air bubbles, and if present noted?		**YES**	**NO**
14.	Were labels incorrectly placed on tared containers? If yes, impact and corrective action are documented below.		**YES**	**NO**
15.	Was sufficient amount of sample sent in each bottle?		**YES**	**NO**
16.	Chain-of-custody identification number:	______________________		
	Temperature blank reading	______________________		
	Cooler temperature reading	______________________		
	Identification number of thermometer	______________________		
17.	Is temperature within 4+/- 2°C?		**YES**	**NO**

CORRECTIVE ACTION FORM ATTACHED **YES** **NO**

Jacobs Project Chemist contacted? Date/Time ______________________

Attach associated CoC record and Conversation Confirmer forms.

Explain any discrepancies: ______________________

____

____

Figure 4-6

Chain-of-Custody Report

Collection Organization:	**Chain-of-Custody:**	**Cooler ID:**	**Admin Number:**
Project Number:	**Laboratory:**	**Bill To:**	**Report To:**

COC Sample ID	Collection Date	Collection Time	Sampler	Containers Number	Containers Type	Containers Volume	Preservative	Matrix	Analyses Requested Group	QC	TAT	Contents Caution	Dispose or Return Samples	Level

Comments:

Special Instructions:

Relinquish By:

Received By: / /

07/26/2000

ATTACHMENT 2

Field Instrument Instructions (PetroFLAG)

PetroFLAG®

HYDROCARBON ANALYZER

User's Manual

DEXSIL
ONE HAMDEN PARK DRIVE
HAMDEN, CT 06517
TEL: 203-288-3509 FAX: 203-248-6523
http://WWW.DEXSIL.COM

Table of Contents

Introduction to the PetroFLAG Hydrocarbon Analysis System 3
Using the PetroFLAG System 5
Choosing the Correct Response Factor 5
Analyzing High Concentration Samples 6
Converting Response Factors for Data Already Collected 6
Temperature Effects on Measurements 6
Effects of Soil Water Content on PetroFLAG Result 7
Sample Preparation 8
Calibration 8
Preparing Blanks and Standards 8
QA/QC 8
The PetroFLAG Test Procedure 10
Analyzer Operation 11
Selecting a Calibration Curve 11
Reading the Blank and Standard 12
Taking a Reading 12
Power Requirement 12
Analyzer Operation Examples 13
Standard Operation 13
Standard Operation - Changing Response Factor Without Recalibrating 13
Standard Operation With Recalibration 14
Special Operating Conditions 15
Operation of the Meter After the Battery Has Been Disconnected 15
Meter Left to Turn Off in Other Mode 15
Helpful Suggestions and Safety Precautions 16
Appendix A: PetroFLAG Response Curves 18
Appendix B: Comparison with Laboratory Methods 19
Appendix C: Determining the Response Factor for Hydrocarbons Not Listed in Table 1 20
Appendix D: Error Conditions 21
Appendix E: Meter Specifications 22
Meter Warranty 23

Ver E25A Rev 2 12/99

Introduction to the PetroFLAG Hydrocarbon Analysis System

NOTE: PLEASE READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO RUN THIS TEST

The PetroFLAG hydrocarbon analysis system is a broad spectrum field analytical tool suitable for any type of hydrocarbon contamination regardless of the source or state of degradation[1]. Unlike other field screening methods, the PetroFLAG system does not target specific compounds such as BTEX (Benzene, Toluene, Methylbenzene and Xylene) or PNAs (Poly-Nuclear Aromatics) that may be part of some hydrocarbon mixture. This makes the PetroFLAG system a very versatile analytical method that can be used on most hydrocarbon spills without prior knowledge of the BTEX or PNA content of the contaminant. The PetroFLAG system uses patented chemistry to respond to the broadest range of hydrocarbons possible. The PetroFLAG system is most sensitive to heavier hydrocarbons such as oils and greases and less sensitive to the lighter more volatile hydrocarbon fuels. The specially designed PetroFLAG analyzer allows the user to select, in the field, the response factor that is appropriate for the suspected contaminant at each site. The response factors for a number of contaminants are listed in table 1. Using the selected response factor, the analyzer compensates for the relative response of each analyte and displays the correct concentration in ppm. The response curves for some typical hydrocarbon contaminants are plotted in Appendix A.

All chemical methods for hydrocarbon analysis in soil that are currently in use, whether field screening methods or laboratory methods, depend on a solvent extraction to remove the hydrocarbons from the soil sample. The extraction efficiency for each method is a function of the solvent used and the extraction procedure. It is, therefore, dependent on many other factors such as the soil type, water content, pH, etc. Many EPA SW-846 methods use chlorinated solvents or Freon as extraction solvents. These solvents were originally chosen for their extraction efficiency for polar organic compounds and may not be appropriate for hydrocarbons. In addition, special measures have to be taken for these lab methods when the soil is wet.[2] The extraction efficiencies may be as low as 1%[3] in some cases.

The extraction solvent used in the PetroFLAG system has been carefully developed to give consistent extraction efficiencies over the range of soil types and conditions most commonly encountered in the field. The PetroFLAG solvent system contains no chlorofluorocarbons or chlorinated solvents, and the extraction efficiency is unaffected by soil moisture, in most cases, up to 15%(w/w).[4]

Because the PetroFLAG system has such a broad response spectrum, there are situations where it will indicate a higher hydrocarbon concentration than other methods might. This can be due to the higher

---

[1]Brake fluid, phosphate ester based hydraulic oil, and other soluble fluids, will not be detected by the PetroFLAG system.

[2]USEPA SW846 Method 3550A Ultrasonic Extraction Rev 1, November 1992

[3]Lee, W.E. III, Houchin, C.A. and Albergo, N., "TRPH Discrimination of Petroleum and Non-petroleum Organic Materials", *American Environmental Lab*, December 1993.

[4]The presence of water will cause a dilution effect resulting in a lower response. This effect can be corrected for, if the water content is known. (For a more complete discussion see "Using the PetroFLAG System: Effects of Soil Water Content on PetroFLAG Result")

extraction efficiency of the PetroFLAG extraction solution or the broader response range of the detection system. SW-846 method 8015B, for example, targets only a very narrow range of hydrocarbons typically in the "Diesel" or "Gasoline" range (DRO or GRO). This method does not detect oils or greases unless the analyst changes the method and specifically looks for heavier compounds. Requesting 8015B for diesel range hydrocarbons may result in under reporting of the total hydrocarbon contamination if oils or greases are present. Method 418.1 is a more general method and detects any Freon extractable compounds that contain a C-H bond. This method has relatively poor extraction efficiencies in many soil types. For a more complete discussion of the comparability of hydrocarbon methods see Appendix B.

The PetroFLAG system responds to the full range of hydrocarbons; therefore, it will also detect some naturally occurring hydrocarbon-like compounds. (Method 418.1 uses a silica column to remove some of these compounds, but will still pick up naturally occurring terpenes and creosotes, etc.) Therefore, in situations where high organic content is suspected, background levels outside the spill site should be determined. This will help to identify any naturally occurring sources of hydrocarbons that may cause a positive interference with the test. In cases where there exists a high natural organic background, a "Soil Calibration" can, in limited circumstances, be used to correct readings for the positive interference. Note: Because of the broad spectrum screening nature of the test, naturally occurring waxes and oils can cause high readings; however, false negatives or under-reported levels are very unlikely.

The PetroFLAG system is a valuable field analytical tool when used as part of a systematic sampling plan. As part of any site work, always have the hydrocarbon contamination characterized at some point during the project, and always send confirmation samples for closure to a certified laboratory. Because each laboratory method for petroleum hydrocarbons has a different target analyte and different response characteristics, use only appropriate methods for comparison. In addition, the realized performance of laboratory methods for petroleum hydrocarbons varies from one laboratory to another; therefore, verify that the lab you use is proficient with the method you request. Always ask for QA/QC deliverables and verify that the blanks, duplicates and spikes are within specification for the method. If the lab is new to you, send them proficiency samples of known concentrations and varying water content.

Lab results often contain one or more samples that are designated "ND" (none detected) without a qualifier. This type of reporting is misleading because information on the limit of quantification is not included. The designation "ND" never means zero ppm and should be followed by an indication of the detection limits of the method used to obtain the result, e.g., ND<40 ppm. In many cases the detection limits for a method will vary with sample size, dilution factors or extraction procedures and may not be the same for all samples in the sample batch. The detection limits for some of the common lab TPH methods are on the order of 40-50 ppm. Therefore, when comparing lab data it is important to know the realized detection limits implied in any "ND" results.

The PetroFLAG analyzer has been specifically designed to be used with the unique patented chemistry of the PetroFLAG system. The meter is shipped fully calibrated, preset with response factor 5. This calibration is sufficient to begin screening measurements; however, in order to achieve optimum performance the analyzer should be calibrated with each batch of samples, or at least daily. The PetroFLAG analyzer is easy to calibrate and calibration solutions are included with every refill pack.

The PetroFLAG analyzer stores two independent calibration equations in separate memory locations. Each calibration has a unique designation, "rC" or "SC". One way to effectively use this feature is to use one for a "low temp." calibration and one for a "high temp." calibration. This practice is very useful when working at field locations where the ambient temperature varies by more than 10°C over the course of the day. One calibration, run at the lower temperature in the morning, could be stored under "SC" and later as the temperature rises, triggering a temperature warning, a new calibration can be run and stored under "rC". (See below under "Temperature Effects") This feature can also be used to store both a site-specific "soil" calibration as "SC" and a "reagent" calibration as "rC", but, as mentioned above, due to the difficulties associated with a soil calibration, this practice is not recommended and should only be used if very good data is available documenting the uniform presence of background organic material.

Table 1: Response Factors and Method Detection Limits for Common Hydrocarbons

Hydrocarbon Type	Method Detection Limit (ppm)	Response Setting
Transformer Oil	15	10
Grease	15	9
Hydraulic Fluid	10	8
Transmission Fluid	19	8
Motor Oil	19	7
#2 Fuel Oil	25	7
#6 Fuel Oil	18	6
Diesel Fuel	13	5
Gear Oil	22	5
Low Aromatic Diesel	27	4
Pennsylvania Crude Oil	20	4
Kerosene	28	4
Jet A	27	4
Weathered Gasoline	1000*	2

*See Appendix A

Choosing the Correct Response Factor

The microprocessor in the PetroFLAG analyzer uses the calibration data to convert the optical reading into a preliminary concentration. It then uses the selected response factor to calculate the correct concentration for the analyte of interest. It is, therefore, important to choose the response factor that is appropriate for the particular hydrocarbon or class of hydrocarbons present at the site. The response factor can be changed at any time without affecting the stored calibrations. (See "Analyzer Operation Examples: Standard Operation-Changing Response Factor Without Re calibrating")

If the contaminant is known or suspected, choose the appropriate response factor from Table 1 and set that response factor on the analyzer. (See "Analyzer Operation" below.) If there is a mixture of hydrocarbons, use the most conservative response factor (i.e. the lowest) for the contaminants known to be present. If the contaminants are unknown, choose a conservative response factor based on those hydrocarbons that are likely to be on the site. By examining Table 1, it will be seen that the majority of typical contaminants are in response category 5 or above.

Analyzing High Concentration Samples

The PetroFLAG Hydrocarbon Analyzer is pre-programmed to warn the user of an over-range condition. If the over-range reading is outside of the linear range (±10 precision), but still within the quantifiable range (±20% precision), the reading will be displayed blinking. This reading can be used as an indication that the concentration in the sample is not less than the displayed value. (Because the response curve for most analytes is non-linear at high concentrations, the concentration in the sample may be higher than the displayed value.) If the over-range condition is outside of the quantifiable range the display will show a blinking "EEEE". Either error indication can be cleared by simply inserting the next vial and pressing READ.

Often it is necessary to obtain accurate results for soil samples with high contaminant concentrations that would cause an over-range condition on the PetroFLAG analyzer when using a 10 gram sample. To quantify these high samples simply re-extract the soil using a 1 gram sample and re-analyze. Then multiply the result by 10 to obtain the concentration in the sample. Using this procedure, soils containing up to 50,000 ppm of light hydrocarbon contamination can be analyzed or 10,000 ppm of a heaver hydrocarbon. For readings at higher concentrations, a "high range kit" is available. NOTE: Using a smaller sample or a "high range kit" will affect the precision and accuracy of the method as well as raise the MDL in proportion to the dilution factor.

Converting Response Factors for Data Already Collected

If data has been collected using a response factor that is later determined to be the wrong one, the data can easily be converted to the correct reading. To make the conversion simply multiply the measured value by the response factor used to make the measurement and divide by the new response factor.

Temperature Effects on Measurements

The PetroFLAG analyzer is equipped with an onboard temperature sensor to measure the ambient temperature while measurements are being made. The software uses this temperature reading to correct the optical readings for drift caused by temperature fluctuations. The corrections have been determined for effects on the color development and the temperature drift of the electronics.

The PetroFLAG analyzer can be used at temperatures from 4°C to 45°C. The temperature corrections are valid for temperatures within 10°C of the calibration temperature. If a calibration is run with each batch of samples the temperature correction is not significant and measurements can be made at any temperature in the usable range. If, however, no calibration is run and the ambient temperature deviates from the calibration temperature by more than 10°C, an error condition will result. The analyzer will display "Err4" which can only be cleared by pressing "NEXT". Pressing "NEXT" will clear the error and cause the current reading to be displayed. This reading can be recorded, but it should be noted that the ambient temperature was outside of the acceptable 10°C window. Any samples remaining in the series can also be read, however, the same error condition will most likely occur. The meter must then be re-calibrated to eliminate the error condition.

To avoid a temperature error when a calibration is not run with the samples, check the ambient temperature before starting. This can be done by taking a reading without inserting a vial. If a reading is displayed, the temperature is within range and readings can proceed. If an error is displayed the meter must be re-calibrated before proceeding.

As mentioned above, storing two calibrations, run at different temperatures, will help reduce the number of recalibrations required as the temperature changes. If the two calibrations are stored under "SC" and "rC" and are run at temperatures 20°C apart, the effective temperature range becomes 40°C.

Effects of Soil Water Content on PetroFLAG Result

The presence of water in a soil sample will have an effect on the final PetroFLAG result, the most obvious is the effect on the reporting value. As with all field measurements, the PetroFLAG system result is calculated based on the sample weight "as received". If there is water present in the sample, this is a "wet weight" result. This will cause an apparent under reporting by PetroFLAG when comparing the field result with a lab reporting on a "dry weight" basis.

To correct for the difference between "wet weight" vs. "dry weight" in reporting, simply divide the PetroFLAG result by the "fraction solids", where fraction solids is:

FS = Dry Weight/Wet Weight

or:

FS = (100-%water)/100

In addition to the reporting wet weight vs. dry weight difference, the presence of water in a soil sample will also cause a "dilution effect". Because the PetroFLAG solvent system is miscible with water, the water present in the soil will be extracted into the solvent phase. The aliquot filtered into the developer vial will, therefore, be diluted by the presence of the water. To first approximation, the correction for this "dilution effect" is to multiply the PetroFLAG result by one plus the "fraction water" in the sample, where fraction water is:

FW=(Wet Weight-Dry Weight)/Wet Weight

or:

FW = %water/100

The overall correction, to both convert the PetroFLAG result to "dry weight" and to correct for the dilution effect is given by the following equation:

DWCR=R((2/FS)-1)

where:

DWCR = "Dry Weight" Corrected Result
R = Result displayed by PetroFLAG unit
FS = Fraction Solids

where:

FS = (100-%water)/100

The above correction is applicable for typical soil types containing up to approximately 15% water by weight. For heavy clays or samples with higher water content, the effect of water content will vary with analyte and should be determined specifically for each site.

In many cases the effects of water content can be overcome by simply using a smaller sample size. This approach is the simplest and can be used effectively when the reduction in precision due to smaller sample size will still satisfy the overall data quality objective.

In some soils with high water content, the PetroFLAG response can be reduced by poor extraction of the analyte in addition to the reduction due to simple dilution. In these soils, the effect of water content on the extraction efficiency can sometimes be reduced by the addition of anhydrous sodium sulfate.

To treat soils with sodium sulfate, weigh out the appropriate amount of sample (10 grams for a standard analysis) and add up to 10 grams of anhydrous sodium sulfate directly to the sample. Mix thoroughly by either stirring or shaking the sample until the mixture is fee-flowing. Add the extraction solvent and follow the standard analysis procedure.

Treatment with sodium sulfate can improve extraction efficiency, but it will not correct for either the dilution effect or the wet weight/dry weight reporting error. The actual water content contained in the sample should still be determined either in the field or later so that the above corrections for wet weight and dilution effect can be applied to the final result.

Sample Preparation

Each 10-pack of soil reagents contains supplies for 10 tests along with, one blank and one calibration standard. Samples can be run individually or batched. For optimum performance and throughput, samples should be run in groups of 10 samples along with a blank and a standard. If more than 10 samples are to be run at one time or sequentially, the meter need not be re-calibrated, provided that the operating conditions and reaction times are maintained. Total time to analyze 10-15 samples is approximately 20-25 minutes.

Calibration

To ensure accurate quantification and repeatable results, it is recommended that the PetroFLAG meter be re-calibrated with each batch of 10 samples or, at least, daily. The meter is easily calibrated using an extra extraction solvent vial as a blank and the calibration standard supplied with each ten-pack of reagents. The blank and calibration standard can be used without soil as a "reagent calibration" or with clean soil as a site-specific "soil calibration" spike. If there is no verifiably clean soil to use as a blank, do not use a soil calibration; use a reagent calibration. Once clean soil has been identified, it can then be used to prepare site specific standards to calibrate the PetroFLAG meter. NOTE: A soil calibration should be used with extreme caution due to the high likelihood of introducing a negative bias, of unknown magnitude, into the data.

After exiting the calibration mode, all further readings made by the PetroFLAG analyzer will automatically incorporate the selected response factor. Therefore, rereading the calibration standard will result in an incorrect reading, i.e. an over estimation of the concentration, on any response setting other than 10.

NOTE: Once the *blank* and *cal standard* have been read discard them. They will fade with time and cannot be reused; DO NOT USE THEM TO RE-CALIBRATE THE METER OR TO CHECK THE EXISTING CALIBRATION.

Preparing Blanks and Standards

The following description summarizes the procedure for preparing the calibration blank and standard. Read the step-by-step instructions below completely before beginning the calibration process.

To prepare a reagent calibration *blank* and a *standard*, first label two soil tubes, one as the "blank" and the other as the "standard". Add to the *blank* tube the contents of a break-top vial containing extraction solvent. Add the contents of the break-top vial labeled "calibration standard" to the *standard* soil tube. Process the blank and standard exactly as soil samples as described below. (See "The PetroFLAG Test Procedure")

A soil calibration is prepared in the same way, with the additional step of adding 10 grams of uncontaminated native soil to each of the labeled calibration tubes (blank and standard). After the soil has been added proceed as above and process the standards along with the unknown samples.

QA/QC

Performing periodic calibrations of the PetroFLAG meter is one of the most important quality control checks that can be made. In addition to calibrating the PetroFLAG meter, performing a periodic calibration also serves as a quality control check of the entire analysis system. Each time a calibration is performed the individual operator prepares fresh standards following the entire analysis procedure. In order to complete a valid calibration, the resulting test standards must meet the QC acceptance criteria stored in the meter. Each time a calibration is run the meter verifies if the operator is performing the test correctly, e.g., following the correct order of steps, holding to the timing requirements, operating the meter correctly, etc. In addition the meter checks itself. As each calibration is made, the intensity of the test solution is compared to the stored values for acceptance. If the optics have degraded or the electronics are out of spec the calibration will be flagged as an error.

The most important factor, after operator error, affecting the accuracy of PetroFLAG measurements is the ambient temperature. If the temperature varies by more than 10°C from the calibration temperature, the accuracy of the resulting measurement will be affected. Therefore, during each measurement made by the meter, the current ambient temperature is compared to the temperature at calibration. If the difference is more than 10°C, a warning is flashed alerting the operator of the temperature drift. This QC check is transparent to the user unless an error condition exists.

Also transparent to the user is the internal check of the optical system. The PetroFLAG meter was designed with two independent optical channels. If, during a measurement, both channels do not agree, an error will be generated.

In addition to the QC checks performed automatically by the PetroFLAG meter, additional QA/QC procedures should be developed to provide assurances that the data quality objectives of each project are met. The most important part of any SOP would be the inclusion of provisions for insuring that confirmatory samples are sent to a qualified lab for verification of the type of hydrocarbon contamination present. This will also serve as a check of the response factor. If laboratory data indicate that the results are correlated but either high or low, then a new response factor should be calculated and used. If the PetroFLAG results are not well correlated with the lab, then the field techniques should be examined to determine possible sources of error. A lack of correlation may be the result of inhomogeneous samples or it may be due to splitting technique, etc.

A program of field QA/QC should be developed that is compatible with the competing requirements of each user. It should include, at a minimum: periodic soil blanks and equipment blanks, soil spikes, and dupes. Other procedures should be implemented depending on the specific requirements of each site.

The PetroFLAG Test Procedure

1) Prepare soil extraction tubes (plastic tubes with plastic screw caps) and developer vials (small glass vials filled approximately half way with liquid) by clearly labeling each with the appropriate sample ID. Do not write in the center 1/3 of the developer vial, as this may obscure the optical path when the readings are taken. Label the bottom of the vial and/or label the cap using the self-adhesive labels supplied with the reagents.

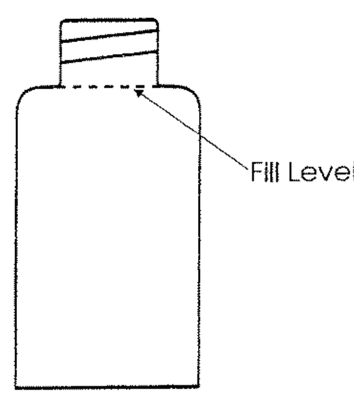
2) Weigh 10 grams (± 0.1 gram) of all unknown soils into labeled plastic screw capped polypropylene tubes.

3) Set timer for 5 minutes. Add one break-top vial of extraction solvent (blue polypropylene top) to the first tube. Start 5 minute timer and shake tube for 15 seconds. Add extraction solvent to each of the remaining tubes, shaking each for 15 seconds (all soil should be fully wet). Shake tubes intermittently for a total of 4 minutes, then let stand for remaining 1 minute.

4) Remove the plunger from a filter-syringe assembly (verify that the filter disk is firmly attached to the syringe barrel) and remove the cap from the first labeled 6 mL glass vial containing developer. Pour free liquid from polypropylene soil tube into syringe barrel (do not add excess soil to syringe as this may plug the filter). Discard the first few drops from filter to waste container, then filter extraction solvent into 6 mL vial. Add extraction solvent drop-wise to developer solution until meniscus just enters the neck (see figure at right), shake for 10 seconds, start 10 minute timer and proceed to next sample. After 10 minutes from the start of the first sample, begin reading the developer vials. (Do not let developer vials stand longer than 20 minutes before reading, as this may result in under-reported values.)

5) If meter is off, turn it on by pressing "READ/ON" and calibrate (optional).

6) To read, place sample vial into reader and press "READ/ON". Be sure that the outside of the vial is clean before reading. Record result on work sheet. Read vials in the same order as they were prepared in.



6 mL Developer Vial

The PetroFLAG analyzer is controlled by a low power consumption micro-computer with the pre-loaded operating program stored in EEPROM memory so it cannot be lost regardless of battery condition. For convenience, the meter stores two calibration curves in separate memory locations. The calibration curves can be independently updated and the response factor can be changed without losing the calibrations.

The PetroFLAG meter is configured to allow easy access to the program modes. The currently active mode is indicated on the LCD display while a reading is in progress. The response factor and the active calibration can be changed from the MAIN MENU using the four buttons on the keypad. The four buttons are:

SCROLL	Scrolls through menu choices.
NEXT	Exits the read mode or skips a menu option without changing or executing. (Also used to clear error conditions.)
READ / ON	Turns the meter on and starts a reading.
SELECT / OFF	Selects a menu choice. Manually turns meter off (only in the *read* mode).

When the PetroFLAG analyzer is turned on it will return to the last mode it was left in. Under normal operation the analyzer will power up in the *read* mode. If the analyzer powers up in the *read* mode, the screen will display the last measured value for two seconds, then display the currently selected calibration curve (rC or SC) and response factor (1-15). The meter is ready to resume measurement. Simply insert a new sample vial and push READ. The display will indicate the calibration curve (either rC or SC) and the response factor (1-15) that is currently selected and, after 5 seconds, will display the measured concentration in ppm.

NOTE: If the battery is disconnected and reconnected, the meter will return automatically to the MAIN MENU. If the calibration curve and response factor displayed are the desired ones, the MAIN MENU can be exited, retaining the calibration data, by pushing NEXT. To return to the *read* mode, continue pressing NEXT until the display shows the calibration curve and the response factor continuously without blinking.

If you wish to exit the *read* mode, push NEXT and operation is returned to the MAIN MENU. The NEXT button is also used to skip a step where a menu selection is required. To change a flashing menu option, for instance to change the response factor, push SCROLL while the option is flashing. To store the currently flashing menu choice, push SELECT. This stores the current choice and moves the flashing cursor to the next program mode.

Selecting a Calibration Curve

Either of the two calibration curves, identified as "rC" and "SC", can be selected from the MAIN MENU. Using either calibration curve, any response factor can be selected. To change the response factor or to recalibrate the unit, use the NEXT button to enter the MAIN MENU screen. Immediately upon entering this menu three decimal points and the response factor will be displayed; next, the first two characters will display the calibration curve that is currently selected (SC or rC). They will blink, indicating that a new curve may be selected. Use the SCROLL button to scroll to the next calibration curve. Push SELECT to select the curve.

The response factor will then blink. Use the SCROLL button to scroll to the desired response factor for the target analyte and SELECT it.

Reading the Blank and Standard

After the response factor has been selected the screen will read CALC for five seconds and then display the calibration temperature. This temperature will remain on the screen until NEXT or READ is pressed. The screen will then prompt you for the "blank" vial by displaying "-bL-". Insert the blank vial and press READ. (See "Preparing Blanks and standards" under "Using the PetroFLAG Hydrocarbon Analysis System.) After 5 seconds the display should read "0" for 2 seconds. The screen will then prompt for the calibration standard "-CSd". Insert the calibration standard and press READ. After 5 seconds the calibration is complete. The meter will then re-read the calibration standard to verify a valid calibration and display "1000". If the concentration is not correct using the newly calculated equation, an error message will flash until NEXT is pushed. If an error condition exists, the previously stored calibration constants will be retained until a valid calibration is completed. (See Appendix C, Table 1: Error Conditions.)

Taking a Reading

After calibration, the meter will then display the calibration curve and response factor currently selected. The meter is ready to read the first sample. After reading a sample (inserting the sample vial and pressing read), the meter will display the concentration in parts per million (ppm) until the READ or NEXT button is pushed. If no button is pushed for a period of five minutes, the meter will automatically turn off. (If the meter turns off automatically, pressing "ON" will turn the meter on and return to the operation mode last used) The meter can be manually turned off, using the OFF button, while in the *read* mode only.

The optical system on the PetroFLAG analyzer is covered with a screw cap to keep out stray light. To remove the cap, simply unscrew it 1/4 of a turn counter-clockwise. After inserting a vial to be read, push the cap over the vial, depressing the spring, and rotate the cap clockwise while holding it down. Turn the cap until it is snug, but do not over tighten.

Power Requirement

The PetroFLAG analyzer is powered by one 9V alkaline battery (included). This battery should last for up to 18,000 readings. If a low battery condition exists "LP" will appear on the display.

Analyzer Operation Examples

Outlined below are step-by-step examples of how to use the PetroFLAG analyzer. Under normal operating conditions the meter will power up in the read mode. The examples given here categorized as "standard operation" assume that the meter was last operated in the read mode. If the meter was left in another mode longer than five minutes or the batteries were removed, see below under special cases.

Standard Operation:

Where the last operation mode was *read*, the calibration data is current and the response factor last used is valid.

1) Turn meter on by pressing:

READ / ON	The last reading will be displayed for 2 seconds. Then the display will show the calibration curve and response factor currently selected. The meter is in the *read* mode.

2) Remove cap, insert vial to be read and tighten cap.

3) To begin reading press:

READ / ON	The display will show the calibration curve and response factor currently selected (blinking), then the display will read CALC for 3 seconds, and finally the result will be displayed.

4) The result will be displayed until the next reading is taken. To make the next reading: remove the vial and repeat steps 2 and 3 above.

Standard Operation-Changing Response Factor Without Recalibrating:

Where the last operation mode was *read* and a different response factor is desired.

1) Turn meter on by pressing:

READ / ON	The last reading will be displayed for 2 seconds. Then the display will show the calibration curve and response factor currently selected. The meter is in the *read* mode.

2) Return operation to the MAIN MENU by pressing:

NEXT	Three decimal points will be displayed along with the current response factor. The calibration curve designation will then begin blinking, indicating that it may be changed.

3) Skip to the response factor entry mode by pressing:

NEXT	The response factor will begin to blink indicating that it may be changed.

4) Scroll to the desired response factor by pressing:

SCROLL	The next response factor will be displayed. Continue pressing SCROLL until the desired response factor is displayed. (Response factors scroll in descending order, i.e., 15-1)

5) After the desired response factor is reached, select it by pressing:

SELECT / OFF

The new response factor has been selected. The meter will now calculate and display the current temperature.

6) Move to the next screen by pressing:

NEXT

The meter will then prompt for the blank to be entered and the calibration procedure to begin by displaying -bL-.

7) Skip over the calibration and move directly to the *read* mode, saving the new response factor but not recalibrating, by pressing (This exits the calibration mode without affecting the current calibration data):

NEXT

The meter will display the current calibration curve and the selected response factor and is ready to read a sample using the new response factor.

8) Proceed with reading a sample by following the procedure for "standard operation" above, beginning at step 2.

Standard Operation With Recalibration:

Where the last operational mode was the *read* mode and the meter is to be re-calibrated. Before proceeding with the calibration procedure, prepare the blank and standard as described in "Using the PetroFLAG Hydrocarbon Analysis System -- Preparing Blanks and Standards" below. The calibration solutions can be prepared using clean soil for a "soil calibration" or with reagents alone for a "reagent calibration". They may also be prepared along with the unknown samples to save time.

1) Turn the meter on by pressing:

READ / ON

The last reading will be displayed for 2 seconds. Then the display will show the calibration curve and response factor currently selected. The meter is in the *read* mode.

2) Return operation to the MAIN MENU by pressing:

NEXT

Three decimal points will be displayed along with the current response factor. The calibration curve designation will then begin blinking, indicating that it may be changed.

3) Scroll to the calibration curve that is to be redetermined by pressing:

SCROLL

The display will show the next calibration curve designation.

or, if the displayed calibration curve is the one to be redetermined, skip directly to the response factor input by pressing NEXT.

4) After the desired calibration is reached select it by pressing:

SELECT / OFF

The calibration curve is now selected and the meter will now prompt for input on the response factor.

5) If the response factor that is displayed is not the desired one, change it by using the SCROLL button as described above under "Standard Operation-Changing the response factor". If the response factor is correct, skip this step by pressing:

NEXT

The meter will now calculate and display the current temperature.

6) Move to the next screen by pressing:

NEXT

The meter will then prompt for the blank to be entered and the calibration procedure to begin by displaying -bL-.

7) Remove cap and insert previously prepared blank, replace cap and begin calibration by pressing:

READ
ON

The display will blink showing the selected cal curve and response factor. The meter will display "0" for three seconds and then prompt for the calibration standard by displaying -CSd.

8) Remove cap and blank vial and insert the calibration standard vial. Read the standard by pressing:

READ
ON

The display will blink showing the selected cal curve and response factor. The display will read "1000" for three seconds and then display the currently selected calibration curve and response factor continuously. The meter is in the read mode.

9) Proceed with reading the unknown samples by following the procedure for standard operation above, beginning at step 2.

Special Operating Conditions:

Operation of the Meter After the Battery has Been Disconnected:

If the battery has been disconnected the microprocessor will automatically return to the MAIN MENU. The steps to follow are described above. The operations to be preformed will determine the exact steps followed.

Meter Left to Turn Off in Other Mode:

If the meter is left in any "screen" for five minutes then the meter will automatically shut off. The meter will then return to that screen when the ON button is pressed.

Helpful Suggestions and Safety Precautions

If PetroFLAG test results indicate no hydrocarbons are present, the sample can be sent in for certified laboratory confirmatory analysis. All environmental soil sampling used for final closure should be performed using methods that are approved by the local regulating agency.

Personal protection should be worn during soil sampling and testing. At a minimum latex gloves and goggles should be worn.

Decontamination stations should be set up using appropriate cleaners and rinsing solutions. Soil sampling equipment not supplied with the reagent pack should be decontaminated between sampling locations to prevent the possibility of cross contamination.

All reagents and sampling scoops supplied with the kit are single-use disposable items. Do not reuse spoons, tubes, filters, or vials. (The electronic balance is NOT disposable)

Check ambient temperature BEFORE extracting soils, if a calibration is not planned for the current batch of samples.

Before adding the soil extract to a filter syringe check to be sure that the filter disk is screwed on tightly.

Do not leave the PetroFLAG analyzer in direct sunlight when not in use. Keep it in the protective carrying case with the lid closed.

Make sure that the contamination at the site is characterized at some time during the investigation.

Avoid sampling organic matter. Scrape away organic material (leaves, sticks, etc.) before sampling.

Avoid sampling directly under pine, cedar, and fir trees unless the sample is collected below the organic layer. Do not collect a sample from an area where tree roots have been encountered.

Avoid sampling directly beneath creosote bushes, sage brush and other oil bearing plants.

Commonly Asked Questions

What are the response factors?

A response factor (RF) is the relationship between your analyte of interest and the calibration standard. The turbidity formed in the development solution is compared to the standard and then a calculation is made to provide the correct concentration for your contaminant. For Example: Equal concentration of diesel and mineral oil do not form the same turbidity. Take the RF of 10 for mineral oil and divide by the RF of 5 for diesel and the result is 2. Therefore, mineral oil forms twice the turbidity of diesel at the same concentration. Put another way 250ppm mineral oil forms the same turbidity as 500 ppm diesel. For more information please see Appendix A in you Manual.

Why doesn't my calibration standard read 1000ppm when I re-read it after calibrating?

This is directly related to the first question. The calibration standard is 1000 ppm mineral oil, therefore, if you read it on any RF other than 10 you will get a different number.

How long are my samples good for after they develop for 10 minutes?

The PetroFLAG development is a temporary reaction, so your reading should be taken right at the end of the 10 minute development period. The turbidity will continue to develop and then begin to fade so no measurements should be taken at all after 20 minutes. This means you must record your data because you cannot save your sample vials for future analysis.

After I prepare a set of calibration solution how long are they good for?

Since the PetroFLAG development chemistry fades over time they are only good for a single use.

The screen is displaying and error code, what does it mean?

See the reference in Appendix D for a list of error codes.

What can I do if my reading is over-range?

Process a new sample using a 1 gram soil sample and multiply the end result by 10. This sample dilution will allow you to read up to 10,000-15,000 ppm on most samples (1-1.5%).

Caution

When opening the break-top ampules DO NOT remove the plastic sleeve from the top. It is there for your protection. Removing it may result in personal injury.

The Extraction Solvent and Calibration Standards contain methanol and are Flammable and Poisonous.

Wear rubber gloves and safety glasses while performing tests.

Dispose of all used reagents and soil properly.

Read the Material Safety Data Sheet before performing test.

Manufacturer's Warranty

The reagents and supplies used in the PetroFLAG test are warranted to be free of defects in material and workmanship until the expiration date stamped on the box. Manufacturer's sole and exclusive liability under this warranty shall be limited to replacement of any materials that are proved to be defective. Manufacturer shall not be liable for any incidental or consequential damages.

Reliable test results are highly dependent upon the care with which the directions are followed and, consequently, cannot be guaranteed.

Appendix A: PetroFLAG Response Curves

Most fuels, lubes and greases are complex mixtures of various hydrocarbons having a broad range of physical and chemical properties. The PetroFLAG system will detect a majority of the ecologically important hydrocarbon mixtures. The PetroFLAG responses to some typical hydrocarbon contaminants are plotted in figure 1[5].

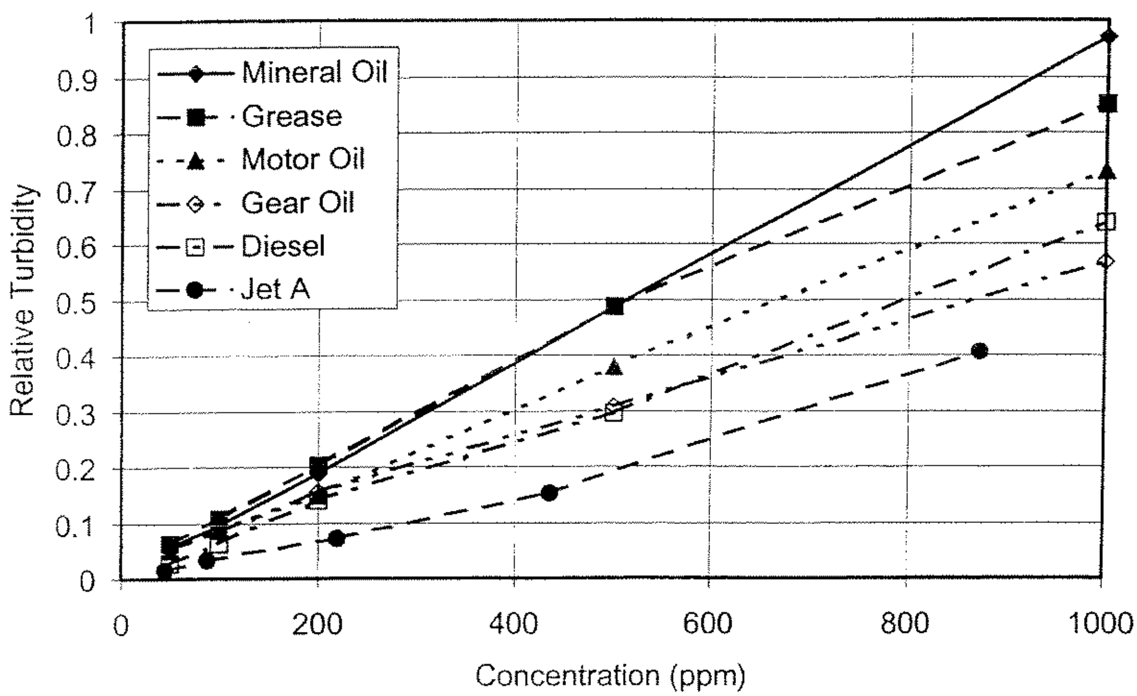


Figure 1: Relative Intensity Data for Common Analytes

[5]The lower limit of quantification, using a 10 gram sample size, is 1000 ppm for gasoline (linear range from 1000 ppm to 5,000 ppm). Brake fluid, phosphate ester based hydraulic oil, or other water soluble compounds will not be detected by the PetroFLAG system.

Appendix B: Comparison with Laboratory Methods

In field trials, the PetroFLAG system was used at sites contaminated with diesel fuel or with oil and grease. In both cases the PetroFLAG results correlated very well with EPA laboratory methods. Both EPA methods 8015B and 418.1 were used to analyze the samples from the diesel site. The resulting correlations were 89% and 92% respectively[6]. The samples from the oil and grease site were analyzed using EPA method 418.1 for soil. The lab results confirmed the PetroFLAG results with no false negatives and only 2 false positives (10%). When comparing the field results and the lab results for the field split samples, the correlation between the PetroFLAG data and EPA method 418.1 for the laboratory split samples was 90%[7].

When comparing the PetroFLAG field results with laboratory results using EPA methods it is important to keep in mind that EPA laboratory methods for TPH are known to have variable extraction efficiency. The extraction efficiency achieved using EPA laboratory methods varies with soil type and moisture content. In addition, the degree to which moisture affects the extraction is dependent on how the individual laboratory is implementing the method. It is, therefore, important to verify that the lab used for comparison is performing the method properly and that the recovery is known.

Another important factor affecting laboratory confirmation analysis is the inhomogeneous nature of soil samples. Whenever possible, homogenize samples using standard methods[8] before taking "splits" to send to the lab for confirmation.

---

[6]Wright, Keith A., "Evaluation of a New Field Test Kit for Determining Total Petroleum Hydrocarbon Concentrations in Soil at a Site Contaminated by Diesel Fuel", Presented at the AEHS Conference on "Hydrocarbon Contaminated Soils", January 11-13, 1995, New Orleans, LA.

[7]Wright, Keith A. and Jermstad, David B., "Evaluation of a Rapid Field Analytical Test Kit for Assessing Hydrocarbon Soil Contamination", Presented at the "Third International Conference On-Site Analysis", January 22-25, 1995 Houston, TX.

[8]See for example: Pitard, Francis F., Pierre Gy's Sampling Theory and Sampling Practice, Volumes 1 and 2, CRC Press, Inc., Boca Raton, FL, 1992).

Appendix C: Determining the Response Factor for Hydrocarbons Not Listed in Table 1

The response factors listed in table 1 are calculated from response curves similar to those in figure 1 in appendix A. The response factor is equal to the slope of the response curve multiplied by 10. The slope of the response curve for the analyte is calculated from the response of the specific analyte relative to the response of the calibration standard. The calibration standard has a slope of one and a response factor of 10 on the PetroFLAG meter. Multiplying the slope of a specific analyte's response curve by 10 yields the appropriate response factor for that analyte.

If a suspected contaminant is not listed in table 1, there are a few easy methods that can be used to determine the response factor. Which one to use is determined by the information and facilities available. The most accurate method would be to replicate the data in figure 1 for the specific analyte, and then calculate the response factor from the slope of the response curve.

To begin, prepare soil standards from a single homogeneous batch of clean soil spiked at a minimum of 5 concentrations between 100 and 1000 ppm. (For light hydrocarbons a higher concentration range can be used.) Analyze the soils in triplicate using a calibrated PetroFLAG meter set to response factor 10. Plot the results with the true spiked concentration on the "X" axis and the meter reading on the "Y" axis. The slope of the regression line (least squares line) through the data points multiplied by 10 is the response factor to use for this analyte. To avoid a low bias and false negatives, round the resulting number down to the nearest whole number when selecting the response factor on the meter. This method can be used if either the contaminant is known or a sample of the neat product is available.

NOTE: If the soil used to prepare the spiked soil standards was not actually clean but contained some hydrocarbons the curve will have a positive intercept. This should not affect the calculated response factor provided that the highest spiked standard does not read higher than 1000 ppm on the PetroFLAG meter.

If the contaminant is unknown and a sample of the pure product is not available then an alternative method can be used. The PetroFLAG results, with the meter set to response factor 10, can be compared with laboratory results from split samples analyzed in triplicate. This method requires extreme care in homogenizing the bulk material and preparing the split samples. Improper sample preparation can result in errors of 100 to 200% or more. To minimize the effects of sample variation, as many samples as possible should be analyzed (greater than 20) and the concentrations should be evenly distributed over the range 100 to 1000 ppm. Once the data has been collected, plot the data as above using the laboratory reference method results as the known concentration. The slope of the regression line multiplied by 10 is then the response factor.

NOTE: This method is not as precise as the spike method and any bias in the laboratory method will result in an error in determining the response factor. It is important to check the laboratory method, and the lab performing it, thoroughly before using it as the reference method. (See appendix B)

If the facilities are not available to perform these tests contact Dexsil for advice.

Appendix D: Error Conditions

Table 2: Error Conditions

Message	Cause	Solution
Flashing Concentration Reading Applies to Unknown Measurements	Over range condition. Sample concentration outside of linear range.	Use smaller sample (1 gram recommended) and rerun.
Flashing "EEEE" Applies to Unknown Measurements	Sensor over range condition. Sample concentration too high.	Use smaller sample (1 gram recommended) and rerun.
"Err0" Applies to Calibration Mode	Blank and Cal Standard vials mixed up. Blank or Cal Standard outside of QC window (CSd too low or bL too high).	Check calibration vials. Rerun and/or make up new ones.
"Err1" All Modes	Readings from the two optical channels do not agree.	Check vial and reread. If error remains, rerun using another vial.
"Err2" Applies to Unknown Measurements	Sample is reading lower than the blank, e.g., calibration Blank soil unusually high background or not zero.	Recalibrate using true Blank soil.
"Err3" Applies to Calibration Mode	Blank or Cal Standard outside of QC window bL too low or CSd too high.	Recalibrate using fresh solutions.
"Err4" Applies to Unknown Measurements	Absolute temperature difference between calibration and reading exceeds 10 C.	Recalibrate at current temperature.
"Err5" All Modes	Ambient temperature outside of operating range. (4°C - 45°C)	Remove meter and reagents to climate controlled environment to recalibrate/rerun.
"LP"	Low Power	Replace battery.

Appendix E: Meter Specifications

A/D Resolution:	0.5 ppm
Display Resolution:	1 ppm
Precision:	Analyte Dependent From MDL to Max Linear Range (MLR) ±10% +5 ppm From Max Linear Range to Max Quantifiable Range (MQR) ± 20%
Measurement Range:	10-10,000 ppm (linear range analyte dependent)
Operating Temperature:	4 °C to 45 °C

Quantification Limit:

Analyte Dependent Response Factor	Approx. MLR (ppm)*	Approx. MQR (ppm)*
15	730	1,460
10	1,000	2,000
5	2,000	4,000
2	5,000	10,000

*Actual limits realized in the field are temperature and device dependent. PetroFLAG meter automatically warns user when each limit has been reached.

Program Storage:	EEPROM
Calibration Storage:	EEPROM
Display:	4 digit ½ inch seven segment LCD
Batteries:	One 9V Alkaline (included)
Battery Life:	18,000 Measurements (using a 550 mAh alkaline battery)
Dimensions:	length=5.75" width=3.5" height=2"
Weight:	9.85 oz (280 g)

DECLARATION OF CONFORMITY

Application of Council Directive (s): 89/336/EEC-93/68/EEC

Standards(s) to which conformity is declared: EN 55011B:1991, IEC 801-2, IEC 801-3

Manufacturer's Name: Dexsil Corporation

Manufacturer's Address: One Hamden Park Drive
Hamden, CT 06517

Importer's Name: Dexsil Corporation

Importer's Address: One Hamden Park Drive
Hamden, CT 06517

Type of Equipment: Hand-Held Hydrocarbon Analyzer

Model No.: PetroFLAG

Serial No..- NA

Year of Manufacture: 1996

I, the undersigned, hereby declare that the equipment specified conforms to the above Directive(s) and Standard(s).

Place: Hamden

Date: April 15, 1996

Theodore B. Lynn, Ph.D.
Director of Research

DEXSIL CORPORATION
PETROFLAG ANALYZER
SIX MONTH LIMITED WARRANTY

DEXSIL CORPORATION warrants your PETROFLAG ANALYZER against defects in material or workmanship for a period of six months from the date of purchase. During the warranty period, any product which is determined by DEXSIL to be defective in material or workmanship and returned to DEXSIL as specified below, will be, as the exclusive remedy, repaired or replaced at DEXSIL's option. The cost of replacement or repair is included, but the customer pays the transportation costs.

Should you feel your PETROFLAG ANALYZER is defective contact a DEXSIL representative at the address below to obtain a return authorization:

DEXSIL CORPORATION
ONE HAMDEN PARK DRIVE
HAMDEN, CT 06517
TEL: (203) 288-3509
FAX: (203) 248-6523

Upon return of your unit it will be inspected and you will be advised whether the product is defective. If defective, arrangements will be made for repair or replacement without extra charge to you.

THE WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. DEXSIL SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

DEXSIL CORPORATION IS NOT LIABLE FOR INDIRECT OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE USE OF THE PRODUCT.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This Warranty applies only to parts or components which are defective and does not cover repairs necessary due to normal wear, misuse, or accidents. All warranty repairs reimbursable under this warranty must be performed by DEXSIL CORPORATION or its representative using approved replacement parts.

Repairs or attempted repairs by anyone other than a DEXSIL representative are not reimbursable under this warranty. In addition, these unauthorized repair attempts may result in additional malfunctions, the correction of which is not covered by warranty.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Material Safety Data Sheet

To comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

PETROFLAG TEST KIT

Section I --- Manufacturer

Manufacturer's Name:
Dexsil Corporation

Emergency Telephone Number:
USA (800) 424-9300 (CHEMTREC)
INT'L (202) 483-7616

Address:
One Hamden Park Drive
Hamden, CT 06517

Telephone Number:
(203) 288-3509

Date Prepared: 09-30-98
Date Reviewed: 09-30-98

Section II --- Identification of Hazardous Ingredient

The PetroFLAG Test Reagent Kit consists of two snap ampules (extraction solvent and calibration solvent) and a screw top vial. Screw top vial contents are non-hazardous.

Component	Contents	TLV/ (PEL)	CAS #	Hazard Class& (Subsidiary-risk)	UN Number
Ampule 1 "Extraction Solvent"	Methanol Solution	200 ppm/ (200 ppm)	67-56-1	3 Flam Liquid &(Poison)	1230
Ampule 2 "Calibration Standard"	Methanol Solution	200 ppm/ (200ppm)	67-56-1	3 Flam Liquid & (Poison)	1230

Section III --- Physical Characteristics

Property	*Ampule 1*	*Ampule 2*
Boiling Pt °C	64.5	64.5
Vapor Pressure mm Hg @ 21°C	97	97
Solubility in Water	miscible	miscible
Specific Gravity	0.79	0.79
Percent Volatile	99.9	99.9
Evaporation Rate Butyl Acetate =1	5.9	5.9
Appearance	clear, colorless	clear, colorless
Odor	pleasant	pleasant

Section IV --- Fire and Explosion Hazard

Flash Point	Ampule 1	50°F
	Ampule 2	50°F

Flammable Limit Unknown

Extinguishing Media Dry chemical, foam, CO_2.

Special Fire Fighting Procedures None

Section V --- Reactivity Data

Stability
All components are stable.
Incompatible With
None
Hazardous Decomposition Productions
Solutions are stable.
Hazardous Polymerization
Will not occur.
Conditions to Avoid
Excessive heat.

Section VI --- Health Hazard Information

First Aid
In case of contact with reagents, rinse well with water. If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat.

Eye Contact
For all kit components, flush eyes with large amounts of water for 15 minutes. Seek medical attention.

Skin contact
Flush with large amounts of water. Use soap and water to wash away organic components.

Inhalation
In case of inhalation, remove to fresh air.

Toxicological Information
Harmful if inhaled or swallowed. Exposure may cause skin irritation and may be harmful if absorbed through the skin. Ingestion will cause gastrointestinal distrubances. Methanol component is identified on lists in CERCLA, SARA Sec. 313 and TSCA.

Section VII --- Spill, Leak and Disposal Procedures

Spills and Leaks	*Ampule 1 - Methanol solution* Solvent absorbent recommended for spills. Flush area with water. *Ampule 2 - Methanol solution* Solvent absorbent recommended for spills. Flush area with water.
Disposal	Used reagents contain oil and solvent. Dispose of as an organic waste in accordance with all applicable federal, state and local environmental regulations.

Section VIII --- Special Protection Information

Respiratory protection	None required during normal use.
Ventilation	Perform test only in a well ventilated area.
Protective gloves	Always wear rubber gloves when performing the PetroFLAG test.
Eye protection	Wear safety glasses.
Other protective equipment	Wear appropriate safety equipment when performing test on site.

Section IX --- Special Precautions and Comments

Storage and Handling Information
Store test kits in a cool, dry place. Check expiration date prior to performing test.

DOT Class
3 Flammable liquid

NA = Not available or not applicable
NF = Not found
NE = Not established

The information in this Material Safety Data Sheet meets the requirements of the United States OCCUPATIONAL SAFETY AND HEALTH ACT and regulations promulgated thereunder (29 CFR 1910.1200 et. seq.) and the Canadian WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. This document is intended only as a guide to the appropriate precautionary handling of the material by a person trained in, or supervised by a person trained in, chemical handling. The user is responsible for determining the precautions and danger of these chemicals for his or her particular application. Depending on usage, protective clothing including eye and face guards and respirators must be used to avoid contact with material or breathing chemical vapors/fumes. Exposure to this product may have serious adverse health effects. These chemicals may interact with other substances. Since the potential uses are so varied, Dexsil cannot warn of all of the potential dangers of use or interaction with other chemicals or materials. Dexsil warrants that the chemicals meet the specifications set forth on the label.
DEXSIL DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
The user should recognize that this product can cause severe injury and even death, especially if improperly handled or the known dangers of use are not heeded. READ ALL PRECAUTIONARY INFORMATION. As new documented general safety information becomes available, Dexsil will periodically revise this Material Safety Data Sheet.
CHEMTREC emergency telephone number is to be used ONLY in the event of CHEMICAL EMERGENCIES involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to the Customer Service Dept. at 1-203-288-3509.

For additional information, contact Dexsil. Rev.0

PetroFLAG Soil Test Kit - TipSheet-

Notes/helpful hints:
10 gm range is 1-1,000 ppm
1 gm range is 1,000-10,000 ppm
Calibrate first, then prep samples.
Use white dots on glass vials.
Write on blue cap on plastic vials (can't read the numbers when it's on the side)
Have cap off of the glass vial before adding extraction to plunger tube… the plunger tube will leak while you dink around with the caps.

Beginning of the day:
Both meters are currently set for rC…5 (diesel)
Calibrate:

1. Turn on the meter [READ/ON]
2. Press [NEXT] (Cal response factor will begin blinking]
3. Press [SELECT]
4. Press [NEXT] (The meter will CALCulate and display the current temp)
5. Press [NEXT] (The meter will display -bL-)
6. Place Blank in meter, replace cap and press [READ] (Display rC-5, 0, then –CSd)
7. Remove Blank, place STD vial in meter, press [READ] (Display rC-5, 1000, then rC-5. Now it's in read mode)

Prepare soil samples:
Have a waste jar (8 oz soil jar) available for methanol, and a couple of large Ziploc baggies for syringes and spatulas.

1. **weigh 10 grams** into blue cap vial
2. **set timer for 5 minutes**
3. **add extraction solution** (blue crack-top ampule) to soil; be sure cap is on tight!
4. **start timer**
5. **shake 15 seconds**
6. **add extraction solvent to each of the remaining tubes, shaking each for 15 seconds**
7. **shake tubes intermittently for 4 minutes, then let stand for 1 minute**
8. **remove cap** from labeled 6 ml glass vial (developer)
9. **pour free liquid from soil tube into syringe barrel** - avoid adding soil to syringe barrel – carefully place plunger in barrel
10. Discard the first couple of drops of solution into waste container
11. **Filter extraction solution into glass vial until it reaches the neck of the vial**; tighten cap securely
12. **Shake vial for 10 seconds, start the 10-minute timer and proceed to next sample**
13. **Begin reading the first vial after 10 minutes** – (do not let developer vials sit for more than 20 minutes)
14. **Turn on meter**
15. Be sure vial is clean – the meter shines a beam of light through it, and any solvent or pen will give a reading that is biased high.
16. **Place first vial in meter, replace cap, press [READ]**

Disposal:

Supplies:

- 2 x 8 oz soil jars (1-methanol, 1-soil) (or 4 oz jars for methanol, depending on amounts generated)
- large Ziploc baggies
- safety glasses
- nitrile gloves

1. Blue cap vials of spent soil/ext solvent: Decant off any extra methanol into methanol waste jar. Dump soil into soil waste jar.
2. Developer vials: Pour solvent into methanol waste jar.
3. Syringes, spatulas and blue cap vials: Collect used materials in Ziploc baggie – trash/PPE waste stream.

The soil and methanol jars can be submitted to the primary laboratory for disposal. Be sure to package them securely so that they do not break, and keep separate from analytical samples. Mark them clearly for disposal; include copy of MS/DS and label methanol waste properly for shipment. *Remember*: only 500 milliliters of methanol can be shipped per container. An 8 oz soil jar is ~ 250 milliliters. (A 4 oz jar is ~ 125 milliliters, so you may want to use 4 oz jars for the methanol waste.)

UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SS83 REMOVAL ACTION WORK PLAN
APPENDIX A - SAMPLING AND ANALYSIS PLAN
PART 2 - QUALITY ASSURANCE PROJECT PLAN

FINAL

JULY 2004

TABLE OF CONTENTS

SECTION **PAGE**

ACRONYMS AND ABBREVIATIONS v
1.0 PROJECT DESCRIPTION 1-1
1.1 BACKGROUND 1-1
1.2 OBJECTIVE AND SCOPE 1-1
1.2.1 Screening Data 1-2
1.2.2 Definitive Data 1-2
1.3 APPLICABILITY 1-4
2.0 ORGANIZATION AND RESPONSIBILITIES 2-1
2.1 PROJECT ORGANIZATION 2-1
2.2 PROJECT RESPONSIBILITIES 2-1
2.2.1 Jacobs Personnel 2-1
2.3 LABORATORY PERSONNEL 2-2
3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA 3-1
3.1 QUANTITATIVE QA OBJECTIVES 3-1
3.2 QUANTITATIVE DATA QUALITY INDICATORS 3-2
3.2.1 Accuracy 3-2
3.2.2 Precision 3-2
3.2.3 Completeness 3-3
3.2.4 Sensitivity 3-3
3.3 QUALITATIVE QUALITY ASSURANCE OBJECTIVES 3-4
3.3.1 Representativeness 3-4
3.3.2 Comparability 3-4
3.3.3 Traceability 3-4
4.0 SAMPLING PROCEDURES 4-1
4.1 SAMPLING PROCEDURES 4-1
4.2 SAMPLE CONTAINERS 4-1
4.2.1 Sample Preservation and Holding Times 4-1
4.3 SAMPLING EQUIPMENT DECONTAMINATION 4-1
5.0 CALIBRATION PROCEDURES AND FREQUENCY 5-4
6.0 ANALYTICAL PROCEDURES 6-4
6.1 LABORATORY ANALYTICAL DATA 6-4
7.0 SAMPLE CUSTODY 7-4
7.1 SAMPLE CUSTODY DEFINITION 7-4
7.2 SAMPLE CUSTODY DOCUMENTATION 7-4
7.2.1 Responsibilities and Procedures 7-4
7.3 FIELD DOCUMENTATION 7-4
7.4 PACKAGING AND SHIPPING REQUIREMENTS 7-4
8.0 INTERNAL QUALITY CONTROL CHECKS 8-4

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

8.1 FIELD QUALITY CONTROL SAMPLES 8-4
8.1.1 Field Duplicate Samples 8-4
8.1.2 Equipment Blanks 8-4
8.1.3 Trip Blanks 8-4
8.1.4 Temperature Blank Samples 8-4
8.2 LABORATORY QUALITY CONTROL SAMPLES 8-4
8.2.1 Blanks 8-4
8.2.2 Matrix Spike and Matrix Spike Duplicate Samples 8-4
8.2.3 Surrogate Spikes 8-4
8.2.4 Laboratory Control Samples (LCS) 8-4
8.2.5 Spike Sample Analysis 8-4
8.2.6 Matrix Duplicate Sample Analysis 8-4
9.0 CALCULATION OF DATA QUALITY INDICATORS 9-4
9.1 ESTIMATION OF PRECISION, ACCURACY, AND COMPLETENESS 9-4
9.2 PERFORMANCE AND SYSTEM AUDITS 9-4
9.2.1 Field Audits 9-4
9.2.2 Laboratory Audits 9-4
9.2.3 Documentation Audit 9-4
10.0 PROCEDURES USED TO ASSESS DATA QUALITY 10-4
10.1 LABORATORY DATA REDUCTION 10-4
10.2 DATA VERIFICATION PROCEDURES 10-4
10.3 DATA VALIDATION PROCEDURES 10-4
10.4 ELECTRONIC DATA MANAGEMENT SYSTEMS 10-4
10.5 DATA REPORTING 10-4
11.0 CORRECTIVE ACTION 11-4
11.1 CRITERIA FOR DATA ACCEPTABILITY 11-4
11.2 RESPONSIBILITY AND AUTHORITY 11-4
11.2.1 Project Activities 11-4
11.2.2 Field Activities 11-4
11.2.3 Laboratory Activities 11-4
11.2.4 Documentation and Distribution 11-4
12.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT 12-4
12.1 RESPONSIBILITY 12-4
12.2 QUALITY ASSURANCE REPORTS 12-4
13.0 REFERENCES 13-4

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

TABLES

Table 1-1 Descriptive Data Categories 1-3
Table 4-1 Sample Containers, Sample Preservation, and Holding Times 4-2
Table 8-1 Quality Control Sample Summary 8-4

(intentionally blank)

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CEMRD-L	U.S. Army Corps of Engineers Missouri River Division Laboratory
CLP	Contract Laboratory Program
CoC	chain of custody
CT&E	CT&E Environmental Services, Inc.
DAR	Data Assessment Report
DOT	U.S. Department of Transportation
DQO	data quality objective
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resources Program
ERPIMS	ERP Information Management System
FSP	Field Sampling Plan
GC/MS	gas chromatograph/ mass spectrometry
GRO	gasoline-range organics
Jacobs	Jacobs Engineering Group Inc.
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LECL	laboratory-established control limits
MB	method blank
mL	milliliter
MQL	method quantitation limit
MS	matrix spike
MSD	matrix spike duplicate
PAH	polycyclic aromatic hydrocarbon
PB	preparation blank
PCB	polychlorinated biphenyl
QA	quality assurance
QAO	quantitative QA objectives
QC	quality control
QAPP	Quality Assurance Project Plan
RA	Removal Action
RPD	relative percent difference
RRO	residual-range organics
SAP	Sampling and Analysis Plan

ACRONYMS AND ABBREVIATIONS
(continued)

SB	sampling blank
SOP	standard operating procedure
SOW	scope of work
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 PROJECT DESCRIPTION

1.1 BACKGROUND

This Quality Assurance Project Plan (QAPP) is the second of three parts of the Sampling and Analysis Plan (SAP) for the SS83 Removal Action (RA) at Elmendorf Air Force Base (AFB), Alaska.

1.2 OBJECTIVE AND SCOPE

This QAPP presents the standard operating procedures, quality assurance (QA) procedures, quality control (QC) measures, and measurement objectives of chemical analysis associated with the field sampling program addressed in the Work Plan.

The objective of the SS83 RA is to remove contamination not addressed during the 2000 Engineering Evaluation/Cost Analysis (USAF 2002). Tasks for achieving that goal are as follows:

- Remove petroleum, oil and lubricant-contaminated soil at six areas within SS83.
- Remove two underground storage tanks (USTs) at the Large Foundation Area.
- Conduct an investigation to determine whether a drainpipe exists at the Large Foundation Area and, if so, remove it.

The purpose of this QAPP is to provide appropriate QA procedures and QC measures to be applied to all activities related to the sampling of soil and groundwater, with particular emphasis on:

- Sample collection and preservation
- Sample handling and documentation
- Laboratory analyses
- Data validation and interpretation
- Data presentation

The Field Sampling Plan (FSP, Part One of the SAP) details field assessment activities such as excavation of soil. In addition, the FSP details field sampling procedures, field documentation requirements, sampling equipment decontamination procedures, and sample collection summaries.

Data Quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to ensure that work performed is consistent with the project objectives and end uses of the data. Different data uses may require different categories of data quality.

Two descriptive data categories (EPA 1993) have been developed to address various data uses and the QA/QC elements required to achieve the desired level of quality. Table 1-1 summarizes the characteristics and data QA/QC elements of the descriptive data categories. These DQO levels are described below.

1.2.1 Screening Data

Data generated by screening instrumentation and procedures involve less-precise measurement (than laboratory analysis) with rapid results available in real time or within hours. Less rigorous sample preparations than are used to generate definitive data (e.g., extractions, digestions, and cleanup procedures) are employed in order to generate rapid results. Screening data are also often used for health and safety monitoring at the site and to locate areas for subsequent and more accurate analyses.

1.2.2 Definitive Data

Data generated as definitive data involve rigorous U.S. Environmental Protection Agency (EPA) reference methodology. Data results will be quantitative with a known and documented analytical precision and accuracy. The compound identity or qualitative results will be confirmed by method-specific requirements. Hardcopy raw documentation is generated as a basis for the data validation process and preparation of a data assessment report (DAR).

All analytical data for this SS83 RA will be generated as definitive data. Rigorous SW-846 analytical procedures (EPA 1986) and updates to methodology (EPA 1994b; 1996), and Alaska Department of Environmental Conservation (ADEC) methodology (ADEC 1999a) will be utilized to produce data applicable to risk-based evaluation (EPA 1990) and for comparability with past data collection activities. Data validation procedures in accordance with EPA-recognized protocol (EPA 1994a; 1999) will be implemented.

Table 1-1
Descriptive Data Categories

Descriptive Data Categories	Characteristics	Data QA/QC Elements
Screening Data	• Rapid, less precise methods. • Less rigorous sample preparations involving extraction, digestion, cleanup procedures. • Analyte identification. • Semiquantitative (less precise) to quantitative. • Results in real time or within hours.	• Completed field logbook. • Sample documentation. • Chain-of-custody forms. • Sampling Design Approach (systematic, random, judgmental, etc.). • Initial and Continuing Calibrations. • Determination and documentation of detection limits. • Analyte(s) identification. • Analyte(s) quantification. • Analytical Error Determination. – Appropriate number (defined in QAPP) of replicate analysis (minimum 1) from homogenized sample for determination of analytical bias and precision. • Definitive Confirmation. – Minimum 10 percent of screening data are confirmed by Definitive Data Category. – Minimum 3 screening samples reported above an applicable action level and 3 screening samples reported below action level (can be non-detects: ND) confirmed by Definitive Data Category.
Definitive Data	• Rigorous Analytical Methods (EPA,). • Quantitative. • Qualitative with confirmation of identity. • Analyte-specific. • Raw data documentation is generated. • Fixed laboratory.	• Completed field logbook. • Sample documentation. • Chain-of-custody forms. • Sampling Design Approach (systematic, random, judgmental, etc.). • Initial and continuing calibrations. • Determination and documentation of detection limits. • Analyte(s) identification. • Analyte(s) quantification • QC blanks (trip, method, rinsate). • Matrix spike recoveries (MS/MSD). • Performance evaluation samples (when specified). • Analytical Error Determination. – Appropriate number (defined in QAPP) of replicate analysis (minimum 1) from homogenized sample for determination of analytical bias and precision. Comparisons are made to method-specific performance criteria. • Total Measurement Error Determination. – Appropriate number (defined in QAPP) co-located samples submitted "blind" to laboratory are analyzed and precision determined. Comparisons are made to measurement error goals.

Notes:

MS/MSD = matrix spike/matrix spike duplicate
For additional definitions, see acronyms and abbreviations list.

1.3 APPLICABILITY

This QAPP is applicable to all project activities associated with the organization, laboratory, and field activities performed in support of data collection activities. Project organization, objectives, functional activities, and specific QA and QC activities are described in this document as follows:

Section 2.0 Organization and Responsibilities
Section 3.0 Quality Assurance Objectives for Measurement Data
Section 4.0 Sampling Procedures
Section 5.0 Calibration Procedures and Frequency
Section 6.0 Analytical Procedures
Section 7.0 Sample Custody
Section 8.0 Internal Quality Control Checks
Section 9.0 Calculation of Data Quality Indicators
Section 10.0 Procedures Used to Assess Data Quality
Section 11.0 Corrective Action
Section 12.0 Quality Assurance Reports to Management
Section 13.0 References

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT ORGANIZATION

This section describes the organizational structure, lines of authority, and responsibilities of key individuals for the project. The organizational structure is designed to provide clear lines of responsibility and authority for the following:

- Identifying lines of communication and coordination
- Monitoring project schedule and performance
- Coordinating support functions such as laboratory and data management

2.2 PROJECT RESPONSIBILITIES

Responsibilities of the key positions for the SS83 RA are described below.

2.2.1 Jacobs Personnel

Jacobs Engineering Group Inc. (Jacobs) is responsible for implementing the project, including SAP design; sample collection; requesting analytical services; data processing, interpretation, and presentation; and the QA procedures and QC measures associated with these activities.

- The Project Manager has overall responsibility for ensuring proper completion of the agreed-upon scope of work (SOW). The Project Manager assists in resolving any technical, contractual, financial, or scheduling problems.
- The Field Team Leader is responsible for implementing the field investigation in accordance with the SAP, and for maintaining field logbooks. This individual also provides technical advice and support to the Project Manager. The Field Team Leader is responsible for the completeness and accuracy of all project data including, but not limited to, chain-of-custody (CoC) forms, and laboratory data. The Field Team Leader will issue field logbooks and notebooks, and will assure that sample documentation and tracking is performed in accordance with the SAP. The Field Team Leader will direct excavating and sampling operations.
- The Project Chemist is responsible for ensuring that project activities meet the SAP requirements and fulfill the objectives for which they were designed. The Project Chemist is involved in sample collection and analysis designs, procurement, and documentation. The Project Chemist is responsible for ensuring that appropriate project procedures are developed with the necessary QA provisions. The Project Chemist will assist in data verification and overseeing data transfer from field and laboratory output to the data management systems. In addition, the Project Chemist will review the data documentation for completeness, track sample status by reconciling CoC forms and laboratory results returned from the laboratory, and perform data verification activities.
- The Field Samplers' responsibilities include collecting samples and field measurements and documenting field activities in accordance with procedures stated in the SAP and the corresponding operating procedures. Field Samplers are responsible for sample labeling

and logging; CoC documentation; assuring that sample containers, preservation, and holding times are as described in the SAP; and preparing samples for delivery to the analytical laboratory.

2.3 LABORATORY PERSONNEL

Laboratory analytical services will be performed by:

CT&E Environmental Services, Inc. (CT&E)
5633 B Street
Anchorage, Alaska 99518
907-562-2342

CT&E has been approved by the Air Force Center for Environmental Excellence (AFCEE) and Jacobs to perform the analytical services for the SS83 RA. CT&E maintains current laboratory validation by U.S. Army Corps of Engineers (USACE) Hazardous, Toxic, and Radioactive Waste Center of Expertise, Missouri River Division. CT&E also maintains current laboratory validation by State of Alaska to perform ADEC AK101, AK102, and AK103 methodology; CT&E's Storage Tank Program designation number is UST-005.

- The Laboratory Manager is responsible for all laboratory activities and for ensuring that the necessary personnel are assigned to the project to complete it as required by this QAPP. The Laboratory Manager is also responsible for keeping the Jacobs Project Manager and Project Chemist informed as to sample status and preliminary results, and for authorizing the release of the final results from the completed analyses.
- The Laboratory QA Officer is responsible for reviewing all QA parameters associated with the analytical method used by the laboratory for this project; for reviewing subsequent QA data generated in the analysis; for ensuring that the laboratory analytical standard operating procedures (SOPs) are followed; and for instituting corrective action and reanalysis of effected samples, if necessary, to keep analyses and reported results within established QC goals.
- The Laboratory Project Manager is responsible for understanding the needs of the client and communicating this information to the project staff. The Laboratory Project Manager handles all client interactions regarding project specifications and tracks the status of all project analyses the during analytical and review processes.
- The Laboratory Sample Custodian is responsible for issuing sampling kits to the Jacobs Project Chemist or designee, inspection and log-in of incoming samples, and control of sample storage at the laboratory.
- The Laboratory Analyst is responsible for the analysis of samples for the requested parameters, following the methods prescribed by this QAPP.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, CoC, laboratory analysis, and reporting that will provide sound scientific data of known and appropriate quality that satisfy the DQOs. QA objectives provide procedures to:

- Control each step of the measurement process beginning with sample collection and proceeding through data interpretation
- Ensure that data will be of known or acceptable precision, accuracy, representativeness, completeness, and comparability

All analytical data for the SS83 RA field program will be generated as definitive data as described by EPA (1993). Rigorous SW-846 analytical procedures (EPA 1986; 1994b; 1996) and ADEC (1999a) methodology will be utilized to produce data usable for risk-based analysis and for comparability with previous data collection activities.

3.1 QUANTITATIVE QA OBJECTIVES

Quantitative QA objectives (QAOs) of measurement data are determined by assessing the data quality indicators of precision, accuracy, completeness, and sensitivity of reported results. The fundamental QAO—with respect to accuracy, precision, and sensitivity of laboratory analytical data—is to achieve the QC acceptance criteria set by the analytical protocols.

Accurate and precise data will be achieved through the use of sampling and analytical procedures that minimize bias, through the use of standard procedures, through the meticulous calibration of analytical equipment, and by implementing corrective action whenever measured accuracy and precision fail to meet pre-established limits.

QAOs of measurement data for hydrocarbon methodology (gasoline-range organics [GRO], diesel-range organics [DRO], and residual-range organics [RRO]) are referenced from the *Underground Storage Tanks Procedures Manual* (ADEC 1999a). QAOs for EPA methodology are adapted from the Version 3.1 of the AFCEE QAPP (AFCEE 2001).

QC samples will be included into the analytical scheme to assess data quality. Details QC samples to be collected and the sample frequency are described in Section 8.0.

3.2 QUANTITATIVE DATA QUALITY INDICATORS

3.2.1 Accuracy

Accuracy is the degree of agreement of a measurement with the accepted reference or true value, and describes the bias in a measurement system. For purposes of this plan, the data quality indicator of accuracy will be calculated as the percent recovery of a known value by the equation outlined in Section 9.0. Laboratory control samples (LCSs) provide information to indicate that the analytical method is in control without any contribution from sample-specific matrix interference effects.

Accuracy of measurements will be assessed at the laboratory by fortifying (spiking) LCS and LCS duplicate (LCSD) samples and matrix spike (MS) and MS duplicate (MSD) samples there with the targeted analytes of interest, and calculating the percent recovery, as follows.

- MS Samples – MS sampling will be performed for organics analysis and percent recoveries will be calculated for at least 5 percent of the samples, with the results being compared to the accuracy obtained during LCS analysis. Significant difference in the values for accuracy from MS and LCS analysis will be discussed in the DAR.
- Surrogate Spikes – Recovery of surrogate spikes in project samples will be compared to method-specified and laboratory-generated control limits. Unacceptable recovery of spikes will be discussed in the DAR with an assessment of matrix effects, where applicable.

3.2.2 Precision

Precision is a measure of the degree of variability in the error of measurements and is calculated from the results of duplicate sample analysis. Precision will be calculated by the relative percent difference (RPD) in concentrations between LCS and LCSD, MS and MSD samples, and field duplicate samples included within the analytical scheme. For purposes of this QAPP, precision is indicated by the RPD in concentrations between duplicate samples and will be calculated by equations outlined in Section 9.

LCS/LCSD RPD in measurement will be calculated and compared to the QAO precision goals.

MS/MSD samples will be included so that the precision within the representative matrix can be determined. MS/MSD RPD in measurement will be calculated and compared to the quantitative QAO precision goals. RPD results of MS/MSD samples exceeding QAO precision goals will be discussed in this DAR to present information on possible sample anomalies in the representative matrix.

- Duplicates collected in the field (field duplicates) and analyzed in the laboratory allow for measurement of both the sample matrix variability and variability in sampling and analytical practices. Field duplicates collected for soil samples will be compared to the quantitative QAO precision goals. Any field duplicate results that exceed QAO precision goals will be discussed in the DAR to communicate possible anomalies in the sample matrix. Field duplicates will be collected for water samples and analyzed for at least 10 percent of the samples.

- MS and MSD samples will be analyzed at a minimum of 5 percent for organic sample analysis so that the precision within the representative matrix can be determined. RPD results exceeding levels established in the guidance will be discussed in the DAR to communicate possible sample anomalies in the representative matrix.
- Field measurements will be recorded in duplicate for total volatile organic compounds (VOCs) by photoionization detector.
- Laboratory duplicates provide information on only the analytical variability or precision. LCSD will be prepared in the laboratory by fortifying method blank samples with targeted compounds of interest. LCSs will be analyzed for a measurement of analytical variability at a minimum frequency of 5 percent.

3.2.3 Completeness

Completeness is defined as the adequacy in quantity of valid measurements to prevent misinterpretation, detect significant patterns and trends, and to achieve the SS83 RA objectives. Completeness is the measure of the amount of data determined valid after completion of validation procedures compared to the amount of samples expected to be collected under normal conditions.

Completeness will be calculated by the equation outlined in Section 9.0 of this QAPP. The QAO for completeness is specified as:

- Data are expected to meet acceptance criteria of 95 percent of aqueous samples and 90 percent of soil samples for the analytical data required under this QAPP.
- Validation recommendations applying bias as estimated values (EPA J-flagged) to results will be considered valid data.
- Validation recommendations rejecting (EPA R-flagged) data results will be considered invalid data.

3.2.4 Sensitivity

Achieving method detection limits depends on instrumental sensitivity and matrix effects. Therefore, it is important to monitor the data quality through constant instrument performance. Instrument sensitivity will be monitored through the use of method blanks and calibration check samples in accordance with the methods discussed in Section 6.

The reporting limit of a chemical analysis is expressed as a method quantitation limit (MQL) by CT&E and will be corrected for percent moisture and sample dilution in analysis. The MQL has been established at a value corresponding to the lowest standard utilized in the initial calibration of the analytical instrument.

3.3 QUALITATIVE QUALITY ASSURANCE OBJECTIVES

3.3.1 Representativeness

Representativeness describes the degree to which data characterize the actual conditions at the site or parameter variations at a sampling point. Representativeness is a qualitative parameter that depends upon proper sampling program design and proper laboratory protocol. Representativeness will be achieved through proper sample collection and handling in a manner that avoids interference and prevents contamination and loss. Representativeness will be satisfied by ensuring that analytical parameters and methodology have been properly selected, and that holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed by analyzing field replicate samples.

3.3.2 Comparability

Comparability is the extent to which comparisons among different measurements of the same quantity or quality will yield valid conclusions. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in the QAPP, are expected to provide comparable data.

Comparability among measurements in this study will be achieved through the use of accepted EPA SW-846 analytical procedures and hydrocarbon analytical methodology defined by the state (ADEC 1999a). The results will be reported by the units of milligram per kilogram dry weight of sample for soil matrices and microgram per liter for water matrices.

3.3.3 Traceability

Traceability is the extent to which data can be substantiated by hard-copy documentation. Traceability documentation exists in two forms: that which links quantification to an authoritative standard and that which explicitly describes the history of each sample, from collection to analysis.

4.0 SAMPLING PROCEDURES

The Work Plan presents sampling design rationale and the anticipated sample locations. Field activities to be conducted include soil excavation, subsurface soil sampling, removal of two USTs, and an investigation for and removal of a suspected drainpipe.

4.1 SAMPLING PROCEDURES

Sampling procedures to be followed in this SS83 RA are described in FSP Section 2.

A sample collection summary is provided in Table 4-1, which presents the requirements for sample containers and volume, preservation, and holding times for the water and soil analyses.

Project requirements for QC samples are described in Section 8.0 of this QAPP. The QA/QC sample requirements are also indicated in Table 4-1 to ensure that sufficient containers are available to collect the additional required sample volume.

4.2 SAMPLE CONTAINERS

Glass sample containers are obtained "precleaned" to EPA Protocol A specifications from the laboratory and are obtained along with verification of that level of integrity. Glass sample containers will be used for all samples for laboratory analysis.

4.2.1 Sample Preservation and Holding Times

Samples will be adequately preserved to ensure their continuous stability from collection in the field to laboratory analysis. Field personnel will ensure that necessary supplies, such as freeze packs and coolers, are on hand to preserve the samples after collection. Table 4-1 provides the preservation and holding times for the required analyses. Holding time specifications are consistent with the requirements outlined in the AFCEE QAPP and ADEC guidance (ADEC 1999a).

4.3 SAMPLING EQUIPMENT DECONTAMINATION

Sampling equipment decontamination is described in FSP Section 2.14 . Disposable sampling and protective equipment will be utilized to potentially limit any possibility of cross-contamination between sampling events.

Table 4-1
Sample Containers, Sample Preservation, and Holding Times

Parameter	Method Analysis	Sample Container Description*	Preservation of Sample	Maximum Holding Time
WATER				
VOC	5030B/8260B	3 40-mL VOA vials w/TLS	Cool to 4°C; HCl pH <2	14 days
PCBs	8082	2 1-L Amber glass w/TLC	Cool to 4°C	7 days Pre-extraction 40 days Post-extraction
Metals (RCRA)	6010B/6020/7470A	500 mL Polyethylene	Cool to 4°C $HN0_3$ to pH<2	180 days Mercury 28 days
SOILS				
GRO	AK101	4-oz. WM Amber Glass w/TLC	BFB surrogated MeOH, Cool to 4°C †	28 days
DRO/RRO	AK102/AK103	8-oz. WM Amber Glass w/TLC	Cool to 4°C	14 days pre-extraction 40 days post-extraction
SVOCS	8270C	8-oz. WM Amber Glass w/TLC	Cool to 4°C	14 days pre-extraction 40 days post-extraction
PAHS	8270C(SIM)	8-oz. WM Amber Glass w/TLC	Cool to 4°C Keep Dark	14 days pre-extraction 40 days post-extraction
VOCS (low level)	8260B	40 mL VOA vial with stir bar	Sodium Bisulfate, Cool to 4°C	14 days to analysis
VOCS (medium level)	8260B	4-oz. WM Glass w/TLS	Field/Methanol, Cool to 4°C †	14 days BTEX
PCBS	8082	8-oz. WM Glass w/ TLC	Cool to 4°C	14 days pre-extraction 40 days post-extraction
METALS (RCRA) TCLP	SW1311/SW6010B/SW7470A	8-oz. WM Glass w/ TLC	Cool to 4°C	180 (28 for mercury) days to TCLP extraction 180 (28 for mercury) days to analysis
BTEX	SW8260B	4-oz. WM Amber Glass w/TLC	BFB surrogated MeOH, Cool to 4°C †	14 days to analysis
METALS (RCRA)	6010B/6020/7471A	8-oz. WM Glass	Cool to 4°C	180 days mercury 28 days

Notes:

* For Matrix Spike/Matrix Spike Duplicate Samples: Soil samples will require one additional container if project sample is completely full per sample container description.

† Soil samples being submitted for either GRO or VOC analysis must be accompanied by a separate jar of soil (not extracted with methanol) that can be used to determine percent moisture. If samples being submitted for GRO or VOC analysis are also being submitted for DRO analysis, the percent moisture can be determined from the aliquot for the DRO analysis.

BFB	= bromofluorobenzene
BTEX	= benzene, toluene, ethylbenzene and xylenes
HCl	= Hydrochloric acid
MeOH	= methanol
mL	= Milliliter
oz.	= ounce
PAH	= Polynuclear aromatic hydrocarbon
PCB	= Polychlorinated biphenyl
RCRA	= Resource Conservation and Recovery Act
SIM	= Selected ion monitoring
SVOC	= semivolatile organic compound
TCLP	= toxicity characteristic leaching procedure
TLC	= Teflon-lined cap
TLS	= Teflon-lined septa
VOA	= volatile organic analysis
WM	= Wide-mouth container
°C	= degrees Centigrade

For additional definitions, see acronyms and abbreviations list.

(intentionally blank)

5.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all instruments and measuring equipment used for conducting field tests and laboratory analyses. Instruments and equipment should be calibrated prior to each use or on a periodic schedule.

Proper field equipment and instrument performance are necessary to obtain reliable data. Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. All measuring and test equipment will be calibrated prior to use and regularly when in use. Calibration of field instruments is governed by the specific SOP for the applicable field analysis method. Frequency will be based upon the type of equipment, inherent stability, manufacturer's recommendations, and intended use. If an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service.

The Field Team Leader will be responsible for implementing and documenting the calibration and preventive maintenance procedures. All calibrations and maintenance procedures will be recorded in the field logbooks. Preventive maintenance will be addressed by daily checks of equipment prior to initiation of field operations.

Instruction manuals for all field instruments will be available on site. Critical spare parts such as probes, batteries, and electrodes will be kept on site to minimize downtime. Preventive maintenance for field instrumentation will be performed in accordance with manufacturer's instructions and applicable SOPs.

(intentionally blank)

6.0 ANALYTICAL PROCEDURES

6.1 LABORATORY ANALYTICAL DATA

Laboratory analysis will be performed by CT&E, a designated USACE laboratory approved by the USACE Missouri River Division Laboratory (CEMRD-L) contract laboratory program.

Analytical methods are listed in Table 4-1 and are defined by EPA SW-846 (EPA 1986; 1994b; 1996) and ADEC (1999a). The following narrative describes the analytical technique, instrument detection, and modification to the methodologies.

- Analysis of samples for petroleum hydrocarbons will be performed by gas chromatography technique with a flame ionization detector. Methodology is defined by the State of Alaska (ADEC 1999a) as "Method for the Determination of Diesel Range Organics" (DRO: AK102), "Method for the Determination of Gasoline Range Organics" (GRO: AK101), and “Method for the Determination of Residual Range Organics” (RRO: AK103).
- VOCs will be assessed in soil and water samples by gas chromatography/mass spectrometry (GC/MS) technique by SW-846 Method 8260B. Project soil samples for GRO/benzene, toluene, ethylbenzene and xylenes (BTEX) analysis will be extracted in the field with methanol to maintain hydrocarbon integrity and minimize analyte volatilization prior to analysis.
- Semivolatile organic compounds will be assessed by the GC/MS technique SW846 Method 8270C.
- Polynuclear aromatic hydrocarbons (PAHs) will be assessed in selected samples and analyzed by a modification of EPA SW-846 (EPA 1996) Method 8270C. The GC/MS technique is operated in the selective ion monitoring mode to increase the sensitivity of the method for PAH target analytes.
- Analysis of samples for polychlorinated biphenyls (PCBs) will be performed by gas chromatography techniques using SW-846 Method 8082.
- Metals analysis (total concentrations) will include digestion by EPA Method 3005A for waters and 3050B for soils with subsequent analysis by inductively coupled plasma spectroscopy/mass spectrometry by EPA SW846 series methods 6010B/6020/7470A/7471A to assess the presence of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

(intentionally blank)

7.0 SAMPLE CUSTODY

7.1 SAMPLE CUSTODY DEFINITION

CoC is a term that identifies the sequential history of individuals who were in control or possession of a sample or group of samples. The CoC record is a written document that identifies and tracks a sample from the time it is collected until the time it is analyzed. A sample is under a person's custody when:

- It is in that person's physical possession,
- It is in that person's view after being in that person's possession,
- It was in that person's possession and then he or she locked the sample in a cooler or refrigerator to prevent tampering, or
- It has been placed in a designated or secure area by that person.

Each time the samples change possession, both individuals must sign, date, and provide time on the CoC record. The CoC protocol will follow procedures described in the document "National Enforcement Investigations Center Policies and Procedures," revised June 1985, EPA-330/9-78-110-R. A sample form is presented in FSP Attachment 1.

7.2 SAMPLE CUSTODY DOCUMENTATION

Individual site samples will be entered on the CoC record following collection. CoC records will be unique for samples originating from a single site.

The following information will be included on the CoC record:

- Sample numbers (corresponding to the sample identification numbers on the sample labels)
- Project number
- Project/client name and location
- Sampler's signature
- Date/time of sample collection
- Type of samples (e.g., soil, groundwater)
- Analytical methods required
- Number and type of containers (e.g., 40 milliliter [mL] glass volatile organic analysis [VOA], 1-liter amber jar)
- Remarks (e.g., "Samples filtered in the field.")
- Laboratory designation
- Date/time samples relinquished
- Date/time samples received

- Receiving individual

Each shipment of samples will be accompanied in the cooler by the completed, signed, and dated CoC records. Following sample collection and prior to shipment, samples will be packaged and preserved to ensure sample integrity during shipment in conformance with the requirements in the FSP. The CoC record will be placed in a waterproof plastic bag and secured to the inside lid of the cooler shipping container.

The shipping container lid will be secured at a minimum of two locations with strapping tape. Signed custody seals will be affixed on the front-right and back-left of the cooler.

7.2.1 Responsibilities and Procedures

Relinquishment of the samples will be the responsibility of the field team members. The field team members will be responsible for the samples from the time they are collected until they are relinquished to the laboratory. A sample custodian at CT&E will receive the sample and initiate internal laboratory custody protocols.

7.3 FIELD DOCUMENTATION

Field sampling will be documented to assure data validity and facilitate analysis and evaluation. The specific identification and documentation requirements are identified in the following subsections. Field documentation requirements and sample identification codes are discussed in the FSP.

7.4 PACKAGING AND SHIPPING REQUIREMENTS

Samples will be packaged and labeled for shipment according to U. S. Department of Transportation (DOT) regulations as promulgated in 49 Code of Federal Regulations 171 through 177.

Packaging and shipment of samples will also be consistent with requirements of sampling handling protocols in the AFCEE QAPP. Some of the requirements are described below.

- Volumes of all water samples contained in 1-liter glass bottles will be marked with a grease pencil prior to shipment.
- All bottles will be enclosed in clear plastic bags, sealed, wrapped with plastic packaging material (bubble-wrap), and placed upright in the cooler for shipment.
- If used, chemical ice (blue-ice) for cooling preservation will additionally be placed and isolated in plastic bags.

- Samples designated as medium or high hazard must be placed in metal paint cans, packed with vermiculite and labeled in accordance with DOT regulations.
- Drain on insulated cooler will be taped shut.
- Signed and numbered custody seals will be affixed to the cooler's front-right and back-left.

(intentionally blank)

8.0 INTERNAL QUALITY CONTROL CHECKS

Project QC samples will be collected in the field to assess precision and accuracy and determine errant contamination through sampling equipment or containers. Project QC samples will accompany project samples to the AFCEE-approved laboratories and are referenced in Table 8-1.

8.1 FIELD QUALITY CONTROL SAMPLES

All field QC samples will be collected, handled, documented, preserved, packaged, and shipped using the same techniques as for all other samples. The following describes the field QC samples included in the analytical scheme.

8.1.1 Field Duplicate Samples

Project data precision, including both field practices and analytical precision, will be assessed by analyzing field duplicate samples. Duplicates taken in the field and analyzed in the laboratory are used to evaluate both the sample matrix variability and variability in sampling and analytical practices.

Field duplicates will be collected for VOA (GRO, BTEX, and VOCs) before other analysis parameters to ensure the integrity of the sample and minimize potential loss of volatile compounds. VOA for soil samples (GRO/BTEX) will not be homogenized in the field and will be collected as discrete colocated samples.

Field duplicates for soil samples submitted for non-volatile analysis (e.g., DRO, RRO, PAHs, PCBs, and metals) will be homogenized in the field—with two sets of containers filled simultaneously—using the same sampling procedure, and submitted to one laboratory as separate samples. Each QC duplicate sample will receive an independent sample number that will be indistinguishable to the laboratory, and submitted "blind" to the laboratory to mask its identity as a duplicate sample.

Field duplicates will be collected for one out of every 10 samples (10 percent) for each matrix and parameter to be analyzed for all samples submitted for analysis.

Table 8-1
Quality Control Sample Summary

Analysis	Field QA/QC Samples*			Laboratory QC Samples			
	Equipment Blanks	Trip Blanks	Field Duplicates	Method Blanks	Matrix Spike Samples †	Laboratory Control Samples‡	Matrix Duplicates
Soil							
VOCs	--	One Methanol Trip Blank per transport	10 % (1/10)	5 % (set/20)	5 % (set/20)	5 % (set/20)	--
GRO							
DRO/RRO		--					
PAHs/SVOCs							
PCBs							
Metals (RCRA)							

Notes:

* Temperature blanks will be included and accompany every cooler shipment.

† One matrix spike/matrix spike duplicate (MS/MSD) set per batch of 20 samples processed for organic analysis. One spike sample analysis and matrix duplicate per batch of 20 samples processed for metals and general chemistry analysis.

‡ One Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) per batch of 20 samples processed.

RCRA = Resource Conservation and Recovery Act

For additional definitions, see acronyms and abbreviations list.

8.1.2 Equipment Blanks

Equipment blanks (also referred to as rinsate blanks) assess the contamination effects on accuracy due to the combined activities of sampling and analysis. An equipment rinsate blank sample will not be collected or analyzed for this field effort.

8.1.3 Trip Blanks

Trip blanks (also referred to as travel blanks), consisting of laboratory distilled water, accompany empty sample containers from the laboratory and are transported to the sampling site to aid demonstration that the containers and samples are not contaminated in transit.

The trip blank requirement will pertain only to VOA (i.e., VOC or GRO) data collection activities. Trip blanks will consist of three 40 –milliliter (mL) glass VOA vials prepared by the laboratory to accompany project samples. The trip blanks are required to accompany any shipment cooler of VOC samples prepared from a unique site. Trip blanks will be submitted "blind" to the laboratory to mask their identity as trip blank samples.

One trip blank, representing the specific VOA (e.g., VOCs or GRO), will be included in every cooler containing aqueous VOC samples. VOA samples will be packed into a unique cooler to minimize the potential of cross-contamination effects from high-level hydrocarbon samples (DRO/RRO analysis) and to minimize the number of trip blank samples submitted.

Soil trip blanks will consist of 25 grams of Ottawa sand and 25 mL of methanol, and will be supplied by the laboratory. One soil trip blank, representing the specific VOA (e.g., VOC or GRO), will be included for every cooler that contains soil VOC or GRO samples. One soil trip blank shall be sent with no more than 20 project samples in a given shipment.

8.1.4 Temperature Blank Samples

A temperature blank consisting of at least 500 mL water in a high-density polyethylene bottle will accompany every cooler transporting project samples to the laboratory. The Laboratory Sample Custodian will record the temperature of the temperature blank sample and cooler during sample receipt procedures and log the data on the CoC documentation in the cooler and on the cooler receipt form.

8.2 LABORATORY QUALITY CONTROL SAMPLES

Laboratory QC requirements are defined by the analytical methodology. The following describes the laboratory QC samples included in the analytical scheme.

8.2.1 Blanks

A method blank (MB) is used to monitor organic laboratory contamination. A preparation blank (PB) is used to monitor inorganic or general chemistry laboratory contamination. A sample of laboratory reagent water or soil matrix is treated with all the reagents and in the same manner as the sample (i.e., digested, extracted, distilled). The MB or PB must contain less than the method's quantitative limit for the compounds of interest. If this criterion is not met, then all sample processing will be halted until corrective measures are taken and documented. All samples processed with the out-of-control MB will be re-extracted and re-analyzed.

One MB or PB will be prepared every day and/or for each batch of 20 samples processed (5 percent), and will be analyzed for all parameters.

8.2.2 Matrix Spike and Matrix Spike Duplicate Samples

Project bias or accuracy will be assessed by preparing and analyzing MS samples. MS samples provide information about the effect of the sample matrix on the digestion and measurement methodology. MS samples will be prepared in the laboratory by fortifying a sample aliquot with known quantities of the targeted compounds of interest at concentrations within the range expected in the sample. This fortified aliquot (or MS) is then analyzed along with an unfortified aliquot. From the results for the fortified aliquot, percent recovery of each analyte within the representative sample matrix can be determined.

Soil samples must be collected in one container so that MS samples can be prepared. Soil MS samples require no extra volume if the containers are completely filled. However, aqueous MS samples must be collected at triple the volume for GRO/VOCs, and double the volume for hydrocarbon analysis.

Sample containers will be identified as MS samples on sample labels and CoC forms. This will allow field observations to initiate MS analysis to evaluate potential matrix interference (e.g., peat or high-organic sample content).

All MS samples are performed in duplicate for organic analysis with the duplicate sample referred to as an MSD sample.

MS and MSD samples will be prepared in the laboratory and analyzed for one set out of every 20 samples (5 percent) submitted per sample matrix (e.g., groundwater, soil).

8.2.3 Surrogate Spikes

Surrogate spikes assist in data quality assessments of gas chromatography analysis. Surrogate spikes will be used to fortify all project samples and MB, LCS, MS, and MSD samples prior to sample preparation and gas chromatography analysis.

The surrogate recovery, expressed as a percentage, will be calculated and compared to control limits specified in ADEC guidance (1999a) for organic analysis. Corrective actions will be initiated if percent recovery exceeds method-specified and/or laboratory-generated established control limits.

8.2.4 Laboratory Control Samples (LCS)

The LCSs are an internal QC check applied by the laboratory. Analytical measurement accuracy and precision will be assessed by preparing and analyzing duplicate LCSs. LCSs will be prepared by fortifying a method blank in the laboratory with known quantities of the targeted compounds of interest being analyzed, at concentrations within the range expected in the sample. This fortified aliquot is then analyzed and the percent recovery calculated by the formula in Section 9.1 of this QAPP. All target analytes will be spiked.

Duplicate LCS will be prepared and analyzed with every preparatory batch of 20 samples for analysis.

8.2.5 Spike Sample Analysis

The spike sample analysis is designed to provide information about the effect of the sample matrix on the digestion and measurement methodology for inorganics metals and general chemistry analysis. The spike is added before digestion (i.e., prior to the addition of other reagents; EPA 1986). All target analytes are included in the spiking solution for metals analysis.

Spike sample analysis will be prepared in the laboratory and analyzed for a minimum of 5 percent of samples submitted for metals and general chemistry analysis.

8.2.6 Matrix Duplicate Sample Analysis

Matrix duplicate analyses are indicators of laboratory precision based on each sample matrix for inorganic analysis.

Matrix duplicate sample analyses will be prepared in the laboratory and analyzed for a minimum of 5 percent of samples submitted for metals and general chemistry analyses.

9.0 CALCULATION OF DATA QUALITY INDICATORS

9.1 ESTIMATION OF PRECISION, ACCURACY, AND COMPLETENESS

Precision and accuracy of the measurements will consider three potential sources of error:

- Gross errors,
- Systematic errors, and
- Random errors.

Data quality will be assessed using the following formulas:

- Precision for field replicates, LCS, and MSD

$$RPD = \frac{2|(D_1 - D_2)|}{D_1 + D_2} X\ 100$$

Where: D_1 = First sample value.
D_2 = Second sample value (replicate).

- Accuracy for LCS and MS samples

$$\%\ Recovery = \frac{(0 - X\ )}{T} X\ 100$$

Where: 0 = Measured quantity of analyte in sample plus spiked solution.
X = Measured sample prior to spiking.
T = Quantity of analyte spiked.

- Completeness

$$\%\ C = 100\%\ X\ (V\ /n\ )$$

Where: %C= Percent completeness.
V = Number of measurements judged valid.
n = Total number of measurements necessary to achieve a level of confidence in decision making.

9.2 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities may be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the SAP and this QAPP. The audits of field and laboratory activities include two separate, independent parts: internal and external audits.

9.2.1 Field Audits

Internal audits of the field activities may be implemented during the data collection activities. Additional audits may be conducted if problems are encountered. The audit will be conducted by the QA Officer and will cover sample identification, sample control, CoC procedures, field documentation, and sampling operations.

During the audit, the QA Officer will maintain a record of the audit with written field notes. The Field Team Leader will review the preliminary audit results. Upon completion of the audit, the QA Officer will develop an audit report that summarizes areas requiring corrective measures. This report will be submitted to the Project Manager, and resolution of final action as described under Section 12.0 will be subsequently implemented.

9.2.2 Laboratory Audits

Jacobs may schedule a laboratory audit. The approved AFCEE contract laboratory is assumed to have undergone detailed system and performance audits for inclusion list of AFCEE-approved laboratories.

The laboratory is expected to conduct routine audits of facilities, processes, and procedures in accordance with written protocols established by the laboratory QA program. It is assumed that these audits will be conducted by the Laboratory QA Officer. Audit results will be documented in written reports.

Prior to any sampling activities at the site, the Project Chemist may assess the laboratory's QC procedures and method performance data to ensure that they will meet the project data quality objectives. The internal QA systems of SOPs, sample custody procedures, instrument calibration, preventive maintenance, QC checks, and corrective action procedures will be reviewed.

9.2.3 Documentation Audit

The Project Manager will monitor and provide peer review of all deliverables for inclusion in the final report.

10.0 PROCEDURES USED TO ASSESS DATA QUALITY

10.1 LABORATORY DATA REDUCTION

Analytical data submitted by the laboratory will have been reviewed by the Laboratory QA Officer or designee to verify that appropriate units are assigned to all concentration values, equations used to calculate concentrations are correct, GC/MS detected compounds are correctly identified, and QC sample results are appropriately summarized and within established control ranges.

10.2 DATA VERIFICATION PROCEDURES

Data verification procedures will be performed to ensure the competency of the reported results. The Project Chemist or designee will verify data sets at the frequency of 100 percent. Laboratory identification numbers will be crosschecked with field identification numbers to verify CoC documentation. Each laboratory value will be reviewed and checked to account for traceability from the data report through the laboratory and the field collection. Missing information regarding any QC elements (surrogates, LCS, MS, duplicates etc.) will be noted. All identified discrepancies from data verification procedures will be corrected through requested correspondence with the laboratory.

Laboratory data will be presented in hardcopy and computerized format consistent with the Jacobs Environmental Management System Laboratory Data Submission Handbook. The hardcopy laboratory data will be compliant with the AFCEE QAPP and be complete to the extent that a thorough data review is possible.

10.3 DATA VALIDATION PROCEDURES

Analytical data will be generated for this project as definitive data (EPA 1993). The validation effort applied for definitive data follows these steps:

- Verification of sample locations and identifications
- Verification of holding times, CoC forms, and sample identification
- Confirmation of 10 percent of the samples collected and submitted for analysis for precision, accuracy, method detection limit, and error determination
- Evaluation of results of the samples in the analytical data packages for all of the elements listed under the SAP and the QAPP
- Review of blank contamination and detection capability for the remaining samples

Jacobs will perform data validation of the analytical results to systematically and independently verify method compliance and assess data quality. Validation will be performed using the laboratory-provided sample result sheets, summary QC sheets, and supplied raw data.

Data validation will follow EPA (1994a, 1999) Contract Laboratory Program (CLP) National Functional Guidelines for Data Review. Qualification of data will follow the EPA guidance for the EPA methods employed even though technically, the CLP-designated methodology will not be specified in the analytical SOW. Recommendations for qualifications of GRO, DRO, and RRO target analytes by ADEC methodology follow professional judgment.

Data review decisions will result in “flags” being applied to the dataset to indicate uncertainty associated with inaccuracy, imprecision, or likely or probable introduced contamination from laboratory or field sources.

Subsequent recommendation for the qualification of data will be made by comparison of the QC sample results to laboratory-established control limits (LECLs).

- LCS and LCSD QC sample results will be compared to laboratory sample accuracy and laboratory sample precision control limits for spiked samples.
- MS and MSD QC sample results will be compared to matrix-spiked accuracy and matrix-spiked precision control limits for spiked samples.
- Surrogate compound recoveries will be compared to method-specified control limits for GRO and DRO analysis and LECL for EPA methodologies.

An assessment of errant method and/or field-introduced contamination will be determined from laboratory blank and QC equipment rinsate samples with subsequent recommendation for the qualification of data.

The Jacobs Project Chemist will perform data validation on the analytical results. The validation effort will consist of:

- Validating laboratory QC samples and field QC samples at 100 percent frequency
- Reviewing data for adherence to the project quantitative QA objectives specified in this QAPP

The Project Chemist will prepare a DAR documenting validation findings and assessing data quality. The DAR will include the following discussions:

- Qualifying field QC samples that do not meet the objectives for precision and accuracy in the final report, along with explaining any discrepancies
- Properly documenting out-of-control events for field or laboratory data generation
- Calculating the QAO for completeness

Corrective actions procedures are discussed in Section 11.0.

10.4 ELECTRONIC DATA MANAGEMENT SYSTEMS

Data collected from the SS83 RA at Elmendorf AFB will be electronically delivered in the Environmental Resources Program (ERP) Information Management System (ERPIMS) format. ERPTools/PC V.2.2 will be used as a data-loading tool for pertinent data elements, including site location, soil boring, lithology, well instillation, and field sampling parameters.

An ERPIMS deliverable and AFCEE hard copy deliverable with summary forms will be requested from the laboratory. These are to be delivered along with the hardcopy data documentation. The Project Chemist or designee will be responsible for performing verification, including crosschecking 100 percent the electronic data deliverables against hardcopy analytical results. Any changes required to the electronic data deliverables as a result of this verification will be made by the laboratory.

10.5 DATA REPORTING

The following are the data reporting deliverables:

- Spreadsheets of the compiled, verified, and validated result database by site
- Data assessment report
- Completed ERPIMS

(intentionally blank)

11.0 CORRECTIVE ACTION

This section summarizes the project corrective action process and procedures.

11.1 CRITERIA FOR DATA ACCEPTABILITY

QA procedures are incorporated into this project to ensure the generation of representative data of high quality. Monitoring adherence to procedures presented in this QAPP, in part, forms the basis for data acceptability. Routine procedures for assessing data quality comprise the major project review of data acceptability.

Identification of nonconformances or deficiencies based on observations, and feedback from the technical staff and project personnel will be the basis for initiating corrective actions. Corrective action procedures are outlined in the following subsections.

11.2 RESPONSIBILITY AND AUTHORITY

When a nonconformance or deficiency is identified during routine QC review procedures or during routine observations by the technical staff and project personnel, corrective action will be initiated by the appropriate manager, such as the Laboratory QA Officer. The initiating manager will completely document the nonconformance and will supply this information to both the appropriate personnel and the project files.

The corrective action schedule will be set in accordance with the implementation procedures described below. No staff member will initiate a corrective action without prior communication of his or her findings through the proper channels, as specified by this QAPP. A non-conformance report will be filed for all non-laboratory-related deficiencies that may potentially impact the quality of the data.

11.2.1 Project Activities

The technical staff and project personnel will be responsible for reporting all suspected technical or QA non-conformances, or suspected deficiencies of any activity or issued document, to the Project Manager. The Project Manager, in turn, will be responsible for assessing the reported problems and making a response decision based on the potential impact on data quality. If the Project Manager determines that the situation is a reportable nonconformance requiring corrective action, he or she will initiate a nonconformance report.

11.2.2 Field Activities

Field personnel will be responsible for reporting any suspected technical or QA deficiencies to the Field Team Leader. The Field Team Leader, in turn, will be responsible for assessing the suspected deficiency and for determining, in consultation with the Project Chemist and Project Manager, the impact on data quality.Any corrective actions taken will be implemented and documented in the field logbook. Corrective action for field measurements may include (but are not limited to) the following:

- Repeat the measurement to check the error.
- Check for all proper adjustment for ambient conditions such as temperature.
- Check the batteries.
- Recalibrate equipment.
- Check the calibration.
- Replace the instrument or piece of equipment.
- Stop work.

11.2.3 Laboratory Activities

Laboratory analyses will be performed by a CEMRD-L approved and accredited laboratory. The laboratory will have a QA program in place and functioning.

Sample receipt problems identified by the Laboratory Sample Custodian during laboratory sample receipt procedures will initiate corrective action procedures. The Project Chemist will submit a resolution of the identified problem or documentation discrepancy to the Project Manager within 48 hours of the samples arriving at the laboratory.

The initial responsibility to monitor the quality of an analytical system is that of the laboratory analyzing the sample. Laboratory personnel will be alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy,
- Blanks contain target analytes above acceptable levels,
- Undesirable trends are detected in spike recoveries or RPD between duplicates,
- There are unusual changes in detection limits,
- Deficiencies are detected by the QA department during internal or external audit or from the results of performance evaluation samples, or
- Inquiries concerning data quality are received.

Corrective action procedures can be handled at the bench level by the analyst, who will review preparation or extraction procedures for possible errors and check instrument calibration, spike and calibration mixes, instrument sensitivity, etc. If the problem persists or a resolution cannot be identified, the matter will be referred to the Laboratory Manager and Laboratory QA Officer for further investigation. Once resolved, full documentation of the corrective action will be filed with the QA department.

The laboratory will verify that all QC procedures are followed and the QC sample results are within acceptance criteria. The laboratory is required to assess the following items, as appropriate:

- Sample preparation procedure
- Initial calibration
- Calibration verification
- Laboratory duplicate analysis
- Laboratory control standard
- Fortified sample result

If the assessment reveals that any of the QC acceptance criteria are not met, the analyst must immediately assess the analytical system to identify a solution and correct the problem. The analyst will notify the Laboratory Manager and Laboratory QA Officer of the problem and, if possible, identify potential causes and corrective actions.

The nature of the corrective action depends on the nature of the problem. For example, if a continuing calibration verification is determined to be out of control, the corrective action may be to recalibrate the analytical system and re-analyze all samples since the last acceptable continuing calibration standard.

Once the appropriate corrective action measures have been defined and taken, and the analytical system is determined to be "in control," the analyst will document the problem, the corrective action, and the data demonstrating that the analytical system is in control. Copies of the documentation will be provided to the Laboratory Manager and Laboratory QA Officer.

Specific corrective measures pertaining to field and trip blanks, field duplicates, and sample loss or breakage are discussed below.

- Field Duplicates – The field duplicate criteria for data validity are defined in Section 3.0 of this QAPP. If the field duplicate criteria are not met, the field-sampling logbook will be examined for any physical/mechanical differences noted during sampling that would explain the discrepancy. Data not meeting the criteria will be qualified as estimated for those field replicates only.

- Samples – If problems are identified by the Laboratory Sample Custodian during laboratory sample receipt procedures (e.g., insufficient sample volume for analysis, sample temperature exceedances, incomplete documentation, and sample shipping problems), the Project Chemist and Project Manager will be notified by fax transmission. A determination of whether another sample will be collected and shipped to the laboratory for analysis will be made using AFCEE guidance and correspondence. The analysis report for the sample batch containing the affected sample will clearly note in the discussion section that a replacement sample was taken.
- QC Samples – If a solvent blank, method blank, or matrix spike is lost or broken during analysis, a replacement QC sample will be sampled and analyzed. The analysis report will clearly note that a replacement QC sample was analyzed. If a field or shipping blank is lost or broken during shipment, storage or analysis, a replacement will not be analyzed. The analysis report for the sample batch associated with the field or shipping blank will clearly note in the discussion section the reason that data are unavailable.

11.2.4 Documentation and Distribution

Corrective actions will be documented by nonconformance reports, which will be filed for all nonconformances. Nonconformance reports will be completed by the project staff member responsible for execution or supervision of the corrective action. Nonconformance reports will include, at a minimum, the following information:

- Name and title of reporter
- Date of filing of report
- Description of nonconformance
- Description and date of follow-up action and/or corrective action, if necessary
- QA approval signature(s) and date (indicating completion of follow-up/corrective action)
- Specific distribution list

12.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

12.1 RESPONSIBILITY

The proper maintenance of QA records is essential to supporting evidentiary proceedings and to ensuring the overall SS83 RA quality. Comprehensive QC records will be maintained in the project files to provide evidence of the QA activities. QC program implementation records will be written and retained on file, and QA documents will be archived in the project files. Pertinent information, including that received from contractors and other outside sources or developed during the project, will be maintained.

12.2 QUALITY ASSURANCE REPORTS

A QA report may be provided if initiated through corrective actions of field operations as the result of field audits or as identified through data validation procedures (Section 10.3 of this QAPP).

The QA reports will include, but are not limited to, the following information.

- A summary of the laboratory QA activities for the reporting period
- Results of laboratory external and internal performance and system audits
- Summaries of corrective action taken in the laboratory to remedy out-of-control situations during the reporting period
- Recommendations, if any, for revisions in laboratory procedures to improve the analytical systems
- Results of field procedures audits
- Data control summary reports
- DAR report

The Project Chemist will provide written documentation to the Project Manager of any deviations from the QAPP or corrective actions initiated in the field that could affect project QA/QC.

(intentionally blank)

13.0 REFERENCES

Air Force Center for Environmental Excellence (AFCEE). 2001. Quality Assurance Project Plan (QAPP). Version 3.1. August.

ADEC (Alaska Department of Environmental Conservation). 1999a. *Underground Storage Tanks Procedures Manual. Guidance for Remediation of Petroleum-Contaminated Soil and Water and Standard Sampling Procedures*. March.

____. 1999b. Oil and Hazardous Substances Pollution Control Regulations. Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances. 18 Alaska Administrative Code (AAC) 75 as amended through January 22, 1999.

USAF (U.S. Air Force). 2002 (February). Engineering Evaluation/Cost Analysis SS83. Final . Elmendorf Air Force Base, Alaska. Environmental Restoration Program.

EPA (U.S. Environmental Protection Agency). 1983. *Methods of Chemical Analysis of Water and Wastes*. EPA-600/4-79-020. March.

____. 1986. *Test Methods for Evaluating Solid Waste*. 3rd ed., SW-846.

____. 1990. *Guidance for Data Usability in Risk Assessment*. Office of Emergency and Remedial Response. EPA/540/R-94/012.

____. 1993. *Data Quality Objectives Process for Superfund*. Office of Solid Waste and Emergency Response (OSWER), EPA540-R-93-071. September.

____. 1994a. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. Office of Emergency and Remedial Response. EPA 540/R-94/013. February.

____. 1994b. *SW-846 Test Methods for Evaluating Solid Waste*. Final Update II. September.

____. 1996. *Test Methods for Evaluating Solid Waste.* Final Update III, SW-846. December.

____. 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Office of Emergency and Remedial Response. EPA 540/R-99/008. October.

(intentionally blank)

UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SS83 REMOVAL ACTION WORK PLAN
APPENDIX A - SAMPLING AND ANALYSIS PLAN
PART 3 - INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN

FINAL

JULY 2004

TABLE OF CONTENTS

SECTION **PAGE**

ACRONYMS AND ABBREVIATIONS iii
1.0 INTRODUCTION 1-1
2.0 ANTICIPATED IDW STREAMS 2-1
3.0 GENERAL IDW MANAGEMENT PROCEDURES 3-1
3.1 IDW TRACKING 3-1
3.2 IDW STAGING 3-1
3.3 WASTE CHARACTERIZATION 3-2
3.4 TURN-IN OF WASTE TO DRMO 3-2
4.0 MANAGEMENT OF SPECIFIC IDW STREAMS 4-1
4.1 SOIL CHARACTERIZATION 4-1
4.2 FINAL DISPOSITION OF SOIL 4-1
4.3 WATER 4-2
4.4 MISCELLANEOUS SOLID WASTE 4-2
4.5 METHANOL-PRESERVED SOIL SAMPLES NOT SENT TO LABORATORY 4-2
4.6 MISCELLANEOUS NON-HAZARDOUS DEBRIS 4-2
4.6.1 Spent Drums 4-3
4.7 DRUMS ENCOUNTERED DURING FIELD ACTIVITIES 4-3
5.0 REFERENCES 5-1

TABLES

Table 1-1 IDW Management Responsibilities 1-2
Table 2-1 Anticipated IDW Streams for the SS83 Removal Action 2-1

ATTACHMENTS

Attachment 1 IDW Inventory Tracking Sheet
Attachment 2 IDW Staging Area Inspection Checklist

(intentionally blank)

ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ASR	Alaska Soil Recycling
COR	Contracting Officer Representative
DRMO	Defense Reutilization and Marketing Office
ESF	Environmental Staging Facility
HSP	Health and Safety Plan
IDW	investigation-derived waste
Jacobs	Jacobs Engineering Group Inc.
mg/kg	milligrams per kilogram
PCB	polychlorinated biphenyl
RA	removal action
TSDF	treatment, storage, and disposal facility

(intentionally blank)

1.0 INTRODUCTION

This Investigation-Derived Waste (IDW) Management Plan is the third part of the three-part Sampling and Analysis Plan for the Removal Action (RA) investigation at the SS83 Landfill on Elmendorf Air Force Base (AFB). The IDW Management Plan identifies IDW anticipated to be generated during SS83 fieldwork activities scheduled for summer 2004. This plan specifically addresses staging procedures, methods for ultimate disposition of various IDW types, and responsibilities for IDW management.

IDW management procedures have been developed in accordance with Elmendorf AFB guidance, specifically the *3rd Wing OPLAN 19-3, Hazardous Waste, Used Oil, and Hazardous Material Management Plan (September 1998)* and the *Basewide Environmental Staging Facility Operations and Maintenance Plan (March 1993)*.

Responsibilities for IDW management associated with the SS83 RA field program are outlined in Table 1-1.

Table 1-1
IDW Management Responsibilities

Organization	Responsibility
Jacobs	• Establish temporary staging area at SS83 during the field effort. • Containerize and label all IDW. • Stage IDW at the Elmendorf Staging Facility pending receipt of analytical results. • Coordinate in advance with Elmendorf AFB TSDF and DRMO personnel to identify potentially hazardous IDW and prearrange waste turn-in procedures. • Characterize IDW to determine appropriate disposal method. • Deliver hazardous IDW to DRMO for subsequent management and disposal. • Dispose of non-hazardous IDW water via an off-site contractor. • Identify non-hazardous IDW soil that contains petroleum hydrocarbons in excess of ADEC Category A; arrange for thermal treatment of this soil by an off-site contractor. • Spread non-hazardous IDW soil that contains petroleum hydrocarbons below ADEC Category A at a location designated by 3CES/CEVR. • Clean drums used to store non-hazardous waste; recycle or stage drums for reuse as directed by 3CES/CEVR.
Elmendorf AFB Environmental Flight (3CES/CEVR)	• Designate a location for ground spreading of IDW soil that contains petroleum hydrocarbons below ADEC Category A levels. • Serve as the waste generator for purpose of manifest and turn-in documentation signatures.
Elmendorf AFB TSDF Personnel	• Provide guidance on hazardous IDW turn-in requirements.
DRMO	• Accept hazardous IDW for storage and ultimate disposal.

Notes:
ADEC = Alaska Department of Environmental Conservation
DRMO = Defense Reutilization and Marketing Office
Jacobs = Jacobs Engineering Group Inc.
TSDF = Treatment, storage, and disposal facility
3CES/CEVR = 3rd Civil Engineer Squadron/Civil Engineer Environmental Restoration
For additional definitions, see acronyms and abbreviations list.

2.0 ANTICIPATED IDW STREAMS

During the SS83 RA field program, it is anticipated that several IDW streams will be generated. Table 2-1 outlines the anticipated IDW streams and anticipated quantity to be generated. If quantities of IDW are generated in excess of the quantities listed in Table 2-1, the Air Force Center for Environmental Excellence (AFCEE) Contracting Officer Representative (COR) and the Air Force project manager will be notified.

Table 2-1
Anticipated IDW Streams for the SS83 Removal Action

IDW Type	Source	Anticipated Constituents	Approximate Quantity
Excavated soil	Excavations, UST excavations	Petroleum hydrocarbons	200 cy
IDW water (e.g., decontamination water)	Decontamination activities	Petroleum hydrocarbons	100 gallons
Miscellaneous solid waste (e.g., used PPE and disposable sampling equipment)	All fieldwork	Petroleum hydrocarbons	2 garbage bags
Exploratory trench	Trench	Unknown constituents	10 cy

Notes:
cy – cubic yard
PPE – personal protective equipment
UST – underground storage tank
For additional definitions, see acronyms and abbreviations list.

(intentionally blank)

3.0 GENERAL IDW MANAGEMENT PROCEDURES

3.1 IDW TRACKING

As IDW is generated during the SS83 RA fieldwork, an IDW inventory will be maintained, as required by Elmendorf AFB (USAF 1993). The inventory will include information on each drum (or other type of container) containing IDW and will allow for tracking the status of IDW generation and final disposition. An example IDW inventory-tracking sheet is provided in Attachment 1 to this IDW Management Plan.

Each drum will have a unique identification number to facilitate drum tracking. Containers will be clearly marked to show information regarding the contents, origin, date of generation, point of contact name and telephone number, and other relevant information.

3.2 IDW STAGING

Elmendorf AFB has determined that the Environmental Staging Facility (ESF) will be available for use during the course of the SS83 RA field program. Therefore, IDW will be staged at a temporary staging location at SS83 until the conclusion of the field program. All IDW will be transported to the ESF at the conclusion of the field program pending receipt of analytical results and determination of final disposition.

As soil is removed from the excavation, it will be placed in a dump truck for shipment to the thermal treatment unit. “Clean” overburden soil will be stockpiled near the excavation and be sampled as such. Soil that is determined to be clean through analytical samples will be used to backfill the excavation. Petroleum-impacted soil will be stored separately from the clean soil. If it is necessary to stockpile contaminated soil, it will be stockpiled on one of the concrete foundations with a 10 millimeter liner placed beneath the soil. If it is not possible to remove the contaminated soil by the end of the day, it will be covered with plastic sheeting to prevent the infiltration of precipitation. The stockpiled, contaminated soil will be shipped off site at the beginning of the next workday. Soil from each SS83 area will be segregated within the stockpile using Visqueen or another similar material.

Should a drainpipe be encountered in the exploratory trench at the Large Foundation Area, excavated soil will be supersacked, as it is unknown what the drain pipe may have carried. The supersacks will remain on site at the Motor Pool temporary staging area pending analytical results to determine final disposition of the soil.

IDW will remain at the staging area until the completion of fieldwork and will then be transported to the ESF pending receipt of analytical results used to characterize the IDW, (see Section 3.3). When IDW is properly characterized and its final disposition determined, arrangements will be made for IDW to be removed from SS83 and transported to its final destination (e.g., thermal treatment facility, Defense Reutilization and Marketing Office [DRMO]). Every effort will be made to remove IDW from the ESF in as timely a manner as possible.

3.3 WASTE CHARACTERIZATION

Drummed or containerized IDW will be characterized based on results from the field sampling program; it is not anticipated that drums or containers will be bulk-sampled for the purpose of waste characterization. Laboratory analyses under the SS83 field program will occur in a seven-day turn-around time in order to close excavations as soon as possible. Upon receipt of analytical results, data will be evaluated to determine whether all impacted soil has been removed from the excavations. Until waste disposition is determined, IDW will remain at the ESF or on site. Section 4.0 details characterization of specific IDW streams.

3.4 TURN-IN OF WASTE TO DRMO

Any IDW determined to be a hazardous waste will be turned in to DRMO for subsequent management and disposal. Any waste to be turned in to DRMO will be placed in a drum or other acceptable container for transportation; it is anticipated that supersacks will be used for soil or other solid waste, and bung-topped 55-gallon drums will be used for liquid waste. A hazardous waste label, to be provided by the Elmendorf AFB Treatment, Storage and Disposal Facility (TSDF), will be affixed to each drum. Waste turn-in to DRMO will be prearranged with assistance from Elmendorf AFB TSDF personnel prior to drums being transported to DRMO. At turn-in, all drums must meet all of the following criteria:

- Container log present
- Containers in good condition
- Properly filled-out hazardous waste labels adhered to the container
- Proper U.S. Department of Transportation markings and labels adhered to the container
- Completed Air Force Form 2005 present
- Copy of material safety data sheet present, if applicable

TSDF and DRMO personnel will complete additional forms and weigh each container.

4.0 MANAGEMENT OF SPECIFIC IDW STREAMS

4.1 SOIL CHARACTERIZATION

Characterization of IDW soil will be based upon investigation analytical results. Specific analyses selected for samples are provided in Appendix A, Part One: Field Sampling Plan, Table 3-1. Upon receipt of laboratory results, analytical results will be compared to Alaska Department of Environmental Conservation (ADEC) Method Two cleanup levels, as presented in Table 3-1 of the work plan.

Analytical results will be reviewed with Elmendorf AFB TSDF personnel to identify containers containing a characteristic waste. The presence of polychlorinated biphenyls (PCBs) in any detectable concentration prohibit IDW soil from thermal treatment. Therefore, the threshold for characterization of PCBs in IDW soil that is impacted by petroleum hydrocarbons (greater than Category A concentrations) will be the detection of PCBs at any concentration.

If IDW soil is below ADEC 18 Alaska Administrative Code (AAC) 75, Method One, Category A (therefore, not requiring thermal treatment), the threshold for characterization of PCBs in IDW soil will correspond to the PCB action level of 1 milligram per kilogram (mg/kg) based on ADEC published guidance on PCB levels in soil. PCBs in IDW soil that is not petroleum impacted with less than 1 mg/kg PCBs will be considered clean.

4.2 FINAL DISPOSITION OF SOIL

Depending upon levels of contaminants detected, final soil disposition will be by one of the methods described below:

- <u>Petroleum contamination with no PCBs</u>. IDW soil identified as only petroleum-contaminated (no PCBs detected) will be processed for off-site thermal treatment at Alaska Soil Recycling (ASR) in Anchorage. Following thermal treatment, the soil will be returned to the SS83 site.
- <u>Petroleum contamination with detected PCBs</u>. Any petroleum-impacted soil that contains PCBs in any detectable concentration cannot be treated at ASR and will, therefore, be designated for turn-in to DRMO as described in Section 3.4 of this IDW Management Plan.
- <u>Petroleum and PCBs below cleanup standards</u>. Soil that meets ADEC 18 AAC 75, Method One, Category A cleanup levels and contains PCBs below the cleanup standard of 1 mg/kg (see Section 4.1.1.3 of this IDW Management Plan) will be spread on the ground at SS83 in an area designated by Elmendorf AFB.
- <u>Petroleum below cleanup standards and PCBs above cleanup standards</u>. Soil that meets ADEC Category A cleanup levels but contains PCBs above the cleanup standards of 1 mg/kg (see Section 4.1.1.3 of this IDW Management Plan) will be designated for turn-in to DRMO as described in Section 3.4 of this IDW Management Plan.

- Hazardous waste due to metals concentrations. Any soil that is considered to be a hazardous waste due to metal constituent content will be turned in to DRMO for subsequent management and disposal as described in Section 3.4 of this IDW Management Plan.

4.3 WATER

IDW water produced during decontamination operations will be temporarily stored at the ESF in 55-gallon bung-top drums. Decontamination water produced from cleaning excavator and sampling equipment will also be containerized in 55-gallon drums. Water samples will only be collected to characterize the contents if contaminants other than petroleum, oil and lubricants are detected in the soil from the exploratory trench at the Large Foundation Area.

All non-hazardous IDW water will be disposed off site in accordance with applicable laws and regulations, or treated in the carbon treatment system at the ESF. However, if sample results indicate that IDW water is hazardous, it will be turned over to the Elmendorf AFB TSDF for disposal.

Drums and tanks will be stored at the ESF until a determination can be made on the correct disposal methods and schedule. It is anticipated that no free-floating product will be encountered during the fieldwork that will require subsequent management. If free-floating product is encountered, Jacobs Engineering Group Inc. (Jacobs) will coordinate with Elmendorf AFB to determine the appropriate disposition.

4.4 MISCELLANEOUS SOLID WASTE

Discarded disposable protective clothing and other similar used supplies will be presumed to be non-hazardous. The waste will be bagged or otherwise containerized for subsequent disposal in an Elmendorf AFB dumpster or directly at the Municipality of Anchorage solid waste landfill. Every precaution will be taken to ensure that this miscellaneous solid waste is not intermixed with other IDW wastes that have specific management procedures.

4.5 METHANOL-PRESERVED SOIL SAMPLES NOT SENT TO LABORATORY

During the 2004 field program, soil samples collected from each sample interval must be immediately field-preserved using methanol, as required by the ADEC Method AK101. Because not all preserved soil samples will be sent to the laboratory for analysis, it is likely there will be methanol-preserved soil samples that require disposal following the field program. These samples will be sent to the laboratory for disposal.

4.6 MISCELLANEOUS NON-HAZARDOUS DEBRIS

The fieldwork will generate other types of non-hazardous debris.

4.6.1 Spent Drums

Any 55-gallon drums utilized as part of the SS83 RA field program will be decontaminated and recycled or stacked for reuse as directed by Elmendorf AFB. These drums will be decontaminated at the ESF by steam-cleaning with an Alconox water solution and a high-pressure hot water rinse, or will be transported to the thermal treatment facility with soil in them for disposal by the thermal treatment facility. Drums to be recycled will be crushed and taken to an off site metal recycler or DRMO.

4.7 DRUMS ENCOUNTERED DURING FIELD ACTIVITIES

Although it is not anticipated, drums may be encountered during excavations at SS83. If any drums containing unknown contents are encountered during excavation activities, the AFCEE COR and Air Force project manager will be notified. The Jacobs Project Manager and Health and Safety Manager will be contacted, and the project Health and Safety Plan (HSP) will be amended to address moving of unknown drums. If a damaged drum with unknown contents is encountered, work in that area will stop pending review of the situation and amendment of the HSP, as needed. Elmendorf AFB will coordinate sampling and disposal of unknown/orphan drums.

(intentionally blank)

5.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2000a. Oil and Hazardous Substances Pollution Control Regulations, Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances, 18 AAC 75, Article 3. As amended through October.

ADEC. 2000b. Underground Storage Tanks Regulations, 18 AAC 78. As amended through August.

ADEC. 1999. *Underground Storage Tanks Procedures Manual – Guidance for Remediation of Petroleum - Contaminated Soil and Water and Standard Sampling Procedures*. December.

U.S. Air Force (USAF). 1998. 3rd Wing OPLAN 19-3, *Hazardous Waste, Used Oil, and Hazardous Material Management Plan*. September 1.

USAF. 1993. *Basewide Environmental Staging Facility Operation and Maintenance Plan.* Environmental Restoration Program, Elmendorf Air Force Base, Alaska. Final. March.

(intentionally blank)

ATTACHMENT 1

IDW Inventory Sheet

SS83 RA Field Program

IDW INVENTORY

Drum No.	Contents	Source (Location, Depth, etc.)	Date Generated	Current Disposition

ATTACHMENT 2

IDW Staging Area Inspection Checklist

SS83 Staging Area Inspection Checklist

Item	Evaluate	Date and Initials	Comments[a]
Drums	• Are drums in good condition (e.g., no corrosion or leaking evident)? • Is each drum labeled to show drum ID number, contents, origin, date of generation, and POC? • Are drums free of extraneous/old labels? • Are top of drums free of any pooled water? • Are drums closed/sealed? • Are drums situated on pallets? • Are drums situated on even/stable surface? • Is there sufficient aisle space (3 feet) between drums to allow for inspection of each drum? • Are drums positioned so labels can be easily read? • Are drums covered with plastic sheeting, and is sheeting sufficiently anchored to withstand wind? • Are all drums or other containers listed on the IDW inventory?		
Liner and Containment	• Is the liner in good condition (e.g., no rips, tears, holes)? • Are all drums staged on top of a liner or other containment device?		
Water Tank	• Is tank in good condition (e.g., no sign of leakage or breaches)? • Is the tank discharge bunghole (if any) properly sealed and free of leakage? • Is the tank staged on top of a liner or other containment device?		
Nonhazardous debris	• Is nonhazardous debris (e.g., concrete, scrap metal) neatly staged and covered with plastic sheeting?		
Other			

Note a: If the answer to any question is "no," please comment on the condition.

UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SS83 REMOVAL ACTION WORK PLAN
APPENDIX B - HEALTH AND SAFETY PLAN

FINAL

JULY 2004

TABLE OF CONTENTS

SECTION **PAGE**

ACRONYMS AND ABBREVIATIONS v
1.0 INTRODUCTION 1-1
2.0 SCOPE OF WORK 2-1
2.1 SITES COVERED BY THIS HSP 2-1
2.2 SUMMARY OF ANTICIPATED FIELDWORK 2-1
2.3 PROJECT HEALTH AND SAFETY RESPONSIBILITIES 2-2
2.3.1 Jacobs Personnel 2-2
2.3.2 Subcontractor Personnel 2-4
2.3.3 Site Visitors 2-5
3.0 HAZARD ASSESSMENT 3-1
3.1 MATERIALS OF CONCERN 3-1
3.2 HAZARDS ASSOCIATED WITH THE MATERIALS OF CONCERN 3-2
3.2.1 Hazards Associated with the Contaminants of Concern 3-3
3.2.2 Fuel Oil No. 2 3-4
3.2.3 Hazardous Substances Brought Onsite by Jacobs and Subcontractors 3-5
3.2.4 HazCat Kit 3-6
3.3 PHYSICAL HAZARDS 3-6
3.3.1 Underground and Overhead Utilities/Installations 3-6
3.3.2 Ordnance and Chemical Warfare Materials 3-6
3.3.3 Back Safety 3-7
3.3.4 Heat Stress 3-7
3.3.5 Excavation and Exploratory Trenching 3-8
3.3.6 Hazards Associated with Drums 3-9
3.3.7 Wildlife 3-10
4.0 HEALTH & SAFETY ENVIRONMENTAL PROCEDURES / SOPS 4-1
5.0 AIR MONITORING 5-1
5.1 GENERAL 5-1
5.2 MONITORING GUIDELINES 5-1
5.3 CALIBRATION AND RECORD KEEPING 5-3
6.0 HAZARD COMMUNICATION PROGRAM 6-1
6.1 HAZARD COMMUNICATION TRAINING 6-1

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

7.0 PERSONAL PROTECTIVE EQUIPMENT ... 7-1
7.1 LEVELS OF PERSONNEL PROTECTIVE EQUIPMENT ... 7-1
7.1.1 Level A ... 7-1
7.1.2 Level B ... 7-1
7.1.3 Level C ... 7-2
7.1.4 Level D ... 7-2
7.2 PROTECTIVE CLOTHING AND EQUIPMENT ... 7-2
7.2.1 Hearing Protection ... 7-3
7.2.2 Eye Protection ... 7-3
7.2.3 Hardhats ... 7-3
7.2.4 Clothing ... 7-4
7.3 RESPIRATORY PROTECTION PROGRAM ... 7-4
7.4 OTHER SAFETY EQUIPMENT ... 7-5
8.0 SITE CONTROL ... 8-1
8.1 GENERAL SITE CONTROL REQUIREMENTS ... 8-1
8.2 WORK ZONES ... 8-1
8.2.1 Exclusion Zone ... 8-2
8.2.2 Contamination Reduction Zone ... 8-2
8.2.3 Support Zone ... 8-2
8.3 BUDDY SYSTEM ... 8-2
8.4 COMMUNICATIONS ... 8-3
8.5 SITE SAFETY AND SECURITY ... 8-3
8.6 DECONTAMINATION PROCEDURES ... 8-3
8.6.1 Personnel Decontamination ... 8-4
8.6.2 Equipment and Vehicle Decontamination ... 8-4
8.7 WASTE HANDLING AND DISPOSAL ... 8-5
8.8 CONFINED SPACE ... 8-5
9.0 TRAINING/MEDICAL SURVEILLANCE ... 9-1
9.1 TRAINING ... 9-1
9.2 HEALTH AND SAFETY BRIEFINGS ... 9-1
9.3 MEDICAL SURVEILLANCE ... 9-1
9.4 HAZARD COMMUNICATION ... 9-2

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

10.0 INSPECTIONS 10-1
10.1 SITE INSPECTIONS SAFETY EVALUATION 10-1
10.2 EQUIPMENT INSPECTIONS 10-1
10.2.1 Daily/shift Inspections and Tests 10-1
10.2.2 Vehicle Inspections 10-2
10.3 SAFETY OBSERVATION REPORTS 10-2
11.0 EXTREME WEATHER SITE WORK 11-1
11.1 TEMPERATURE SAMPLING 11-2
12.0 EMERGENCY PROCEDURES 12-1
12.1 PRE-EMERGENCY PLANNING 12-1
12.2 EMERGENCY COMMUNICATION 12-1
12.3 INJURY/ILLNESS/EMERGENCY MEDICAL TREATMENT 12-2
12.4 FIRE 12-2
12.5 PERSONAL PROTECTIVE EQUIPMENT FAILURE 12-3
12.5.1 Other Equipment Failure 12-3
12.6 EVACUATION 12-3
12.7 EMERGENCY RESPONSE AND ACCIDENT FOLLOW-UP 12-3
12.8 EXPOSURE TO BLOOD BORNE PATHOGENS 12-4
12.9 VEHICLE ACCIDENT 12-5
12.10 INJURY AND ILLNESS 12-5
12.11 SPILL OR RELEASE PROCEDURES 12-5
13.0 ORIENTATION AND TRAINING 13-1
14.0 SITE POSTINGS 14-1
15.0 REFERENCES 15-1

TABLES

Table 3-1 Summary of 8-Hour TWAs & 15-Minute STELs for Hazards to Field Personnel 3-2
Table 5-1 Project-Specific Air Monitoring Requirements 5-2

TABLE OF CONTENTS
(continued)

ATTACHMENTS

Attachment A Project-Specific Contacts and Maps

Attachment B Project-Specific Jacobs Forms

Attachment C Project-Specific Supplemental Information

Attachment D Project-Specific Safe Plans of Action

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
bgs	below ground surface
CFR	Code of Federal Regulations
COC	contaminant of concern
COR	Contracting Officer Representative
DOSH	Division of Occupational Safety and Health
DRO	diesel-range organics
^{o}F	degrees Fahrenheit
HSE	health, safety and environment
HSEP	health, safety and environment procedure
HSM	Health and Safety Manager
HSP	Health and Safety Plan
Jacobs	Jacobs Engineering Group Inc.
LEL	lower explosive limit
mg/m^3	milligrams per cubic meter
µg/m^3	micrograms per cubic meter
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PID	photoionization detector
PM	Project Manager
POL	petroleum, oil and lubricants
PPE	personal protective equipment
ppm	parts per million
ppmv	parts per million volume
RA	removal action
RCRA	Resource Conservation and Recovery Act
SCBA	self-contained breathing apparatus

ACRONYMS AND ABBREVIATIONS
(continued)

SM	site manager
SOR	Safety Observation Report
SPA	Safe Plan of Action
SSHO	Site Safety and Health Officer
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average
USAF	U.S. Air Force
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound

1.0 INTRODUCTION

This Health and Safety Plan (HSP) has been prepared to establish the health and safety procedures required to minimize any potential risk to personnel while conducting fieldwork activities for the U.S. Air Force (USAF) during the SS83 Removal Action (RA) as described in the Work Plan (USAF 2004). The investigation is being performed for the Air Force Center for Environmental Excellence (AFCEE) under Contract No. FA8903-04-D-8673-0002, Task Order 0002 at Site SS83 on Elmendorf Air Force Base (AFB), Alaska. This field effort is being conducted as a follow-up to the 2003 Decision Document, which requires excavation and treatment of soil from six petroleum, oil, and lubricant (POL)-contaminated areas, removal of two underground storage tanks (USTs) and an investigation for, and possible removal, of an existing drain discharge pipe. In addition, removal of all, or portions of, onsite concrete foundations may be required to access the contaminated soil.

This HASP directly applies to Jacobs Engineering Group Inc. (Jacobs) personnel and subcontractors who will be potentially exposed to safety and/or health hazards related to the work. Subcontractors also must comply with all applicable Federal Occupational Safety and Health Administration (OSHA) General Industry and Construction Standards, including, but not limited to, the wearing of personal protective equipment (PPE) and the use of respiratory protection. The procedures in this HSP have been developed based upon current knowledge of the specific chemical and physical hazards known or anticipated for the operations that will be conducted during this project.

This HSP has been written to comply with the requirements of the Jacobs Health and Safety Policy Manual. All activities covered by this HSP must be conducted in complete compliance with this HSP and with all applicable federal, state, and local health and safety regulations. These include the OSHA General Industry Standards in 29 Code of Federal Regulations (CFR) 1910.120 and the OSHA Construction Industry Standards in 29 CFR 1926. Personnel covered by this HSP who cannot or will not comply with these requirements will be excluded from site activities.

Personnel working on this site must sign the "sign-off" sheet provided as Attachment B-1. Subcontractors must submit a "sign-off" sheet from their own, equally stringent HSP or, if choosing to follow this HSP, they must also sign this form. Any changes to this HSP must be recorded on the Approval of Modifications form (Attachment B-2) and approved by the Health and Safety Manager (HSM); changes must also be coordinated through the AFCEE Contracting Officer Representative (COR).

(intentionally blank)

2.0 SCOPE OF WORK

2.1 SITES COVERED BY THIS HSP

The overall scope of work covered by this HSP includes the fieldwork methods to complete the RA activities at Site SS83 on Elmendorf AFB, including excavation of test pits, removal and handling of USTs, possible removal of a drain discharge pipe and concrete foundations, soil sampling, and waste transportation and disposal.

2.2 SUMMARY OF ANTICIPATED FIELDWORK

Specific field activities included under this HSP are:

- Pre-mobilization coordination, obtain base permits necessary for intrusive work, unexploded ordnance (UXO) recognition training, subcontractor pre-mobilization coordination and meetings
- Mobilization and site setup
- Concrete foundation removal
- UST removal, cleaning and recycling
- POL soil excavation
- Drainpipe investigation, removal, and recycling (if a drainpipe is located)
- Confirmation/characterization soil sample collection
- Backfilling
- Equipment and personnel decontamination
- Handling and disposal of investigation-derived waste and tanks removed from the site

SS83 was historically used as an anti-aircraft artillery site; and currently is the site of a large antenna. As reported by the Elmendorf AFB 3rd Communications Squadron Safety Office, the antenna is a receiver antenna that does not pose any chemical or radiation hazard. The site contains foundations from pre-existing buildings, USTs, remains of bunkers, and a landfill.

Based on previous site investigations, it is assumed that soil is contaminated with POL only and is not subject to regulation by the Resource Conservation and Recovery Act (RCRA) and/or Toxic Substances Control Act. The presence of ordnance is not anticipated at this site. Depending on their location, confirmation/characterization soil samples may be collected from the SS83 area for analysis of the following constituents:

- AK101, gasoline-range organics
- AK102, diesel-range organics (DRO)
- AK103, residual-range organics

- SW8260B, volatile organic compounds (VOC)
- SW8270C, semivolatile organic compounds
- SW8270CSIM, polynuclear aromatic hydrocarbons (PAH)
- SW8082, polychlorinated biphenyls (PCBs)
- SW6010B/SW7471A, eight RCRA metals
- SW1311/SW6010B/SW7470A, toxicity characteristic leaching procedure eight RCRA metals

Refer to the Work Plan for further information.

2.3 PROJECT HEALTH AND SAFETY RESPONSIBILITIES

The following sections describe roles and responsibilities for Jacobs and Subcontractor personnel and site visitors.

2.3.1 Jacobs Personnel

The following paragraphs describe the roles and responsibilities of Jacobs personnel.

2.3.1.1 Project Manager

The Project Manager (PM) has, by designation, the primary responsibility to ensure the overall health and safety of personnel associated with this project. The PM, therefore, has the primary responsibility to ensure the implementation of the requirements of this HSP. The Jacobs field team leader, the person in charge of all field activities, may assume some of the health and safety duties of the PM. Some of the PM's specific responsibilities include:

- Ensuring that on-site personnel have read and understand this HSP and have completed the sign-off sheet
- Ensuring that a Safe Plan of Action (SPA) is completed and communicated to field personnel for all site activities
- Ensuring that all personnel have attended a briefing, prior to performing work on site, apprising them of the contents of this HSP and all identified site-specific hazards, and that personnel understand the OSHA safety and health protection compliance information
- Ensuring that sufficient PPE, as required by this HSP, is available to field personnel
- Ensuring that all subcontractor personnel submit documentation demonstrating employee participation in a medical monitoring program and training program
- Ensuring that any changes to this HSP are recorded on an Approval of Modifications form (Attachment B2) and approved by the HSM
- Maintaining a high level of health and safety consciousness among employees at the work site

- Maintaining regular communication with the HSM

2.3.1.2 Health and Safety Manager

The HSM is the individual responsible for the approval, interpretation, and modification of this HSP. Modifications to this HSP that may result in less stringent precautions cannot be undertaken by the PM or the Site Safety and Health Officer (SSHO) without the approval of the HSM. Specific HSM duties include:

- Advising the PM and SSHO on matters relating to health and safety on site
- Recommending appropriate PPE and air monitoring instrumentation to protect personnel from site hazards
- Maintaining contact with the PM to evaluate site conditions regularly and review new information that might result in modifications to this HSP
- Assisting in the preparation of the HSP
- Working with the PM to ensure that sufficient PPE is available on site
- Performing field audits to monitor the effectiveness of the HSP and to assure compliance with it as well as this HSP
- Monitoring where required and where deemed necessary to determine the adequacy of protective measures and PPE specified by this HSP
- Coordinating Jacobs employee training and medical monitoring program
- Supervising and monitoring the safety performance of all personnel to ensure that required safety and health procedures are followed, and correcting any deficiencies
- Conducting accident/incident investigations and preparing accident/incident investigation reports
- Conducting briefings, when necessary, to apprise personnel of the contents of this HSP and the known site hazards

2.3.1.3 Site Safety and Health Officer

The SSHO must enforce the requirements of this HSP once on-site fieldwork begins. The SSHO has the authority to immediately correct all situations where noncompliance is noted and to stop work immediately in cases where an immediate danger is perceived. Specific SSHO responsibilities include:

- Ensuring that an SPA is completed, communicated, and adhered to by field personnel for all site activities
- Procuring and distributing the PPE needed for this project
- Verifying that all PPE and health and safety equipment are in good working order
- Monitoring workers' exposure to hazardous substances/chemicals and activities as deemed necessary to determine appropriate engineering and administrative personnel protective

requirements

- Establishing and enforcing site control
- Notifying the PM and the HSM of all noncompliance situations and immediate danger situations
- Initiating emergency response procedures

2.3.1.4 Field Personnel

All Jacobs personnel are responsible for following the health and safety procedures specified in this HSP and for performing their work in a safe and responsible manner. Specific field personnel responsibilities include:

- Obtaining a copy of this HSP and reading it in its entirety prior to the start of on-site work
- Bringing any questions or concerns regarding the HSP's content to the PM or HSM prior to the start of fieldwork
- Following the SPA requirement and assisting in identifying activities and hazards not addressed on the SPA
- Reporting all accidents and incidents to the PM
- Complying with requests made by the SSHO while on site

2.3.2 Subcontractor Personnel

Subcontractors shall implement and follow this plan and will perform the following specific duties:

- Follow the requirements set forth in this plan.
- Attend Supervising for Safety Training at Jacobs prior to site mobilization.
- Attend site-specific orientation.
- Agree to abide by this HSP by signing the sign-off sheet (Attachment B1), before working on-site. This sign-off sheet will be retained by the SSHO.
- Provide SSHO Material Safety Data Sheet (MSDS) copies for hazardous chemicals brought on site.
- Provide SSHO copies of required training certifications and medial authorizations to work on site, including those required by 29 CFR 1910.120 and 29 CFR 1926.65.
- Develop activity hazard analyses/ safe plans of action that address specific hazards associated with tasks to be performed for each phase of work (e.g., locations of overhead utility lines, traffic patterns), including developing and providing specific work procedures to Jacobs for review of potential hazards.
- Ensure workers are trained in safe and proper use of all tools they may use.
- Appoint an on-site Competent Safety Representative for each job site.

- Provide all necessary PPE to employees and ensure its proper use.
- Maintain all necessary records and submit required reports.
- Conduct daily safety briefings.
- Obtain all work permits as required.
- Conduct safety inspections and report discrepancies using the Safety Observation Report (SOR) form (Attachment B4), and promptly correct unsafe conditions.
- Conduct regular inspections of equipment. Defective or unsafe equipment must be red-tagged and immediately taken out of service or repaired.
- Provide inspection documentation and corrective actions to SSHO on a weekly basis.
- Provide other subcontract information and subcontractor safety performance requirements, as required.

The site manager (SM) will inform the subcontracting foreman or leader of any safety and health violations. The SSHO or SM can cease subcontractor work under eminently dangerous conditions, and resume work when the unsafe condition is corrected. Repeated violations could cause termination of the subcontract.

2.3.3 Site Visitors

Occasionally, visitors may arrive at the site during field activities. Most visitors can be accommodated by providing them with a viewing area in a safe location away from the active work zones and by a briefing conducted by the field team leader.

In some instances, visitors (client or agency personnel) may require access to restricted site zones. If a visitor has a justified need for site access, the SSHO or the HSM will make arrangements for entry. The required level of PPE within the exclusion area will be strictly enforced. Visitors must be escorted at all times. Visitors who cannot show proof of the 29 CFR 1910.120 training certificate and medical monitoring program will not be allowed to access the exclusion areas. If respiratory protection is required, visitors must furnish their own, and the respirator type must match the specifications detailed in this HSP.

If a workable, safe arrangement cannot be agreed upon, or if the activities of the visitor jeopardize on-site activities, the field team leader/SSHO should immediately contact the PM and the HSM.

(intentionally blank)

3.0 HAZARD ASSESSMENT

This Hazard Assessment is intended to provide a health and safety design analysis as required to identify, assess, and evaluate the potential hazards involved in the various characterization subtasks needed to accomplish this work. This section addresses the material hazards and the physical and operational hazards that may be expected for all subtasks of this work. The specific subtasks are delineated in Section 2.2 of this document, along with the potential materials of concern.

SPAs shall be used for any task that could reasonably present a risk of injury, illness, or environmental damage. Specifically, they should be used before proceeding with any field or shop task. SPAs are also a valuable tool for office environments. The SPA will define activities being performed and identify work sequences, specific hazards anticipated, and control measures used to eliminate or reduce each hazard to an acceptable level. The SS83 SPA Procedure (Attachment C1) outlines the requirements for preparing and implementing SPAs for the project.

SPAs have been developed for each of the definable features of work, and are presented in Attachment D. These SPAs were prepared in the Anchorage office and will require updating as site conditions change. Each SPA is a living document and shall be inclusive of all work activities. The plan identifies each site and the specific work to be conducted there, along with contaminants of concern (COCs). A list of the project-specific chemical hazards is found in Attachment C2.

3.1 MATERIALS OF CONCERN

Table 3-1 summarizes the most common chemical contaminants that can reasonably be expected at SS83. For each COC, the American Conference of Governmental Industrial Hygienists (ACGIH) has published exposure limit guidelines for respiratory protection. These guidelines are listed beside each substance as time-weighted averages (TWAs) and short-term exposure limits (STELs). These values are taken from *Threshold Limit Values (TLVs), and Biological Exposure Indices for 2002*, ACGIH, except where noted.

Table 3-1
Summary of 8-Hour TWAs & 15-Minute STELs for Hazards to Field Personnel

Substance	Time Weighted Average (ppmv)	Short-Term Exposure Limit (ppmv)
Petroleum Hydrocarbons		
Gasoline	300	500
Diesel/Jet Fuel	N/A	N/A
Site-Related Volatile Organic Compounds (VOCs are present in all fuel hydrocarbons and chlorinated solvents)		
- Benzene (ACGIH)	0.5	2.5
- Ethylbenzene	100	125
- Toluene (ACGIH)	50	150
- Xylenes	100	150
Metals		
Lead, Inorganic	0.050 mg/m^3	N/A
Arsenic	0.01 mg/m^3	N/A
Barium	10 mg/m^3	N/A
Cadmium	0.01 mg/m^3	N/A
Chromium	0.5 mg/m^3	N/A
Mercury (elemental and inorganic forms)	0.025 mg/m^3	N/A
Nickel (insoluable inorganic compounds)	0.2 mg/m^3	N/A
Zinc	2 mg/m^3	10 mg/m^3
PAHs	0.2 mg/m^3	N/A
PCBs	0.5 mg/m^3	N/A
Chlordane	0.5 mg/m^3	N/A
Endrin	0.1 mg/m^3	N/A
Lindane	0.5 mg/m^3	N/A
Chemicals Brought Onsite by Jacobs		
2,4-D	10 mg/m^3	N/A
2,4,5-T	10 mg/m^3	N/A
Alconox	None	None
Methanol	200	250
HazCat Test Kit	*	*

Notes:
*Follow manufacturer's instructions.
ACGIH - American Conference of the Governmental Industrial Hygienists
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
mg/m^3 - milligrams per cubic meter
ppmv - parts per million by volume
For additional definitions, see acronyms and abbreviations list.

3.2 HAZARDS ASSOCIATED WITH THE MATERIALS OF CONCERN

Hazards associated with gasoline, diesel fuel, VOC, PAHs, and metals are described below.

3.2.1 Hazards Associated with the Contaminants of Concern

3.2.1.1 Gasoline

Gasoline primarily consists of a mixture of hydrocarbons, including aliphatic hydrocarbons, aromatic hydrocarbons, and a variety of branched and unsaturated hydrocarbons.

Extremely high levels of exposure, which are unlikely to occur at this site, could produce symptoms such as dizziness, coma, collapse, and death. Exposure to non-lethal doses is usually followed by complete recovery, although cases of permanent brain damage following massive exposure have been reported. In general, gasoline toxicity is related to benzene and other aromatic hydrocarbons. ACGIH has established a TWA exposure limit for gasoline of 300 parts per million (ppm) and an STEL of 500 ppm.

3.2.1.2 Diesel Fuel

Diesel fuel is generally considered to be of moderate to low toxicity and federal or recommended airborne exposure limits have not been established for its vapor. However, inhalation of low diesel vapor concentrations may cause mucous membrane irritation.

Inhalation of high diesel vapor concentrations may cause extensive pulmonary edema (i.e., filling of the lungs with fluid). Aspiration of the liquid into the lungs will also result in severe pulmonary edema. Ingestion of small quantities of the liquid may produce nausea and vomiting and in large quantities, may produce pulmonary edema. Chronic skin contact with the liquid may produce primary skin irritation as a result of defatting.

Because of the relatively low vapor pressure of diesel fuel at standard temperature and pressure, overexposure to its vapors is not expected to occur in an outdoor environment. Ingestion and aspiration of the liquid are not expected to occur. Therefore, if exposure is to occur, the major route of exposure is likely to be via the skin through direct contact with contaminated soil.

Vapors of diesel fuel are significantly heavier than air (vapor density more than 4) and will tend to subside and accumulate in low-lying areas. The liquid is insoluble in water, is lighter than water (specific gravity less than 1), and will, therefore, float on the water's surface.

3.2.1.3 Volatile Organic Compounds (Benzene, Toluene, Ethylbenzene and Xylene Compounds)

Benzene, toluene, ethylbenzene, and xylenes, examples of VOCs, are colorless, aromatic liquids. In moderate to heavy exposures they may produce headache, eye and throat irritation, narcosis, and anesthesia. Excessive exposures can also produce liver and kidney damage, and bone marrow depression. Xylenes and toluene are generally more acutely toxic, but benzene is of more concern chronically. Benzene is associated with leukemia and aplastic anemia in chronic exposures and is, therefore, a primary substance of concern found in gasoline. For this reason, Draeger tubes, or other specific monitoring methods, should be used on site to verify that benzene is not present at concentrations greater than 0.5 ppm.

The OSHA permissible exposure limit (PEL) for benzene is 1 ppm, with an STEL of 2.5 ppm. Its olfactory detection level (can be smelled) is 5 ppm. Benzene is very flammable, with a flash point of 12 degrees Fahrenheit (^{o}F). Ethylbenzene is also extremely flammable. Its TLU is 100 ppm (TWA) and its STEL is 125 ppm.

The current TLV for toluene is 50 ppm as an 8-hour average and the STEL is 150 ppm. The odor of toluene is a strong, aromatic one, not as sweet as benzene. The TLU for xylenes is 100 ppm, with an STEL of 150 ppm. The immediately dangerous to life or health level is 1,000 ppm. Xylenes have a flash point of 81^{o} F.

3.2.2 Fuel Oil No. 2

Fuel oil no. 2 is generally considered to be of moderate to low toxicity. Federal or recommended airborne exposure limits have not been established for fuel oil vapors. However, inhalation of low concentrations of the vapor may cause mucous membrane irritation. Inhalation of high vapor concentrations may cause extensive pulmonary edema. Chronic direct skin contact with fuel oils may produce skin irritation as a result of defatting.

Because of the relatively low vapor pressure of fuel oil, overexposure to their vapors is not expected to occur in the outdoor environment.

3.2.2.1 Polycyclic Aromatic Hydrocarbons

PAHs are various combinations of three or more closed (benzene) rings together with attached molecular structures. They occur naturally in coal, petroleum, tars, pitches, and woods, and can be formed in fires involving heavy hydrocarbon materials.

Examples of PAHs are anthracenes, benzo(a)pyrene, chrysenes, fluoranthene, naphthalene, and pyrenes, among many others. Many PAHs are carcinogenic. As a class, they should be treated as carcinogens and exposures kept to a minimum. There is no OSHA PEL for most of the specific compounds; however, the "Coal Tar Pitch Volatiles" PEL should be used (0.2 milligrams per cubic meter [mg/m^3]). PAHs are generally solids and not very volatile, making dust or smoke the likely route of exposure.

3.2.2.2 Polychlorinated Biphenyls

PCBs are heavy, chlorinated oils. They vary somewhat in composition and in toxicity; there are over 200 isomers. PCBs may irritate the skin, throat, and eyes. They have long been considered suspect human carcinogens; however, this has never been proven. Acute toxicity is rather low. Exposure has been associated with potential liver damage and a skin condition known as "chloracne."

PCBs are not very volatile; thus, they are seldom a respiratory hazard unless heated or agitated severely. The only approved respiratory protection for PCBs is supplied air.

PCBs will penetrate the intact skin; thus, care should be exercised to use impervious gloves and coveralls to prevent skin contact. Ingestion is also a potential mode of entry. Good decontamination and hygiene practices will avoid this problem.

The OSHA PEL and the ACGIH TLV exposure limits for the PCBs chlorodiphenyl (43% chlorine) and chlorodiphenyl (54% chlorine) for an eight-hour day are 1 mg/m^3 and 0.5 mg/m^3, respectively.

3.2.2.3 Lead, Inorganic

The early symptoms of lead poisoning, as a result of overexposure (either through ingestion or inhalation) include fatigue, sleep disturbance, a metallic taste, headache, aching bones and muscles, digestive irregularities, abdominal pains, and decreased appetite. Chronic overexposures to lead affect the blood cells, the central nervous system, the kidneys, and male and female reproductive systems. Lead has also been identified as a fetotoxin. The route with the greatest potential for absorption is that of inhalation, although ingestion is also dangerous.

The OSHA PEL for inorganic lead is 50 micrograms per cubic meter ($\mu g/m^3$), and is recommended to be 40 $\mu g/m^3$ if workers are of reproductive age.

3.2.3 Hazardous Substances Brought Onsite by Jacobs and Subcontractors

A MSDS must be available for each hazardous substance that Jacobs or subcontractors bring to the site, including solutions/chemicals that will be used to decontaminate sampling equipment, calibration gases for monitoring instrumentation, or reagents for field test kits. All containers of hazardous materials must be labeled in accordance with OSHA's Hazard Communication Standard.

Jacobs anticipates using Alconox for personnel decontamination, as well as calibration gasses consisting of isobutylene, carbon dioxide, methane, oxygen, and hydrogen sulfide during fieldwork. Methanol, hexane, and sulfuric acid will be used in sampling and in field test kits. MSDSs for these substances are provided in Attachment D for substances brought onsite by subcontractors will be provided to Jacobs prior to initial use the substance on site. A copy of these MSDSs will be submitted to the Civil Engineer Squadron/Restoration Program in advance of fieldwork.

3.2.4 HazCat Kit

In the event that leaking tanks are discovered containing substances that are not readily identifiable, a HazCat kit will be used to characterize a representative sample of the contents. This kit contains chemicals and reagents which, if used improperly, have the potential to cause harm; therefore, only properly trained individuals will be authorized to conduct tests. Even use of this kit by properly trained individuals can still generate potentially harmful vapors. For this reason, testing of samples will be conducted only in a well-ventilated area free from locations where vapors may accumulate.

3.3 PHYSICAL HAZARDS

3.3.1 Underground and Overhead Utilities/Installations

The estimated location of utility installations, such as communications, sewer, telephone, electric, water lines, and other underground installations that may be encountered, shall be determined prior to excavating via Elmendorf AFB's Base Civil Engineer Work Clearance Request. Elmendorf AFB personnel shall sign off utility clearances. Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated in a manner that maintains a minimum clearance of 10 feet. The site shall be established to avoid existing utilities and communication antennas, as well as their respective grounding grids in the area. A copy of the Utility Clearance Form (Health, Safety and Environment Procedure [HSEP] 7.3.3) is provided in Attachment D2.

3.3.2 Ordnance and Chemical Warfare Materials

SS83 has been inspected previously for the presence of UXO. While no UXO has been identified yet on site, the potential does exist for UXO to be present at SS83. For this reason, all Jacobs field personnel will receive awareness training concerning UXO and chemical warfare materials. The awareness training will be provided by the USAF, prior to commencement of the project. If UXO or suspected UXO is encountered, all work will stop and the USAF PM, as well as the PM and HSM, will be contacted immediately. The USAF PM will have the explosive ordnance disposal team remove the suspected item from the site prior to commencement of work.

3.3.3 Back Safety

Using proper technique to lift and move heavy pieces of equipment is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects:

- Bend at the knees, not the waist. Let your legs do the lifting.
- Do not twist while lifting.
- Bring the load as close to you as possible before lifting.
- Be sure the path you are taking while carrying a heavy object is free of obstructions and all slip, trip, and fall hazards.
- Use mechanical devices to move objects, such as drums of investigation-derived wastes or generators, that are too heavy to be moved manually.
- If mechanical devices are not available, ask another person to assist you.

3.3.4 Heat Stress

Heat stress may occur on this site due to use of impervious coveralls or other protective equipment. Heat stress may appear in the form of heat exhaustion or heat stroke.

3.3.4.1 Heat Exhaustion

- Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim appears very pale, his skin is clammy, and he or she may perspire profusely. The pulse is weak and fast; his breathing is shallow. The victim may faint unless he or she lies down. These symptoms may pass without treatment but can also continue, and death may occur.
- First Aid: Immediately move the victim to a shady or cool area with good air circulation and remove all protective outerwear. Call a physician. Treat the victim for shock: make him or her lie down with feet raised 6 to 12 inches. Keep the victim cool and loosen all clothing. If the victim is conscious, offer sips of water. Transport victim to a medical facility as soon as possible.

3.3.4.2 Heat Stroke

- Symptoms: **A MEDICAL EMERGENCY!** Heat stroke is the most serious reaction to heat stress because the body excessively overheats, reaching temperatures as high as 107°F to

110°F. The first symptoms often include head pain; dizziness; nausea; and skin that is dry, red, and hot. Unconsciousness follows quickly and death is imminent if exposure continues.

- First Aid: Call 9-1-1 for medical help. Immediately move the victim to a cool and shady area. Remove all protective outerwear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Moisten the bare skin with cool water or rubbing alcohol, if available.

The main objective is to cool, without chilling, the victim. Give no stimulants. Transport the victim to a medical facility as soon as possible.

3.3.5 Excavation and Exploratory Trenching

Physical hazards associated with excavation and exploratory trenching may be the most significant hazards encountered during work to be conducted at this site. An excavation is any manmade cut, cavity or trench, or any depression in an earth surface formed by earth removal.

Trenches will be advanced within the work area in an attempt to identify potentially contaminated debris or drums containing potential contaminants. To accomplish this, trenches will be dug from surface level down to no greater than 17 feet below ground surface (bgs), or when groundwater is encountered (whichever comes first). At no time may any personnel enter these trenches.

The following additional general safety procedures will apply while conducting excavation activities and while working around open excavations.

- Physical barricades such as orange construction fences or their equivalent must be placed around all unattended excavations.
- No person shall be permitted under loads handled by digging or lifting equipment.
- No person shall remain near a vehicle being loaded. Operators may remain inside the closed cab of the vehicle.
- All excavation work must have the prior approval of the SM, all permits must be obtained, and utilities located prior to start of work.
- At no time may personnel enter an excavation at this site. If a sample needs to be collected from the excavation, the excavator operator will collect a scoop of soil using the excavator bucket from the desired sample location. The operator will then set the bucket on the ground and lock out the controls prior to the sampler approaching the bucket for sample collection.
- Periodic atmospheric testing shall be conducted to ensure that the work area remains free of all potentially hazardous atmospheres.
- Except in stable rock, excavation below the level or base of footing of any foundation or retaining wall shall not be permitted unless the wall is first underpinned and all other precautions taken to ensure the stability of the adjacent walls and the safety of employees involved in the work.

- All excavations shall be closed or protected before the end of shift.
- Excavations left open will be inspected and the inspection documented using Jacobs' daily trench/excavation inspection form or its equivalent.
- Excavated and other materials shall be kept at least 2 feet from the excavation edge or behind retaining devices sufficient to prevent material or equipment from falling or rolling into the excavation.
- Excavations will not be deeper than 20 feet bgs and sidewalls will not be sloped. No personnel will enter the excavations at any time for any reason.
- A minimum safe distance will be maintained between overhead utilities and operating equipment. A spotter should be used as needed to ensure these safe distances are maintained.

At a minimum, these activities must comply with the health and safety practices specified in 29 CFR 1926 (the OSHA Construction Standards). If a damaged drum of unknown contents is encountered, work in that area will stop pending review and evaluation of the situation.

3.3.6 Hazards Associated with Drums

Although not anticipated at SS83, a drum could be uncovered during excavation activities. If a drum of contents not readily identifiable by markings or other characteristics is encountered, the Jacobs PM and HSM will be notified. Upon notification, the Jacobs PM will notify the AFCEE COR and USAF PM.

Opening the drum and characterizing the drum contents requires a higher level of respiratory and skin protection. At a minimum, level B protection will be utilized when handling and opening, and during sampling and characterization of drums having unknown contents.

Drums loaded with liquid or solid materials may be very heavy. For this reason, proper equipment is necessary for handling and moving loaded drums. Equipment used to handle and move drums must be operated safely and properly. Drums will need to be accessed using brass/beryllium non-sparking bung wrenches, cutting tools, and hammers.

In the event that leaking drums are discovered, they will be removed from the excavation and placed into overpacks. If drums that cannot be placed into overpacks due to their crushed state are removed from the excavation, they will be placed into a lined fish tote, supersack, or other appropriate outer container capable of preventing further release of its contents. The contents of the damaged drum will then be transferred to a new container appropriate for transportation and disposal.

3.3.7 Wildlife

Evidence of moose and bears at Site SS83 has been observed. Field personnel should be observant and follow procedures and guidelines in Working Safely Around Wild Animals (HSEP 7.4) Attachment C8.

4.0 HEALTH & SAFETY ENVIRONMENTAL PROCEDURES / SOPS

This HSP is not intended to repeat or duplicate Jacobs Corporate Health, Safety and Environmental Procedures, and Safe Operating Procedures. Nor is it intended to duplicate U.S. Army, USAF, or CFR requirements. In the case of conflicting guidelines, the most-stringent requirements shall apply.

Field personnel shall participate in a medical surveillance program. Specifics for the baseline, interim, and periodic physicals can be found in the Medical Monitoring Program for Environmental Project Work (HSEP 4.1) in Attachment C7. Field workers must provide documentation to the SSHO of their participation in the medical program and evidence they are current. Workers with medical limitations, as well as employers of subcontract employees, are responsible for notifying the PM and the SSHO of said limitations so that work tasks can be appropriately assigned. For guidance, the SSHO may contact Jacobs occupational medical consultant for issues such as chemical exposure, necessary medical testing, presence of on-site pesticides, determining baseline cholinesterase levels, etc.

Each worker is responsible for completing a monthly Hazardous Material Exposure and Field Activity Report form (Attachment B-16) and for notifying management if an incident or exposure occurs. The Jacobs Anchorage Safety and Health Office ensures distribution of blank forms to appropriate employees, collects completed forms, and forwards completed forms to corporate health and safety in Denver for review and retention.

Teaming partners and/or subcontractors shall provide the SSHO documentation of their employees' participation in a medical surveillance program, evidence they are current, and any medical restrictions before their employees are sent to a field project.

(intentionally blank)

5.0 AIR MONITORING

5.1 GENERAL

Under SSHO supervision, monitoring will be conducted to verify that the field team is using appropriate types and levels of PPE. The type and extent of monitoring conducted will depend upon the site-specific conditions and potentially contaminated debris encountered at the time of sampling. The information contained in this section is provided as background reference to the participants in this project. Under SSHO guidance, air monitoring will be implemented following the guidelines in this section. Section 7.0 of this document provides PPE recommendations for the expected level of substances that field personnel may encounter. Special circumstances--such as encountering drums of unknown contents--will require a PPE upgrade until exposure levels warrant reduction. The HSM, with the assistance of trained field personnel, will identify these conditions and may influence additional PPE measures.

5.2 MONITORING GUIDELINES

Previous work activities at Site SS83 have shown that hazardous atmospheres have not been present at the site. Soil and water analytical results from previous investigations indicate the presence of chromium and lead above screening criteria. Arsenic and methylene chloride were also detected, but appear to be due to background concentrations (arsenic) and laboratory contamination (methylene chloride). DRO were also detected in one bluff soil sample during the 2000 investigation; arsenic was detected in two soil samples during the 2003 engineering evaluation/cost analysis (USAF 2002). Additional data on analyses performed and analytical results is provided in the Work Plan.

Although hazardous levels of gases or vapors have not been identified during previous sampling activities, monitoring will be conducted because there is the possibility of unknowns. A photoionization detector (PID) or equivalent instrument equipped with a (minimum) 10.6 electron volt lamp will be used to monitor the breathing zone of workers performing activities associated with all tasks and to monitor levels of contamination in excavated soil. Based on PID monitoring results, a Draeger pump fitted with benzene colorimetric tubes, or equivalent instrument, will also be used to monitor the workers' breathing zone. Monitoring will be conducted for benzene because it is a carcinogen and the TLV and PEL for benzene are more conservative than other volatile organics of concern at SS83. If benzene is detected above allowable limits, passive dosimeters for volatile organics will be used. A four-gas meter that measures the percent of lower explosive limit (LEL), oxygen, hydrogen sulfide, and carbon dioxide also will be used while work is conducted on-site. Air monitoring requirements and action levels are provided in Table 5-1.

Table 5-1
Project-Specific Air Monitoring Requirements

Instrument	Tasks	Action Levels		Frequency [1]	Calibration [2]
PID: Minimum 10.6 eV, calibrated with IsoButylene	All Tasks	0-10 ppm BZ >5-25 ppm BZ 10-50 ppm 50-100 ppm >25 to 50 ppm BZ >100 ppm BZ Note: Detections above background levels.	Level D Level C, use tubes for benzene Level B Stop work; reevaluate	Monitor the breathing zone at the beginning of operations and whenever site conditions change. PPE levels C and B require continuous monitoring.	Daily – pre- and post-use
Direct reading instrument: Colorimetric Tubes: Benzene	All Tasks	<5 ppm BZ 5 – 50 ppm BZ >50 to 100 ppm BZ >100 ppm BZ	Level D Level C, 15 minute period Level B Stop work; reevaluate	When PID readings indicate need for Level C or when benzene levels exceed PEL, conduct periodic colorimetric measurements to document concentrations and justify PPE levels. Also, passive dosimeters will be used if benzene concentrations exceed the PEL in the breathing zone.	Not required
Combustible Gas Meter [3]	All Tasks	≥10% LEL	Stop work; reevaluate (explosion hazard)	Continuous monitoring of a confined space. Screening during excavating or before performing hot work.	Daily - pre- and post-use
Oxygen Meter	Confined Space Entry	<19.5% >23.5%	Provide alternate air source (Level B) Explosion hazard, stop work, reevaluate	Screening before entering confined space.	Daily - pre- and post-use

Notes:
1 Air monitoring shall be documented using field logs or monitoring forms.
2 Calibrations shall be documented in the field logs or calibration logs.
3 Oxygen must be > 15 percent for LEL reading to be accurate.

BZ = Breathing Zone
eV = electron volts
LEL = lower explosive limit
< = less than
> = greater than
% = percent

For additional definitions, see acronyms and abbreviations list.

The PID will be used to monitor the breathing zone during site activities. When monitoring using a PID, the background level of the area must be established by monitoring outside the exclusion zone and upwind of the site. Action levels are based on detections above background levels. PID action levels, frequency, and PPE requirements are provided in Table 5-1.

To evaluate the presence of benzene at the site, first site characterization data and any previous monitoring should be reviewed. If information is not available to support the absence of benzene a sampling pump and benzene detector tubes will be used to monitor the area. Monitoring should occur periodically throughout excavation activities as site conditions change. If benzene is detected at the site, personnel should stop work, get out of the area, dicuss the situation with the SSHO, review and follow the PPE and the air monitoring guidelines found in Table 5-1. Passive personal dosimeter for benzene will be required to be worn at this time to ensure personnel's exposure is measured and recorded. Exposure samples will be collected fromt eh site worker with the greatest potential for exposure and at a location downwind to document potential contamination migrating offsite. A third blank sample will be submitted to the laboratory for quality control purposes. Results of the monitoring must be communicated to workers formerly within 15 working days of receipt of the results. Table 5-1 provides action levels, frequency, and PPE requirements.

An action level for combustible gas indicator readings will be set at 10 percent of the LEL and a minimum of 19.5 percent oxygen. The action level for the LEL is a conservative limit to help ensure that higher levels are not encountered in "pockets" or localized areas. Above 10 percent LEL, the work is considered "hot work" and requires special precautions. At less than 19.5 percent oxygen, the atmosphere is considered oxygen-deficient and a supplied-air breathing apparatus is required.

There is no method for real-time monitoring of PCB or metals contamination. Neither is a volatile air contaminant; however, production of large amounts of potentially contaminated airborne dust could contribute to exposure. Dust levels will be controlled to prevent exposure; however, if control is not possible, respiratory protection should be worn when noticeable or irritating levels of dust are encountered. Activities should be conducted in a manner that keeps personnel upwind of the work area.

Confirmation that action levels are no longer exceeded will countermand PPE upgrades. This confirmation may be achieved by Draeger tube readings or other means. If site conditions require upgrade of respiratory protection, the AFCEE COR and the USAF PM will be notified.

5.3 CALIBRATION AND RECORD KEEPING

The PID will be calibrated with isobutylene each day prior to use and as needed during the day (e.g., if PID drift is noted). All instruments used on site will be calibrated in accordance with the manufacturer's instruction manual. All calibrations will be recorded in the Air Monitoring Record Form (Attachment B-5) for personal monitoring and for other area samples, use the Health and Safety Calibration Log (Attachment B-10). All results will be recorded on the Air Monitoring Record form for personal monitoring (Attachment B-5) or for air sampling, the Exposure Monitoring Log (Attachment B-6). PID readings collected during soil sampling will be recorded in the field logbook.

Copies of field logbook pages containing results from air monitoring conducted (e.g., four-gas meter and PID readings) on site and equipment calibrations will be maintained within the project files. PPE worn on site during sampling and monitoring activities also will be noted in the field logs or monitoring forms.

6.0 HAZARD COMMUNICATION PROGRAM

The Hazard Communication Program has been established to inform workers and subcontractors of potential site-specific hazards.

6.1 HAZARD COMMUNICATION TRAINING

The SSHO will present Hazard Communication training in accordance with the Site SS83 Elmendorf AFB Hazard Communication Program (Attachment C3). Hazard Communication Training will be provided before starting work. This training will be documented using the Hazard Communication and Right to Know Standards form located in the back of the program.

(intentionally blank)

7.0 PERSONAL PROTECTIVE EQUIPMENT

The proper use of PPE is critical to protect workers from immediate and long-term toxic effects resulting from chemical releases. PPE also includes the appropriate foul-weather clothing and other life-safety equipment and devices that are intended to promote worker safety. There are four PPE levels: Level A, Level B, Level C, and Level D. The general respiratory and clothing requirements of each level are described below. The minimum requirements for all site work and information on PPE items are described in Sections 7.1 through 7.4.

7.1 LEVELS OF PERSONNEL PROTECTIVE EQUIPMENT

Descriptions of each PPE level follow.

7.1.1 Level A

- Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
- Totally encapsulating chemical-protective suit.
- Coveralls (optional)
- Long underwear (optional)
- Gloves, outer, chemical-resistant.
- Gloves, inner, chemical-resistant.
- Boots, chemical-resistant, steel toe and shank.
- Hardhat (under suit).

7.1.2 Level B

- Positive pressure, full face-piece SCBA or positive pressure-supplied air respirator with escape SCBA, approved by NIOSH.
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank
- Boot-covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (under suit)(optional)

- Face shield (optional)

7.1.3 Level C

- Full-face or half-mask, air purifying respirators (Mine Safety & Health Administration/NIOSH approved)
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls)
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank (optional)
- Boot-covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (optional)
- Escape mask (optional)

7.1.4 Level D

When gross contamination is encountered:

- Coveralls
- Chemically resistant clothing (optional)
- Gloves, (chemical resistance is optional)
- Gloves, inner, chemical-resistant (optional)
- Boots, chemical-resistant, steel toe and shank (optional)
- Boot-covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (optional)
- Safety glasses with side shields or chemical splash goggles (optional)
- Escape mask (optional)
- Face shield (optional)
- Hearing protection (optional)

7.2 PROTECTIVE CLOTHING AND EQUIPMENT

All workers involved in fieldwork activities are required to protect themselves appropriately from the chemical and physical hazards at the site. All field personnel should wear at a minimum the following PPE:

- Eye protection
- Hearing protection
- Hardhat
- Steel-toed boots
- High-visibility reflective vest

Clothing sufficient to protect workers from skin contact with substances, as well as heat and cold, also may be required as site conditions dictate. Additional PPE may be required depending upon the site conditions. Additional PPE levels deemed necessary will be discussed during the daily safety meetings and will be provided for use before commencing site activities.

7.2.1 Hearing Protection

Adequate hearing protection is required in all areas that may expose workers to high levels of noise. These work areas include those around heavy equipment, generators, compressors, and other noise-generating equipment. Hearing protection measures include:

- Engineering controls (when feasible)
- Ear plugs
- Ear muffs

7.2.2 Eye Protection

Basic eye protection, such as safety glasses, is required in all work areas. Additional eye protection equipment will be worn as site conditions dictate. Instances that would require an increase in eye protection include work conducted in dusty conditions or when handling substances that may splash. Eye protection includes:

- Safety glasses with side shields--minimal eye protection
- Goggles—splash, dust, and foreign object protection
- Face shields--splash and foreign object protection

7.2.3 Hardhats

Hardhats are required for workers where there is a potential for being struck from overhead or in areas adjacent to heavy equipment operations.

7.2.4 Clothing

When gross contamination is encountered (such as in an excavation), then clothing required for preventing skin contact with hazardous substances will be worn. Protective clothing that shall be maintained on site by individual site workers for use shall include the following:

- Splash protection coveralls such as Tyvek or Kappler (poly-coated for liquid contact)
- Neoprene boots, Tyvek booties, or rubber boots
- Nitrile gloves, with either a cotton or leather outer shell

If no apparent gross contamination is observed during work activities, the following clothing modifications will apply:

- General work clothing, including:
  - Long pants, long-sleeve shirts
  - No loose clothing
  - Coveralls (use encouraged)
  - Steel toed boots
- Gloves:
  - Double nitrile gloves for personnel handling samples
  - Single nitrile gloves under work gloves
  - Heavy nitrile gloves when steam cleaning (under-gloves not required)

Reflective vests are not required over protective coveralls, as this use may subject them to exposure from site contamination. PPE used during site activities that cannot be completely decontaminated shall be bagged at the worksite for disposal. Individual workers shall not remove PPE from the site until adequate decontamination has been conducted.

7.3 RESPIRATORY PROTECTION PROGRAM

All employees will be provided protection from occupational exposure where potential exposure to dusts, fumes, mists, radionuclides, toxic gases, vapors, or oxygen deficiency exists. Where feasible, exposure to contaminants at concentrations presenting potential health hazards will be eliminated using engineering controls. When effective engineering controls are not feasible, use of personal respiratory protective equipment will be required to achieve this goal. Respiratory protection measures will be instituted based upon worksite monitoring results, worker sensitivity, and pre-determined protection levels related to work conditions. Respiratory protection action levels are provided in Table 5-1.

Excavating activities could create contaminated dust and possibly low levels of vapors. Dust levels will be controlled to prevent exposure; however, if dust levels cannot be adequately controlled, workers will wear respiratory protection when noticeable or irritating dust levels are encountered. Activities should be conducted to keep personnel upwind of the work area.

If leaking drums are encountered, they will be removed from the excavation using the excavator. Once drums are uncovered, personnel shall stay upwind and Level C protection shall be used to conduct monitoring of the uncovered trench. The PID will be used to monitor the breathing zone; action levels for PPE upgrades are provided in Table 5-1. Sampling of drums will require level B protection until the drum contents can be characterized.

During periods of respirator use, cartridges are to be changed each day of use, whenever breakthrough is detected, or when dust loading makes breathing difficult, whichever occurs first. If site conditions require respiratory protection upgrade (as described above), the AFCEE COR and the USAF PM will be notified. Refer to Attachment B-15 for the Respiratory Projection Program and Report forms.

7.4 OTHER SAFETY EQUIPMENT

The following additional safety equipment will be brought to and maintained for use at the work sites:

- Portable eye wash station or sufficient bottles to provide adequate eye irrigation
- First-aid kit
- Type A-B-C fire extinguisher

This equipment may be maintained inside site vehicles or equipment provided that its location is communicated to all personnel on site prior to the start of work.

(intentionally blank)

8.0 SITE CONTROL

8.1 GENERAL SITE CONTROL REQUIREMENTS

To prevent exposure of unprotected personnel and contaminant migration, work areas and the associated PPE requirements will be clearly identified using the proper signage at the access point to the work site. Only authorized personnel will be allowed to enter the work area.

Operations will be conducted in a safe manner consistent with the policies and procedures outlined in the HSP. As an administrative measure to limit personnel exposure to site hazards, the number of personnel allowed on-site will be restricted to the minimum needed to complete the required work.

Site access will be controlled to reduce the possibility of entry by unauthorized or unprotected individuals, and to prevent the transfer of contaminants from the site by personnel or equipment. This will be accomplished using administrative controls because physical barriers may not be practical. Only Jacobs and subcontractor personnel will be allowed access to this area during field operations. Persons entering this zone are required to wear PPE as prescribed in Section 7.0 of this HSP.

The SSHO or a designee will be alert to persons attempting to enter the site's exclusion zone and will prohibit unauthorized or unprotected persons from entering these zones. Zones may be modified or expanded by the SSHO depending upon changing wind and site conditions.

8.2 WORK ZONES

Work areas or zones will be designated as suggested in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH/OSHA/USCG/EPA 1985). The guidance manual recommends that the vicinity around each of the work areas be divided into three zones:

- Exclusion or "hot" zone
- Contamination reduction zone
- Support zone

Clearly delineated work zones help ensure that:

- Site personnel are adequately protected from existing hazards.
- Specific activities and hazards are confined to the appropriate areas.
- Personnel can be accurately and quickly located and evacuated during an emergency.

Personnel will comply with HSEP 7.3.2, Site Control (Attachment C4). When establishing Work Zones, vehicles will be arranged to provide efficient evacuation due to wildlife or other emergencies.

For work areas with potential exposure to radiological hazards, radiological areas including the exclusion zone will be established and posted.

8.2.1 Exclusion Zone

The exclusion zone will consist of the immediate active work areas where sampling takes place. This is anticipated to be limited to the areas in which excavations and trenching will take place. The zone perimeter will be sufficiently large to prevent contact by unprotected personnel with either dusts or vapors arising from these operations. The exclusion zone perimeters will be marked and will be relocated along with the work activity. All personnel entering these areas must wear the prescribed level of PPE. Personnel entry into exclusion zones will be noted on the daily safety meeting form.

8.2.2 Contamination Reduction Zone

The contamination reduction zone will be located between the exclusion and support zones. If required, personnel will begin the sequential decontamination process in this area after exiting the exclusion zone. To prevent cross-contamination and for accountability purposes, all personnel will enter and leave the exclusion zone through the contamination reduction zone. To help avoid tracking potentially contaminated materials off site, gloves, booties (if applicable), and protective coveralls (if applicable) should be removed when leaving the contamination reduction zone.

8.2.3 Support Zone

The support zone will consist of those areas around the exclusion zone where the equipment is staged (typically the support vehicles). Eating and drinking will be allowed in this area only.

8.3 BUDDY SYSTEM

The SSHO will designate personnel in contaminated or hazardous areas to work with a buddy capable of:

- Assisting his/her partner
- Monitoring partner for signs of chemical or other exposures (e.g., heat or cold)
- Periodically verifying the integrity of partner's PPE

- Notifying the SSHO when emergency help is needed

Personnel shall enter the exclusion zone through an access control point and the crew supervisor will verify that workers use the buddy system at all times. A buddy system should be used in all of our projects away from emergency medical care, in order to provide assistance if needed.

8.4 COMMUNICATIONS

Verbal communication at the sites could be impaired by on-site background noise caused by heavy equipment and by the use of PPE. Hand signals to be used among personnel within the exclusion zone will be reviewed during tailgate safety meetings (before starting work). Communication among personnel at the project site will be conducted using two-way common-band-frequency radios. Communication with personnel not located at the project site will be made via radio, cellular telephone, or digital pager. Specific telephone and digital pager numbers for personnel assigned to individual projects are listed in Attachment A, Table 1.

8.5 SITE SAFETY AND SECURITY

Site security is essential to:

- Prevent unauthorized, unprotected, or unqualified people from being exposed to site hazards.
- Prevent vandalism.
- Protect established and safe working procedures.
- Protect personnel from wildlife.

Site safety and security will be maintained by:

- Limiting access at control points to authorized and essential personnel.
- Assigning the responsibility for enforcing exit and entry requirements.
- Requiring the SSHO to approve all visitors to the site.
- Stopping work immediately if unauthorized personnel or wildlife attempt to or succeed in accessing the work area or exclusion zone. In this case, the worker shall notify the SSHO, site superintendent, and the PM immediately. If wildlife enters the work area, workers shall walk to the nearest vehicle and leave the job site.

8.6 DECONTAMINATION PROCEDURES

Decontamination protects workers, the public, and the environment by limiting exposure to harmful substances and by preventing the spread of contamination. The SSHO will oversee decontamination procedures to determine their effectiveness and will take corrective actions to rectify any deficiencies.

8.6.1 Personnel Decontamination

At areas where an exclusion zone is necessary, all personnel exiting the exclusion zone will follow decontamination procedures. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the exclusion zone before decontamination. The SSHO may approve simplification of the procedures in the field when a determination has been made that decontamination procedures can be less stringent.

Decontamination procedures for the POL-contaminated sites are as follows:

- Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on the plastic drop cloths or containers that are provided.
- Scrub boots and gloves in decontamination solution or detergent water. Rinse off using copious amounts of clean water.
- Step across to the next station and remove coveralls and gloves. Deposit them in a container with a plastic liner.
- Remove respirator while avoid touching the face with the fingers. Deposit the respirator on a plastic sheet or in a container.
- Wash hands and face thoroughly.

8.6.2 Equipment and Vehicle Decontamination

Small instruments and equipment will be protected from contamination by draping, masking, or otherwise covering the instruments with plastic to the degree possible without hindering operation of the unit. Contaminated protective coverings will be removed from the equipment and disposed of in the appropriate containers. Any dirt or obvious contamination on the equipment will be brushed or wiped with damp disposable wipes, or wiped using Liquinox. The equipment will then be dried. Instruments are to be checked, field calibrated, and recharged as necessary for the next day's operation.

Vehicles and equipment used on site will be gross-decontaminated prior to leaving the site to eliminate contaminant migration from the site, as well as the potential for cross-contamination between sites. Gross decontamination includes the removal of potentially contaminated materials by use of a shovel or other hand tools, and stiff bristle brushes. All materials removed during gross decontamination will be accumulated and managed along with similar waste streams in accordance with the SS83 Waste Management Plan (included as part of the Quality Program Plan Part 2, Attachment 2). Equipment used on site will be completely decontaminated when it is no longer required on site, prior to its return.

8.7 WASTE HANDLING AND DISPOSAL

Waste generated on-site from field activities includes investigation-derived wastewater, contaminated soil, USTs, piping, concrete, PPE, laboratory waste, field trash, and office trash. Wastes will be minimized, segregated, packaged and managed on site in accordance with the SS83 Waste Management Plan (included as part of the Quality Program Plan Part 2, Attachment 2). Disposal of all wastes will be in accordance with state and federal requirements.

8.8 CONFINED SPACE

Personnel are not expected to need to enter confined spaces to clean, inspect, repair, and perform other duties associated with equipment or processes as part of this field effort. Potentially hazardous confined spaces include but are not limited to:

- Space large enough and so configured that an employee can bodily enter and perform assigned work.
- Space with limited or restricted means of entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits).
- Space not designed for continuous employee occupancy.

In the unlikely that confined space work will be required, Jacobs HSEP 7.2 Confined Space Entry (Attachment C5) will be followed when conducting confined space work.

(intentionally blank)

9.0 TRAINING/MEDICAL SURVEILLANCE

9.1 TRAINING

All personnel who will perform field activities must have completed the training and medical surveillance requirements specified in the OSHA Hazardous Waste Operations and Emergency Response Standard [29 CFR 1910.120(e) and (f)]. Therefore, such personnel must have completed 40 hours of initial training or eight hours of refresher training within the last year. All site personnel must also have received training in the level of personnel protective equipment, which they may be required to wear during the course of fieldwork. After arriving at the work site, all personnel will receive a site-specific orientation.

Managers or supervisors of personnel performing field activities must have completed the specified eight hours of management training in addition to the initial/refresher training. Personnel who will operate lift trucks or heavy equipment will have receiving training or have applicable experience. Additionally, key field personnel will attend USAF-provided training in UXO Awareness Class / Chemical Warfare Materials Awareness Class.

9.2 HEALTH AND SAFETY BRIEFINGS

A pre-entry health and safety briefing will be held prior to commencing fieldwork. The SSHO will lead the briefing, at which site-specific hazards and injury prevention will be discussed. Additional health and safety meetings shall be held whenever necessary (e.g., changes in activities or process). Attachment D1 contains the SPA form to be completed before each work activity; Attachment B17 contains the Health and Safety Briefing form used to document such meetings and personnel attendance.

9.3 MEDICAL SURVEILLANCE

All field personnel also must have completed and passed an annual and/or baseline occupational medical surveillance examination *within the last year*. Employees potentially wearing respirators must have passed a fit-test for the specific respirators and must have medical approval to wear the designated respirator.

Documentation of the above, in the form of a copy of each employee's training certificate(s) and summary letter from the occupational medical surveillance examination, must be on file prior to the employee performing site activities.

9.4 HAZARD COMMUNICATION

If subcontractors bring any hazardous material on-site, they must inform Jacobs and submit an MSDS for that material before its initial use on site. Jacobs will likewise inform the subcontractors of hazardous substances brought on site to which subcontractor employees may be exposed. All site employees will be informed of the potential hazards of all materials brought on site and to which they may be exposed, prior to the use of those substances.

Jacobs will submit to the USAF an inventory and applicable MSDSs for any hazardous materials to be brought on site.

A copy of all the MSDSs for products used on site will be maintained on site by the SSHO. The only exception to this will include products available to the general public when the product is used in the workplace in the same manner that a consumer would use the product, i.e., where the duration and frequency of use is not greater than what the typical consumer would experience.

10.0 INSPECTIONS

Site and equipment inspections will be performed on a routine basis as described below.

10.1 SITE INSPECTIONS SAFETY EVALUATION

The following inspections are required:

- The HSM will conduct periodic project audits and will use the Safety Evaluation Review (Attachment C6) or equivalent.
- The SM shall conduct a health, safety and environment (HSE) review of the job site before any new phase of work is initiated, and monthly thereafter.
- The SSHO shall conduct daily HSE inspections of each project site. Observations noted during the inspection will be documented on SORs (Attachment B-4) and noted in the Daily Health and Safety report provided in Attachment B-8).

All site inspection results should be reviewed with the SM and subcontractors as applicable. All deficiencies should be corrected. Serious deficiencies must be corrected immediately.

10.2 EQUIPMENT INSPECTIONS

Any machinery or mechanized equipment shall be inspected and tested by a competent person and certified to be in safe operating condition prior to use at the site. Inspections and tests shall be in accordance with the manufacturer's recommendations and shall be documented. Test and inspection records shall be recorded on the Jacobs equipment inspection form (Attachment B14). All forms shall be maintained at the project site.

10.2.1 Daily/shift Inspections and Tests

All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions as indicated below:

- Tests shall be made at the beginning of each shift during which the equipment is to be used, to determine that brakes and operating systems are in proper working condition and that all required safety devices are in place and functioning.
- Whenever any machinery or equipment is found to be unsafe, or when a deficiency affecting the safe operation of equipment is observed, the equipment shall be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.
- A tag indicating that the equipment shall not be operated, and that the tag shall not be removed, shall be placed in a conspicuous location on the equipment. Where required, lockout tag-out procedures shall be used.
- The tag shall remain in its attached location until it is demonstrated to the individual dead lining the equipment that the equipment is safe to operate.

- When corrections are complete, the machinery or equipment shall be retested and re-inspected before being returned to service.

10.2.2 Vehicle Inspections

All motor vehicles owned or rented by Jacobs or our subcontractors will be inspected prior to use. During the inspection all deficiencies found will be noted and corrected prior to equipment use (Attachment B-13). Vehicles that cannot be brought to safe operating condition will not be used. In addition to pre-use inspections, the vehicle's primary driver will be responsible for ensuring that scheduled and periodic maintenance is performed to maintain it in a safe operable condition. At no time will anyone operate a vehicle they believe to be unsafe.

10.3 SAFETY OBSERVATION REPORTS

All site personnel, not just the site SSHO, are to complete an SOR form when real or potential unsafe acts or unsafe conditions have been identified. (The success of this program increases when the number of SORs completed by non-HSE specialists exceeds those completed by HSE specialists. This means all personnel are developing safety-conscious attitudes.)

SORs shall also be used to encourage and reward safe behavior. Providing positive reinforcement of a job or task well executed is far more encouraging than only recognizing unsafe behavior. Encouragement can be rewarding throughout the whole project and can lead to achieving a better and healthier project environment.

Any corrective measures shall be documented on the SOR form. A blank SOR form is included in Attachment B4.

All SORs shall be submitted to the SSHO within 24 hours of their completion. Completed forms shall be maintained with project records and a copy forwarded to the Anchorage HSE Group each week.

11.0 EXTREME WEATHER SITE WORK

For the purposes of this work plan, temperatures below –15°F will be referred to as extreme cold weather. The 2004 field activities are scheduled for the summer. However, weather conditions causing extreme cold temperatures at the site are discussed in the event this project continues into the colder seasons or abnormal weather patterns occur.

Wind's effect on skin and threshold temperatures should be taken into account when assigning work activities (Attachment C, Tables 2 and 3). Personnel assignments will be made to minimize prolonged sitting or standing still in unheated areas. In addition, warm up areas will be designated when the temperature drops below –20°F and shall be used at the onset of the following:

- Heavy shivering
- Frostnip (minor frostbite)
- Feelings of excessive fatigue
- Drowsiness
- Irritability
- Euphoria

The frequency and duration of warm-up time shall be dictated by the severity of the exposure to extreme cold conditions. All non-emergency work in unheated spaces should cease when temperatures reach –45°F.

In addition to the extreme cold, site personnel should be prepared for warmer temperatures during the summer months. Field personnel wearing additional PPE during hazardous waste management activities may be more susceptible to heat stress. Four environmental factors affect the amount of stress workers experience in hot work areas: temperature, humidity, sun (radiant heat), and air velocity (wind). Additional stress levels are associated with age, weight, fitness, medical condition and acclimation to heat. Symptoms of heat stress are heat rash (prickly heat), increased heart rate, loss of concentration, and irritability. These symptoms may lead to fainting or death. The following steps are recommended to reduce the risk of heat stress:

- Move to a cooler place.
- Reduce workload or pace.
- Rest in cool areas (may consider taking longer breaks and monitor stress).
- Wear lightweight clothing (if allowed given site conditions).
- Perform strenuous activities during hours when the sun is less intense or temperatures are cooler.
- Drink plenty of water (1 quart per person per hour).

11.1 TEMPERATURE SAMPLING

When ambient air temperature falls below 30°F or above 80°F, the SSHO will monitor and log the temperature and wind speed every 4 hours or as conditions change. These readings will be maintained on site in a logbook. Temperature and wind-speed readings will be taken into account when making personnel assignments. The SSHO will notify the SM when a wind chill factor of –15°F is recorded.

12.0 EMERGENCY PROCEDURES

The following sections describe pre-emergency planning, emergency equipment and supplies, emergency contacts, emergency procedures, emergency response and accident follow up, evacuation information, contacts, post-incident notifications, record keeping, and vehicle accident reporting procedures.

12.1 PRE-EMERGENCY PLANNING

The SSHO and SM will coordinate with applicable emergency service providers for all job site locations. Contacts, contact numbers, and primary gathering points will be reviewed prior to mobilization to SS83 at Elmendorf AFB. An Emergency Contact List is provided in Attachment A, Table 1 and includes numbers for fire, state troopers, medical facilities and the U.S. Coast Guard.

12.2 EMERGENCY COMMUNICATION

In addition to communication methods described in the HSP, the following communication and contact methods will be used:

- Land line phone
- Two-way radio
- Cellular phone

The following visual hand signals will be used:

- Clutching throat = Personal distress
- Arm waving and pointing towards the exit direction = Evacuate the area

When calling for an emergency response, by telephone or radio, report the following information:

- Your name
- Your company's name
- Type of emergency
- Location of accident or injury
- Time of incident
- Type of first aid or response being given

DO NOT HANG UP until the operator or emergency dispatcher has received the complete information and directs you to hang up.

Notify the SSHO or SM and your immediate supervisor immediately after hanging up the phone. Further information or assistance may be needed from you to complete the accident investigation process.

12.3 INJURY/ILLNESS/EMERGENCY MEDICAL TREATMENT

Should a person become injured, an Authorization for Medical Treatment form (Attachment B7) shall be taken to the medical facility with the employee. The site personnel shall complete the top portion of the form and the doctor at the medical facility shall complete the bottom portion of the form. The acting site supervisor (lead) shall:

- Secure the accident area and complete an accident report with all applicable witness statements.
- Prepare descriptive figures depicting the general site layout, directions, emergency contacts, and the location of the medical facility.

An accident with any of the consequences listed below shall be reported immediately to the Jacobs HSM. A government-designated representative will also be notified if following events occur:

- Fatal injury
- One or more persons admitted to a hospital
- Property damage in an amount specified by the designated authority

Daily records of all first aid treatments not otherwise reportable shall be maintained on First Aid register and furnished to the HSM weekly.

12.4 FIRE

Upon notification of a fire on site, all non-emergency responders will assemble at a predetermined area. If the site fire prevents personnel from reaching the field office, a second assembly point is located at the Anchorage office. Equipment to prevent the spread of any fire in remote locations will be available on site at all times.

A fire watch shall be assigned while hot work is in progress. A Welding/Brazing/Hot Work Permit (Attachment B9) shall be completed and approved by the SSHO prior to hot work activities. Upon completion of hot work, the fire watch keep watch of the work area for an additional 30 minutes to ensure a fire does not develop.

12.5 PERSONAL PROTECTIVE EQUIPMENT FAILURE

If any site worker experiences a PPE failure, that person and his/her buddy will immediately leave the exclusion zone through the decontamination area. The SSHO shall be notified of any defect or failure of PPE. Reentry into the exclusion zone will not be permitted until the equipment has been properly repaired or replaced.

12.5.1 Other Equipment Failure

If other equipment on site fails to operate properly, the equipment shall be red-tagged and removed from service and the SSHO notified. After completion of repairs, the equipment shall be re-inspected, evaluated, and appropriate actions taken. The SSHO will evaluate the safety hazards to site personnel before continuing operations.

12.6 EVACUATION

If an evacuation of the work area is necessary, the following steps should be followed:

- After receiving the signal to evacuate, all non-response personnel are to leave the work area in an upwind direction and assemble at a predetermined point.
- After the location has been evacuated, if appropriate and safe, the SSHO and a designated buddy shall remain at or near the work location to assist local responders and advise them of the nature and location of the incident.
- The supervisor will account for field team members at the assembly point(s).
- The supervisor will complete an incident report with applicable witness statements as soon as possible after an incident.

Evacuation routes and assembly points shall be designated to facilitate access and provide direction for emergency responders. All on-site personnel will be advised of evacuation routes and assembly points during the safety orientation and/or daily tailgate meetings. The SSHO or SM shall document the actual evacuation routes and assembly points, whenever evacuation occurs.

12.7 EMERGENCY RESPONSE AND ACCIDENT FOLLOW-UP

Elmendorf AFB Hospital personnel will respond to any medical emergency 9-1-1 calls on Base. Medical attention that does not warrant a 9-1-1 emergency response will be managed by a medical facility off Base. A map showing the locations of the local hospitals is provided in Attachment A.

Any accident/incident resulting in an OSHA-recordable injury or illness, treatment at a hospital or physician's office, property damage, or a near-miss accident requires completion of an accident/incident report and submittal to the report to the HSM in accordance with Jacobs Health and Safety Policy. The investigation will begin as soon as emergency conditions are under control. The purpose of this investigation is not to attribute blame but to determine the pertinent facts so that repeated or similar occurrences can be avoided. A copy of procedure for accidents, and incidents is included as Attachment B11. If required, Jacobs will promptly notify OSHA in the event of any serious or fatal accident.

Following any incident or emergency, the SM or designee shall directly notify the HSM, the PM, and the client as soon as possible. The SM shall be prepared to provide the following information:

- SSHO name
- Project name and number
- Exact location of incident
- Name of victim and their employer
- Nature and extent of injuries
- The name and address of medical facility (if personnel were transported off site)
- The name of physician providing off-site care
- A phone number where the SSHO can be contacted during the next 24 hours

An on-site first-aid kit will be maintained. The kit will contain gloves and a cardiopulmonary resuscitation shield for protection from blood-borne pathogens. An on-site portable eyewash also will be maintained.

The client representatives (USAF and AFCEE) must be notified of any accident or injury. Copies of the USAF notification forms are provided in Attachment B18.

12.8 EXPOSURE TO BLOOD BORNE PATHOGENS

The following procedures will be implemented when a potential exposure to blood-borne pathogens occur:

- The SSHO must be notified immediately when a first aid incident occurs.
- The SSHO shall provide a report to the HSM, as required by reporting procedures.
- The report shall include names of all first aid providers who rendered assistance, and a description of the incident including time, date, and types of barriers used.
- If a blood-borne pathogen or other potentially infectious material exposure has occurred, the description of the incident (above) must include a determination. This determination is necessary to ensure proper post-exposure evaluation and prophylaxis occurred, and that follow-up procedures were made immediately available (a Jacobs policy requirement).

- Hepatitis B vaccination must be offered to all workers who have occupational exposure to blood or other potentially infectious materials.
- The report shall be recorded on the First Aid register.

12.9 VEHICLE ACCIDENT

The SM and SSHO shall be promptly notified of any accidents involving vehicles. The SM will be responsible for notifying the PM, HSM, and the client representative. A determination of operator drug testing will be made at that time. HSEP Vehicle Accident procedures shall be followed and report forms completed. (Attachment B12).

12.10 INJURY AND ILLNESS

An initial accident investigation will begin in accordance with HSEP 5.1, Accident and Incidents (Attachment B11). At a minimum:

- The scene will be secured with no movement of material or equipment until a review of the accident is completed.
- Signed statements from witnesses will be obtained.

If an employee is taken into a medical facility for treatment, the Authorization for Medical Treatment form shall be completed (Attachment B7). This form should be faxed to the HSM after the physician has completed it.

12.11 SPILL OR RELEASE PROCEDURES

The SSHO and SM shall be notified immediately when a spill or release occurs. The SSHO or SM shall notify the PM and client as soon as the site is under control and an SPA has been developed and implemented. No one shall enter the site until the SPA is in place and approach has been approved. Regulatory agencies will be notified by the PM or the client.

Personnel involved with containment or cleanup shall wear appropriate PPE as defined in the SPA for specific contaminants. Immediately notify the SSHO or SM. The SSHO or SM will be responsible for notifying the PM and the client. The client and PM will determine the strategy for notifying regulatory agencies.

Appropriate methods to contain, control, or remove product released shall be followed by personnel involved.

(intentionally blank)

13.0 ORIENTATION AND TRAINING

Prior to the start of work activities, all personnel working on this project and any new person visiting or conducting work on this project shall be briefed on this plan. All personnel shall sign the Site Project Safety and Health Agreement Sign-Off Sheet (Attachment B1) indicating they have been briefed and understand the requirements contained in this HSP.

Prior to work, a daily safety tailgate meeting will be held to discuss planned work activities, safety precautions, activity hazard analysis, emergency response updates, employee concerns, SOR, site conditions, monitoring results, injury/illnesses that may have occurred, exclusion zone entries, client issues, and other topics of concern to employees. The Safety Tailgate Meeting and Exclusion Zone Entry Log (Attachment B17) will be used to document the meeting. (Note: Tailgate meetings should begin with and emphasize daily work activities. Subcontractors should be leading this portion of the meeting with assistance from the SM and the SSHO.)

(intentionally blank)

14.0 SITE POSTINGS

There will not be a site trailer onsite, therefore there will be no bulletin board for site postings.

(intentionally blank)

15.0 REFERENCES

ACGIH *(*American Conference of Governmental Industrial Hygienists *)* 2002. *TLVs, Threshold Limit Values and Biological Exposure Indices for 2002*. American Conference of Governmental Industrial Hygienists.

DOSH (Division of Occupational Safety and Health, Alaska). (1987, amended 1991). *Hazardous Waste Operations and Emergency Response Standard*. State of Alaska Department of Labor Administration DOSH.

NIOSH/OSHA/USCG/EPA. 1985 (November). *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

OFR (Office of the Federal Register). 1999 (July). *Hazardous Waste Operations and Emergency Response.* National Archives and Records Administration. 29 CFR 1910.120 and 1926.65.

USAF (U.S. Air Force). 2002. *SS83 Landfill Engineering Evaluation/ Cost Analysis (EE/CA) Work Plan*.

(intentionally blank)

ATTACHMENT A

Project-Specific Contacts and Maps

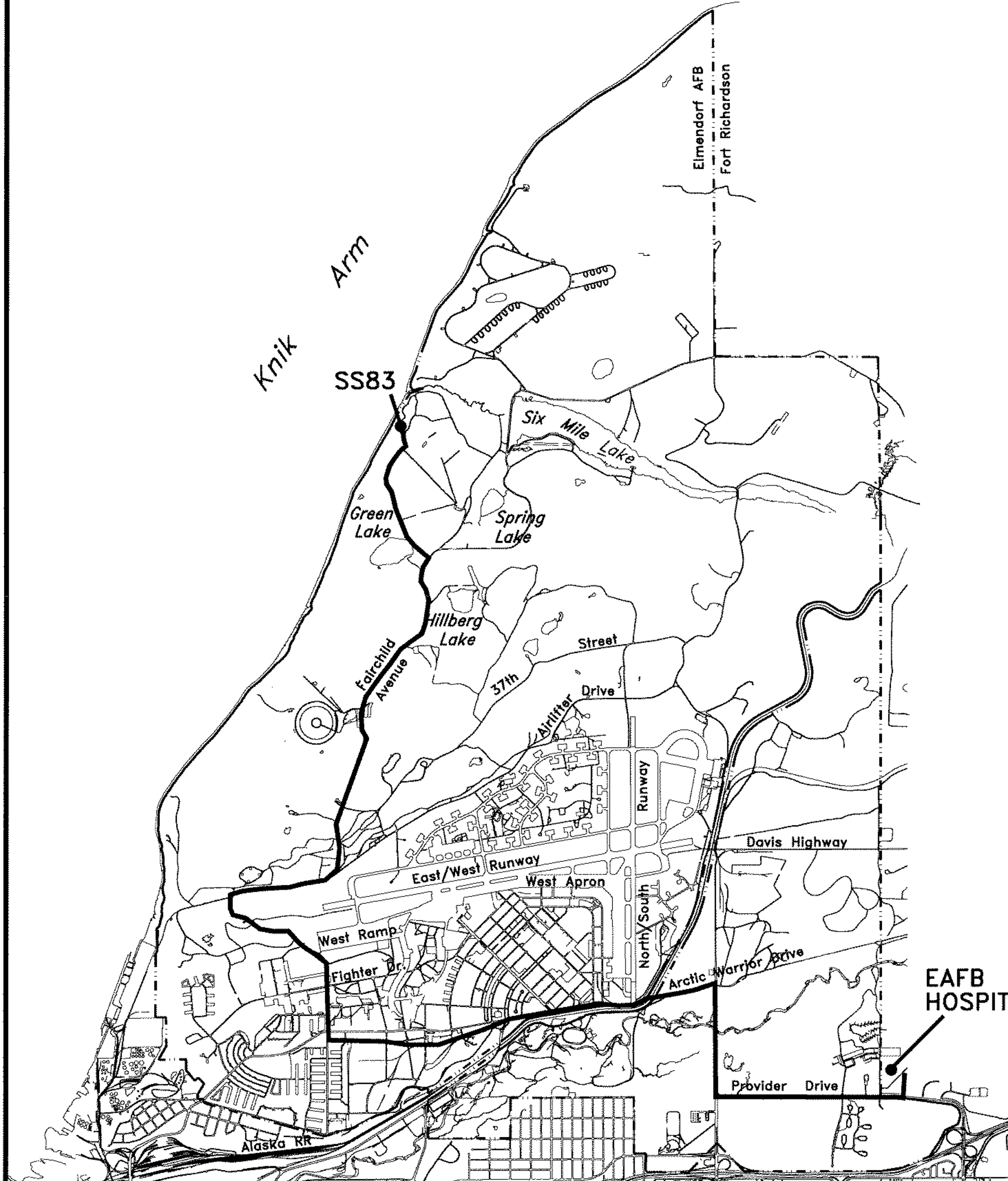
Table A1: Site SS83 Elmendorf AFB Contact List and Emergency Numbers

Figure A1: Hospital Locations and Routes

TABLE A1
EMERGENCY RESPONSE CONTACTS AND TELEPHONE NUMBERS

Emergency Response Organizations	
Ambulance	911*
Security	911*
Fire	911*
Elmendorf Hospital - Emergency	911*
Hospitals: Non-Emergency	
Alaska Regional Hospital Providence Alaska Medical Center	264-1222 261-3111
National Response Center	1-800-424-8802
Poison Control	1-800-222-1222
CHEM-TEL Customer: Peach ID #JACO 01	1-800-255-3924
Alaska State Troopers	907-428-7200
SS83 Landfill Key Project Team Members	
Project Manager Stephen Witzmann	751-3332 (wk) 346-3214 (home)
Health and Safety Representatives	
Health and Safety Manager, Anchorage, AK Brad Burns	751-3387 (wk) 907-223-8713
Client Representatives	
AFCEE CO Linda Fellows AFCEE COR Kevin Thomas	552-9762 552-4112
EAFB Project Manager Ellen Godden	552-7111
*** When dialing 911 from a fixed phone on Elmendorf AFB, you will reach the Elmendorf AFB emergency operator. When dialing 911 from a cell phone on Elmendorf AFB, you will reach the municipal 911 operators and must ask to be connected to the Elmendorf AFB emergency operator.**	

Directions to Hospitals (Figure A1):
Call 911 and follow instructions.



Municipality of Anchorage

DRAWING: Elmendorf\05Z02100\F3605HOS.dwg C/SC: 1:1PS DRAWN: SSR DATE: June 7, 02 ZIP: 44/00	FIGURE 10-1 SS83 ROUTE TO EAFB HOSPITAL	3 CES/CEVR SS83 LANDFILL EE/CA ELMENDORF AFB, ALASKA F41624-00-D-8031-0021

ATTACHMENT B

Project-Specific Jacobs Forms

Attachment B1: Site Project Safety and Health Agreement Sign-Off Sheet
Attachment B2: Approval of Modifications
Attachment B3: Visitor Check-in Log
Attachment B4: Safety Observation Report
Attachment B5: Personal Air Monitoring Record Form
Attachment B6: Exposure Monitoring Log
Attachment B7: Authorization for Medical Treatment
Attachment B8: Daily Health and Safety Report
Attachment B9: Welding / Brazing / Hot Work Permit
Attachment B10: Health and Safety Calibration Log
Attachment B11: Vehicle Accident Procedure and Report Forms
Attachment B12: HSE Procedure – Vehicle Accidents
Attachment B13: Rental Equipment Condition Report for Automobiles / Trucks
Attachment B14: Standard Equipment Inspection Form
Attachment B15: Respiratory Program and Report Forms
Attachment B16: Hazardous Material Exposure and Field Activity Report
Attachment B17: Site Tailgate Meeting and Exclusion Zone Entry Log

JACOBS ENGINEERING GROUP INC.

Attachment B1

SITE PROJECT SAFETY AND HEALTH AGREEMENT SIGN-OFF SHEET

Title	Signature	Date
Client: AFCEE		
Cindy Hood, Project Manager		
JACOBS:		
B. Burns, HSE Manager		
Tom Tompkins, Project Manager		
K. McGovern, Site Manager		
Project Team:	**"I have read and agree to abide by this SSHP Addendum and Standard SSHP."**	

JACOBS ENGINEERING GROUP INC.

Attachment B2

APPROVAL OF MODIFICATIONS

Change Number	Effective Date	Table Number Changed	Content of Change	Jacobs Approval Health and Safety Manager and Project Manager	Client Approval

JACOBS ENGINEERING GROUP INC.

Attachment B3

VISITOR CHECK-IN LOG

Project Name:		Project No.:	Date:	
			Time (24-Hour)	
Name	Representing	Destination	In	Out

JACOBS ENGINEERING GROUP INC.

Attachment B4

SAFETY OBSERVATION REPORT

Date: ____________ **Time:** _________ **Originator:** ______________________________

Project: ____________________ **Supervisor:** ______________________________

Location: ____________________ **Action Person:** ______________________________

Observation:

____

____

____

____

____

Check Box That Applies:

- ☐ Safe Behavior Observed (No Further Action Required) Proper Procedures Followed
- ☐ Unsafe Behavior
- ☐ Unsafe Condition

- ☐ If Non-compliance describe non-compliance below:

____

____

____

Corrective Action:

____

____

Further Action or Help Needed?

____

____

____

Action Person Signature:	Date Closed:	Action Person Notified: Yes/No

JACOBS ENGINEERING GROUP INC.

Attachment B5

AIR MONITORING RECORD

Employee Name: ________ **Employee No.:** ________ **Company:** ________ **Title:** ________

Project Name: ________ **Project Number:** ________

Date Sampled: ________ **Sampled By:** ________

Sampling Method and Analyte: ________

Collection Media:

____ Charcoal Tube   ____ Filter (Total)   ____ Passive Dosimeter   Collector Mfg: ________

____ Silica Gel   ____ Filter (Resp.)   ____ Other: ________   Size/Type: ________

____ Chromosorb   ____ Impinger   ________   Lot #: ________

Sample Type:

____ Personal - TWA   ____ Blank   Does Sampling Represent Typical Exposure? ________

____ Personal Peak   ____ Bulk   Temperature ________   Collector Mfg: ________

____ Area   ____ Other ____   Humidity: ________   Wind: ________

____ Source   ________

Activities During Sample Collection:

____

____

Sample Pump: Mfg & Model #: ________ Serial #: ________

Calibrator: Type: ________ Mfg & Model #: ________ Serial #: ________

Calibration Date: ________ Calibrated By: ________

Sample #	Time On	Time Off	Total Time	Pre Cal Flow Rate	Post Cal Flow Rate	Average Flow Rate	Sample Volume	Analytical Result	TWA

Descriptive Data: (Engineering controls or PPE used, work activities, sample interferences etc.)

____

____

Date: ________ Signature: ________

Attachment B6

Exposure Monitoring Log

Project Name:	Project No.	Date:
Location Monitored:	Atmospheric Conditions	
Activity Monitored:		
Site No.		

		Readings								
Time (24-Hour Clock)	**Background**	**Monitor (depth)**	**FID (ppm)**	**PID (ppm)**	**%O_2**	**%LEL**	**H_2S**	**Mini-Ram**	**Other**	**Samplers Initials**

JACOBS ENGINEERING GROUP INC.

Attachment B7

Authorization for Medical Treatment

TO: Dr. ___________________ Address: ____________________________ Date: _______________

This form signed by our representative is your authority to render treatment to:

____

(Employee)

in accordance with the provisions of and under the conditions prescribed by the Workers' Compensation Act. Unless the case is an emergency, kindly obtain authorization for surgery, radical procedures, or hospitalization from the insurance carrier. Send your bill and report to us at the address listed below.

____

Authorized Representative

Date of Injury: __________________ Location: _________________________ Job No. ______________

How Injury Occurred: ____

Please complete and return by mail to the following address to ensure prompt payment of charges:

Risk Manager
1111 South Arroyo Parkway
Pasadena, CA 99105

FOR DOCTOR'S USE ONLY

Diagnosis of Injury: ____

Disposition of Patient:

____ Occupational ____ Non-Occupational ____ Unable to Determine

____ Able to resume regular duties

____ Able to resume regular duties next workday

____ Able to resume restricted duties with the following limitations: ___________________________________
____

____ Unable to return to work, estimated length of disability: ___________________________________

Return for follow-up visit on __________(Date)

____

Doctor's Signature

JACOBS ENGINEERING GROUP INC.

Attachment B8

DAILY HEALTH AND SAFETY REPORT

Contract Number / Delivery Order Number: ______________________
Project Title: ______________________
Location: ______________________

Date: ____________ **List Contractors/Organizations Present:** ____________

WEATHER CONDITIONS

Temp Low:		Temp Hi:	Comments:

Wind Speed: ____________ Conditions: ______________________

Zero Accident Process

Safe Plans of Action in effect today: **Yes** ☐ **No** ☐

Total Project SPAs generated to date: ______________________

Were any Safety Observation Reports (SORs) generated today? (List Individually) **Yes** ☐ **No** ☐

Total SORs for today: ____________ Total SORs since mobilization: ____________

Health and Safety Inspections

Check any of the following inspections performed today:

☐ Heavy Equipment	☐ Cranes
☐ Hand Tools	☐ Storage Areas
☐ Site Office	☐ Sanitation Facilities
☐ Drill Rig	☐ Monitoring Instruments
☐ Misc. Electrical	☐ Misc. Equipment
☐ Excavation	☐ Exclusion Zone
☐ PPE	☐ Operations
☐ Other	List:

Observation/Comments made during the daily inspections :

Air Monitoring

Was air monitoring performed within the breathing zone today?	☐ N/A	☐ Yes	☐ No
Did the air monitoring results exceed the PEL?	☐ N/A	☐ Yes	☐ No
Have Air Samples Been Collected for Laboratory Analysis?		☐ **Yes**	☐ **No**

Type of Test (personal, area, perimeter)	Test Method/Matrix	Quantity of Samples

General Health and Safety

Worker protection levels this date:	☐ **Level A**	☐ **Level B**	☐ **Level C**	☐ **Level D**	☐ **N/A**

Was any work activity conducted within a confined space?		☐ **Yes**	☐ **No**
Was any work activity conducted within an area determined to be immediately dangerous to life and health?		☐ **Yes**	☐ **No**
Were approved decontamination procedures used on workers and equipment as required?	☐ **N/A**	☐ **Yes**	☐ **No**
Was a Safety Tailgate Meeting held this day? (See attached)		☐ **Yes**	☐ **No**
Was there any “Lost Time” accidents this day? (If YES, attach copy of completed accident report)		☐ **Yes**	☐ **No**
Was hazardous waste/materials released into the environment? (If YES, attach copy of spill report)		☐ **Yes**	☐ **No**

(SM) ____________________ Health and Safety ____________________

Date ____________________ Date ____________________

JACOBS ENGINEERING GROUP INC.

Attachment B9

WELDING/BRAZING/HOT WORK PERMIT PERMIT #__________

Issued by: ______________________________

Approved by SSHO: ______________________________

Date Permit Issued: ______________ Time Permit Issued: ______________ Expiration Date: ______________

Operation to be Performed: ______________________________

Location of Operation: ______________________________

Special Precautions:

TESTING				
Location of Testing	**Time**	**Percentage of LEL**	**Percentage of O_2**	**Initials**

CHECKLIST			
Item	**N/A**	**Yes**	**Initials of Inspector**
Surround equipment and operation safe for hot work			
Tank purged			
Extinguisher present			
No combustibles within 35 feet of operation or items protected by covers or removed from area			
No flammables within 50 feet			
Worker has proper protective equipment to perform function			
Safety blankets available			
Flammable gases greater than 10% present additional precaution needed to perform operation			
Fire watch required			
Welding unit inspected			
Adequate ventilation available			

The location where the work is to be performed has been examined, necessary precautions taken to provide for worker safety and for the area to be a fire safe environment for performing these functions. Permission is granted for the work to be performed.

Signature of SSHO performing inspection and issuing the permit:

I am fully qualified to perform this operation and understand my responsibilities outlined by the inspection just conducted.

Signature of welder/on scene supervisor performing operation:

JACOBS ENGINEERING

Engineers and Constructors

ATTACHMENT B10

Health and Safety Instrument Calibration Log

Date	Time	Instrument	MFG Model #	Serial #	Calibration Gas	Lot #	Concentration	BKG Counts	Span Setting	Initials

Attachment B11: Vehicle Accident Procedure and Report Forms

Incident Reporting Process

HS&E Procedure – Accidents and Incidents

HSE Procedure	Document No: HSEP 5.1	Page:
Accidents and Incidents	Supersedes: CHSP 5.1 CHSP 5.1.1 CHSP 5.1.2 CHSP 5.1.3	Rev. 2

Issuing Department:	Approval:	Previous Rev. Date:	Current Revision Date:
Corporate HSE	Mike.Coyle@Jacobs.com	1 Jun 97	9 May 03

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE 5

2.0 RESPONSIBILITIES 5

- 2.1. Site Management 5
- 2.2. Supervision 5
- 2.3. Employees 5
- 2.4. Site HSE Department Representative 5

3.0 DEFINITIONS 5

4.0 PROCEDURE 5

- 4.1. Accident/Incident Investigation 5
- 4.2. Investigation Reports and Recordkeeping 5
- 4.3. Communication of Investigation Findings 5
- 4.4. Releases and Employee Exposures Involving Hazardous Chemicals 5
- 4.5. Recording Work-Related Injuries and Illnesses For Regulatory Purposes 5
- 4.6. Serious Or Fatal Incidents 5
- 4.7. Training 5

5.0 REFERENCES 5

FIGURES

Figure 1 - Accident/Incident Incestigation Report

Figure 2 - Witness Statement

Figure 3 - Authorization for Medical Treatment

Figure 4 - First Aid Register

1.0 PURPOSE AND SCOPE

Investigations, reporting, and recording of all accidents, incidents, and illnesses is a key step in detecting trends and establishing measures to prevent recurrence. For this reason, it is imperative that all accidents, incidents, and illnesses be reported, investigated, and documented. This includes non-injury events and dangerous occurrences.

This HSEP applies to all employees and company subcontractors engaged in operations covered by the HSE Manual.

For incidents involving motor vehicles, refer to HSEP 5.2. For environmental incidents, refer to HSEP section 22.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1 SITE MANAGEMENT

Site Management shall organize accident investigations and actively participate in them, as required.

Site Management is responsible for analysis of safety records to measure the effectiveness of preventive/follow-up actions and the ongoing safety program.

2.2 SUPERVISION

For accidents, incidents, and illnesses involving their personnel, Supervisors must

- Promptly report them to the HSE Department and to Site Management,
- Lead investigations, and
- Ensure that all records are completed in a timely fashion.

2.3 EMPLOYEES

Employees must immediately report all accidents, incidents, and illnesses to their Supervisor or the HSE Department.

2.4 SITE HSE DEPARTMENT REPRESENTATIVE

The Site HSE Supervisor shall

- assist Site Management in organization of investigations and participate in them,
- assist Supervisors in properly reporting and recording all accidents, incidents, and illnesses,

- establish and maintain all records required by this HSEP and regulatory agency recordkeeping requirements, and
- assist Site Management in the analysis of records to measure the effectiveness of preventive and follow-up actions and the ongoing HSE program.

3.0 DEFINITIONS

Accidents and Incidents	An unplanned, undesirable event, which disrupts work activity. This includes events that did not result in injury or property damage, but could have.
First Aid	Any one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which does not require medical care. Such treatment and observation are considered first aid even though provided by a physician or a licensed healthcare professional.
Illness	Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases, which may be caused by inhalation, absorption, ingestion, or direct contact.
Injury	Any injury such as a cut, fracture, sprain, amputation, etc., which results from a work incident or from a single instantaneous exposure in the work environment. It should be noted, conditions resulting form animal bites, such as insect or snakebites, and from one-time exposure to chemicals are considered to be injuries.

4.0 PROCEDURE

In the event of a workplace incident involving injury or illness, the first priority is to provide the best assistance possible to employees who may need it and to ensure the safety of others who may be affected or acting as emergency responders.

4.1 ACCIDENT/INCIDENT INVESTIGATION

In order to eliminate incidents, both injury and non-injury, it is important to perform thorough investigations when accidents/incidents occur. An accident/incident investigation is not a fault-finding endeavor, rather it is a fact-finding effort. Immediate action taken to identify causes can be utilized to prevent recurrence of future incidents of a similar nature.

Investigations must be conducted whenever an accident/incident occurs, including non-injury and first-aid-type incidents. Participants in the basic investigation process should include, at a minimum:

- The person(s) involved and/or injured in the incident.
- First- and second-line supervisors of the person(s) involved in the incident.
- Site Manageror office manager.
- The local HSE professional.

In the event of serious incidents, it may be appropriate to add Company management and/or subject matter/discipline specialists to the investigation team.

The investigation team should examine the accident/incident scene, if appropriate, and then review all facts pertaining to the incident in a conference environment.

The task-specific safe work plan (Safe Plan of Action) should be examined as part of the investigation process.

4.2 INVESTIGATION REPORTS AND RECORDKEEPING

4.2.1 Investigation Report

The Accident/Incident Investigation Report (Figure 1) shall be completed by the first line supervisor as soon as possible following the incident. In the event of a serious incident, the responsibility for report preparation may be assigned to another investigation team member.

The original of the Accident/Incident Investigation Report shall be maintained at the jobsite. A copy shall be sent to the appropriate HSE Manager.

4.2.2 Witness Statement

The Witness Statement (Figure 2) shall be used to obtain a signed statement from witnesses of their factual observations, as soon as reasonably appropriate after the incident.

Statements should be written by the witness, however, another person may record his/her dictation if so requested by the witness.

Statements should be taken and prepared in a confidential and non-threatening environment.

Append the Witness Statement to the Accident/Incident Investigation Report.

4.2.3 Authorization for Medical Treatment

For incidents that require medical evaluation or treatment of a Company employee, a Company supervisor shall complete an Authorization for Medical Treatment form. A new form shall be sent with the employee upon each visit to the medical services provider. (See Figure 3 for a sample authorization form that can be tailored for local use.)

Ask the medical services provider to complete the disposition portion (lower half) of the form.

Since form distribution varies by location, check with the Corporate HSE Department for distribution in your area.

4.2.4 Employer's First Report of Injury (US Only)

For US operations, an Employer's First Report of Injury (E-1) shall be completed for all injuries, which require referral to a physician for either evaluation or treatment. Contact your HSE Department to arrange for completion of the E-1.

This report and required accompanying reports must be promptly sent to HSE for review and forwarding to the Risk Management Department.

4.2.5 First Aid Register

The First Aid Register (Figure 4) is the primary project injury log and must be kept on-site at all times.

All injuries and/or illnesses (job related or personal) treated or reported (actual or alleged) shall be entered in the log, no matter how minor.

4.3 COMMUNICATION OF INVESTIGATION FINDINGS

A review of the incident facts, identified causes, and actions to prevent recurrence should be documented and communicated to employees. Office and jobsite communications can take the form of safety meetings, Task Safety Analysis (TSA) meetings, etc. Findings should also be incorporated in future SPAs and task-specific safe work plans.

For incident findings that may be of value to other locations, Corporate HSE will circulate lessons learned in the form of Safety Alerts, Safety Shorts, Lessons Learned, etc.

4.4 RELEASES & EMPLOYEE EXPOSURES INVOLVING HAZARDOUS CHEMICALS

Incidents involving potential exposure to hazardous materials, including incidents on-site, in the office, during Company travel, and hazardous material releases in (EPA-RCRA in US) reportable quantities, must be reported to a Senior HSE Manager.

Report all releases or exposures even though the incident may be considered minor or even though no adverse health effects or symptoms are apparent at the time.

Further procedures and notifications of regulatory agencies and clients shall be followed as defined in the site-specific Health, Safety, and Environment Plan (HSP) or HASAP.

A copy of the investigation report shall be placed in the affected employee(s) corporate medical file.

The Site or Office Manager shall complete all other investigation and reporting requirements as outlined in this HSEP.

4.5 RECORDING WORK-RELATED INJURIES & ILLNESSES FOR REGULATORY PURPOSES

Many local HSE regulatory agencies have incident reporting, recording, and posting requirements, which will be followed by all Company entities operating in those areas. The local HSE Manager is responsible for ensuring compliance with these requirements.

4.5.1 <u>Recordkeeping</u>

For US operations, enter OSHA Recordable Cases within three days in the OSHA Form 300, the Log of Work-Related Injuries and Illnesses.

For US operations that are covered by MSHA, recordable cases shall be recorded on Form 7000-1, with copies sent to the designated MSHA offices within the 10th workday after learning of its occurrence.

Refer also to HSEP 5.3 for generation and maintenance of incident statistics.

4.5.2 <u>Posting Requirements</u>

For US operations, OSHA Form 300A, Summary of Work-Related Injuries and Illnesses, for the preceding year must be posted from February 1 to April 30.

When there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

4.6 SERIOUS OR FATAL INCIDENTS

Occasionally, serious incidents may occur at project sites or offices that involve Company employees or third parties (contractor, client, member of the public, etc.) and may include events such as

- Serious personnel injury and/or illness,
- Significant vehicle incidents,
- Significant equipment or structural damage, and/or
- Significant threat or damage to the environment.

In such cases, the following requirements may apply.

4.6.1 <u>Internal Notifications</u>

In the event of a fatal or serious incident, an immediate telephone report shall be made by the Site or Office Manager or Project Manager or the Site HSE Supervisor to the Operations Manager and Senior HSE Manager.

The Senior HSE Manager shall immediately notify the Vice President of HSE. The Operations Manager shall immediately notify the Group Vice President. These managers will notify other senior Company managers, as appropriate.

All notifications shall be made in person or via direct phone conversations, rather than by e-mail or voice messages.

4.6.2 Regulatory Agency Notifications

Notification to local, state, and Federal agencies will be made by Corporate HSE, if necessary.

For US operations, Fed-OSHA reporting requirements can be found in 29 CFR 1904.8.

4.6.3 Next of Kin Notification

Notification of the next of kin shall be coordinated through Corporate HSE or HR.

Notification shall be made in person by a member of Company management. If, in the event the employee's next of kin resides out of town or state, such notification should be coordinated through a local Company office or a local law enforcement organization.

Local management should consider the need for help with immediate, short-term transportation, lodging, or similar assistance for the next-of-kin.

4.6.4 Accident Investigation

The incident scene shall be secured immediately. No movement of material or equipment shall be made until a review of the incident scene has been completed and documented. (Securing equipment or material, which could result in further injury, may be done.)

A team comprised of representatives from HSE, Operations, and Legal will conduct the investigation. The Legal Department will direct the investigation in order to assure attorney-client privilege, as necessary.

Investigations shall include:

1. Obtaining from witnesses signed statements of their complete and factual observations, as defined above. In the case of certain serious incidents, local law-enforcement personnel may participate in, or conduct, collection of witness statements.
2. Ensuring that adequate photographs are taken from several angles. Release of photographs shall be coordinated through the HSE Department with proper approval by the site owner or client and Company Legal Department.
3. Documentation management for all photos, measurements, statements, and handwritten notes, etc., in a single file. The HSE representative may designate the contents of this file as confidential, "Attorney – Client Privilege", as directed by the Corporate Legal Department.

4.6.5 Media Relations

Some incidents may involve media interaction. Refer to Jacobs Global Policy Supplement, GPS1-105, Media Interaction, for directions and guidelines.

4.6.6 <u>Client Assurance</u>

The client shall be assured that the Company is professionally investigating the incident and will make the necessary program adjustments or recommendations to prevent recurrence.

4.7 TRAINING

Supervisors must be trained in proper accident/incident investigation techniques and the recording and reporting requirements.

The Accident/Incident Investigation Report (Figure 1) must be issued and reviewed as part of this training.

5.0 REFERENCES

29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses

U.S. Department of Labor, Bureau of Labor Statistics, Record-keeping Guidelines for Occupational Injuries and Illnesses (the "Blue Book")

FIGURES

Accident/Incident Investigation Report
Witness Statement
Authorization For Medical Treatment
First Aid Register

Figure 1 - Accident/Incident Investigation Report

Date of Accident/Incident:____________ Time of Incident:_______________ Company:__________________________

Date of Investigation:____________________ Project Number:________________ Client:__________________________

Location of Accident/Incident:____

Did injury result? Yes/No _____, If yes, provide Employee Name(s):____

S.S. No.:___________________ Skill:___________________Yrs. in this Skill:________Yrs. with Company:_________

Describe Type of Injury:____

Was property damaged ? Yes/No _____, Describe damage/owner:____

____

Is damaged property secured/maintained? Yes/No_____, Person Maintaining___________________________________

Names of Witnesses/Coworkers (With Social Security No.):____

____

Weather / Wind Conditions:____

List/Describe all personal protective equipment (PPE) in use by person exposed or injured:________________________

____

If Chemicals Involved:

Name(s) of Chemical(s) Encountered:____
____

Form of Chemicals (Solid, Liquid, Gas, Vapor, Dust, Mist Fume):______________________________________

Describe Radiological Materials (if any):____

Volume or Quantity Released:____

Description of Accident/Incident:____

____

____

____

____

Contributing Factors:____

____

What **corrective actions** are being taken to prevent recurrence? Also list the person responsible for implementing and the target completion date for each item.

____

____

____

Was an SPA/JSA developed for the task being performed? Yes/No_____, If yes, attach a copy.

Was a permit issued? Yes/No _________, If yes, attach a copy of the permit in effect at time of the incident.

Indirect cause: **Lack of**: Training____, Resources____, Belief____ (*explain)

____

Basic cause: **Failure to**: Plan____, Direct____, Organize____, Control____(*explain)

____

INVESTIGATION TEAM MEMBERS:

Injured / Involved:	Name	Signature
Supervisor:	Name	Signature
Site/Office Manager:	Name	Signature
HSE Professional:	Name	Signature
Name (Others)	Title	Signature
Name (Others)	Title	Signature

Client Representative(s) Contacted:____

Agency Representative(s) Contacted:____

* Attach additional sheets and supplemental data & information as necessary.

** Distribution: Original must be filed on-site; 1 copy must be sent promptly to the Corporate Health and Safety Department.

Figure 2 - Witness Statement

Please print or type.

Name:____ Title:___________________

Social Security Number:___________________________________Date:________ Time:________

Temporary Address:_____________________________________ Phone No.________________

____

Permanent Address:_____________________________________ Phone No.________________

____

Location at Time of Accident:____

Describe, to the best of your knowledge, what happened just before, during, and just after the accident:

____

____

____

____

____

____

____

____

____

____

____

____

____

____

Signature

Figure 3 - Authorization For Medical Treatment

To: ______________________________ Address: ______________________________ Date: _______

This form, signed by our representative, is your authorization to render **initial** medical treatment only to:

____

(Employee)

in accordance with the provisions of, and under the conditions prescribed by, the Workers' Compensation Act. Unless the case is an emergency, kindly obtain authorization for surgery, radical procedures, or hospitalization from the insurance carrier.

Fax this completed form to (*enter here the fax number for the local Jacobs Risk Management office point of contact*)

Send your bill and report to (*enter insurance carrier's mailing address and name of point-of-contact to whom the report and bill should be sent*)

____

Authorized Jacobs Representative

Date of Injury _______________ Location _________________________________ Job No. ___________

How injury occurred ____

____

For Doctor's Use Only

Diagnosis of Injury: ____

Disposition of Patient: ☐ Occupational ☐ Non-Occupational ☐ Unable to determine

☐ Able to resume regular duties.

☐ Able to resume regular duties next workday.

☐ Able to resume restricted duties with the following limitations: _____________________

____

☐ Unable to return to work; estimated length of disability: _______________________________

Return for follow-up visit on ____ (Date)

Discharged from care on ____ (Date)

____

(Doctor's Signature)

Figure 4 - First Aid Register

Company:____

Project Name/Number:____

Jobsite Location:____

Month / Year:____

Site or Office Manager:____

Page: _____ of _____

Date	Time	Name	Supervisor Or Foreman	Type of Injury, Body Part, and Brief Description of Injury	Class*

***Class** - Classification: **FAV** - First Aid Visit **E-1** - Doctor's Visit **OSHA** - OSHA Recordable **Other:**

Attachment B12: HSE Procedure – Vehicle Accidents

JACOBS ENGINEERING GROUP INC.

Work Instruction HSE Procedure		Document No: HSEP 5.2	Page: 5-5 of 3
Vehicle Accidents		Supersedes: HSEP 5.2	Rev. 3
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 23 Aug 01	Current Revision Date: 1 Apr 03

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE 5

2.0 RESPONSIBILITIES 5

- 2.1. Management 5
- 2.2. Supervisor 5
- 2.3. Employee 5
- 2.4. Corporate Risk Department 5
- 2.5. Human Resources Department 5

3.0 DEFINITIONS 5

4.0 PROCEDURE 5

- 4.1. Reporting 5
- 4.2. Post-incident Actions 5

5.0 REFERENCES 5

FIGURES

Figure 1 - Vehicle Accident Report

1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed in the event of a vehicle accident involving a Company owned or leased vehicle or a personal vehicle used for Company business and to any other motor vehicle, e.g. personal or borrowed and "third party motor vehicles", used by personnel engaged in Company business. This procedure addresses all motorized vehicles including cars, trucks, busses, all-terrain vehicles, golf carts, etc.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1 MANAGEMENT

Each Manager will ensure that Company Risk Management Department accident report forms are maintained in each Company vehicle under his/her control.

The appropriate manager must review all Vehicle Accident Reports with the employee and supervisor involved.

2.2 SUPERVISOR

Supervisors shall promptly report any vehicle incidents to operations management, HSE, and Corporate Risk Management.

Supervisors of employees involved in vehicle accidents must investigate the accident and complete the Vehicle Accident Report (Figure 1) with input from the person(s) involved in the incident and witnesses to the incident.

Copies of completed reports shall be promptly submitted to the Company Risk Management Department, to Corporate HSE, and to the office or operations program manager.

2.3 EMPLOYEE

Employees are responsible to promptly report all vehicle accidents to their supervisor or appropriate manager.

Employee drivers involved in vehicle accidents shall assist their supervisor or manager with completion of a Vehicle Accident Report.

2.4 CORPORATE RISK DEPARTMENT

The Corporate Risk Department distributes accident report forms, which are to be maintained in each vehicle covered by this HSEP.

2.5 HUMAN RESOURCES DEPARTMENT

The appropriate Human Resources Department will obtain a signed copy of the Motor Vehicle Operator Qualification form (HSEP 21.2) for each qualified operator.

3.0 DEFINITIONS

Qualified Operator	Personnel who been designated and authorized by the Company to operate motor vehicles on Company business.
Vehicle	Motorized vehicles, including cars, trucks, busses, all-terrain vehicles, golf carts, etc.

4.0 PROCEDURE REPORTING

Accident report forms shall be maintained in all vehicles owned, leased by the Company, or personal vehicles utilized for Company business. The forms are supplied by the Corporate Risk Management Department.

The form shall also be used in filing reports of accidents involving equipment vehicles (on-site or offsite) such as cherry pickers, backhoes, trucks, cars, etc.

Supervisors of employees involved in vehicle accidents must investigate the accident and complete the Vehicle Accident Report (Figure 1) with input from the person(s) involved in the incident and witnesses to the incident.

The report shall be distributed as follows:

- Corporate Health, Safety, and Environment
- Site or Manager's File
- Jacobs Vehicle Management Group
- Corporate Risk Management

Each incident will be investigated by a representative of the Corporate HSE Department in order to identify the cause and to determine measures to be taken to prevent a similar recurrence.

Disciplinary action and/or retraining may be required for any employee involved in a vehicle accident.

4.1 POST-INCIDENT ACTIONS

Vehicle operators shall be given instructions by their supervisor or an HSE representative on how to report an accident and what to do at the scene.

- Stop at once to investigate.
- If necessary, have someone call for emergency medical services.
- Call the police if the incident occurs on public property.
- Do not admit liability, even if you feel you are at fault.

- Do not discuss the incident with anyone at the scene other than the police, and only answer questions asked by them.
- Do not provide a written statement to anyone unless approved by Corporate Legal or Corporate Risk Management.
- Do not move vehicle until cleared by the police or unless local ordinances require moving vehicles after an accident.
- If possible, obtain names, addresses, license numbers, and phone numbers of any witnesses.
- Promptly notify your supervisor after an incident and assist with completion of the Vehicle Accident Report (Figure 1).
- Obtain from Risk Management an Automobile Loss Notice form and complete and submit to Risk Management.

5.0 REFERENCES

HSEP 21.2

FIGURES

Vehicle Accident Report

Figure 1 - Vehicle Accident Report

Claim Reporting

Risk Management Dept.Toll Free: 877/832-1721 Phone: 832 351-7146 Fax: 832 351-7712

Company Name ____________________

Date of Accident ____________Time of Accident ____________

Location of Accident ____________________

Project No. ____________________ Vehicle No. ____________

Company Vehicle

Driver ____________________ Date of Birth ____________

Work Address: ____________________

Home Address: ____________________

Work Phone No. ____________ Home Phone No. ____________

Supervisor Name/Phone ____________________

Vehicle Owner ____________ Make and Model ____________

License No. ________ Vehicle Identification No. ____________

Name(s) of Passengers: ____________________

Other Vehicle

Driver ____________________

Home Address of Driver ____________________

Work Phone No. ____________ Home Phone No. ____________

Driver's License No. (Including State) ____________________

Vehicle Owner ____________ Make and Model____________

Relation of Driver to Owner ____________________

Insurance Company ____________________

Insurance Agent ____________ Policy No. ____________

Description of Accident

____

____

____

Description of Damage To Vehicle

Company Vehicle: ____________________

Est. Repair Cost $________ Where Vehicle Can Be Seen:____________

Other Vehicle: ____________________

Est. Repair Cost $________ Where Vehicle Can Be Seen____________

Injuries/Witnesses

Company Vehicle: Name and Age of Injured ☐ Witnesses ☐ ____________________

____

Relation to Driver of Company Vehicle ____

____

Name of Investigating Officer:

____

Badge No. _____Police Report Number ____________Citations_______________________

Other Property Damage

Owner's Name, Address, and Phone No.

____

____

Describe Damage

____

____Report submitted by __________________________ Date __________________________

Diagram of Accident

Attachment B13: Rental Equipment Condition Report for Automobiles / Trucks

Attachment B14: Standard Equipment Inspection Form

JE REMEDIATION TECHNOLOGIES, INC.
A MEMBER OF THE JACOBS ENGINEERING GROUP

Attachment B13

RENTAL EQUIPMENT CONDITION REPORT

FOR AUTOMOBILES/TRUCKS

CLIENT ____________________ **PROJECT NO.** ______________________

VEHICLE TYPE _________________________AGENCY RECEIVED FROM ______________________

MAKE/MODEL _____________ MILEAGE Out _____________ MILEAGE In _____________

"Yes or No" Where Appropriate "G" - New or in Good Condition "R" - Requires Repairs "N" - Items Not Applicable

BODY & INTERIOR

- ☐ Inspection Sticker _____________ ☐ Upholstery _________________
- ☐ License/Sticker __________________ ☐ Heater/Defroster ______________
- ☐ Door Locks _________________ ☐ Air Conditioner ______________
- ☐ Door Handles ______________________ ☐ Steering ____________________
- ☐ Lighting System ______________ ☐ Floor Boards/Mats _______________
- ☐ Body _____________________ ☐ Paint ______________________

ENGINE & OPERATING SYSTEMS

- ☐ Oil Level and Condition _____________ ☐ Oil Leaks ___________________
- ☐ Operating Condition _______________ ☐ Cooling System/Hoses ______________
- ☐ Water Level/Anti-Freeze _____________ ☐ Transmission ________________
- ☐ Tire Condition/Lugs _______________ ☐ Transmission Level/Condition _________
- ☐ Battery Condition __ ___________________ ☐ Corrosion/terminal Connections_________________
- ☐ Tire Pressure _____ ☐ Lug Nuts______________ ☐ Fan/ Alternator_________ ☐ Belts _______
- ☐ Control Panel, Gauges ______________ ☐ Spare Tire _____________
- ☐ Jack, Tire Tool _____________________ ☐ Exhaust System _______________
- ☐ Windshield Wipers _______________ ☐ Brakes __________________
- ☐ Windows, Windshield __________ ☐ Parking Brake ___________________

REMARKS:
Initial Inspection By ____ Date ____

JACOBS ENGINEERING GROUP INC.

Attachment B14

Standard Equipment Inspection Form

Make	Type	Year of Manufacture	Date	Model	Serial No.	Hours	Employee ID	Inspector Name

			Engine	Attachment	Attachment
Fill in appropriate boxes	Company Name				
	Supervisor Name				

A. SERVICE CHECKS PRE-FIELD MOBILIZATION:

ITEM	*OK*	*AMT NEEDED*	*ITEM*	*OK*	*AMT ADDED*
Radiator & Freeze Protection			Batteries		
Transmission			Differential/Plan		
Final Drives			Tandems		
Engine			Fuel Level		
Hydraulic System			Drain Fuel Sediment		
Lubrication Points			Pivot Shaft		

B. EQUIPMENT INSPECTION PRE-FIELD MOBILIZATION

	CONDITION Bad/Good/ Excellent	*Attn Needed*	Explanation	*Corrected? (Y/N)*
Engine Compartment				
Radiator				
Fan & Shrouds				
Air Induction and Filter				
Belts Pulleys				
Exhaust & Rain Cap				
Battery & Cables				
Hydraulic Cylinders				
Operators Comp.				
Controls & Linkages				
Hoses & Lines				
Oil Leaks				
Fuel Leaks				
Coolant				
Fasteners				
Cracks				
Guards & Covers				
Cutting Edges				
Sprockets				
Rollers & Idlers				
Tracks or Tires				

Attachment B14 (continued)

B. EQUIPMENT INSPECTION PRE-FIELD MOBILIZATION (continued)

	CONDITION Bad/Good/ Excellent	***Attn Needed***	**Explanation**	***Corrected? (Y/N)***
Engine				
Governor Control				
Trans Operation				
Trans Linkage				
Steering System				
Service Brakes				
Parking Brake				
Unusual Noise				
Gauges Operational				
Gauges Normal				
Backup Alarm				
Heater & Fan				
Switches				
Wipers & Washer				
Lights				
Horn				
Seat & Seat Belts				
Windows				
Doors				
General Appearance:				
Machine Damage:				

NOTES:

Attachment B14 (continued)

NOTES (continued)**:**

Deficiencies noted: ☐ Yes ☐ No Explain: ______________________

Deficiencies fixed: ☐ Yes ☐ No Date: ______________

Inspection 100% complete ☐ Yes ☐ No

Subcontractor Signature ______________________ Date all items passed inspection: ______________

Jacobs Representative ______________________ Date: ______________

Attachment B15: Respiratory Protection Program and Report Forms

Attachment B15

7.0 TERC RESPIRATORY PROTECTION PROGRAM

The Respiratory Program Administrator for the Company is Terry Briggs, Ph.D., CIH, who is located in the Denver, CO office. He is responsible for the overall administration of this Program and conducting evaluations of the Program's effectiveness. Because the Company operates multiple project locations in various states, the Program Administrator has designated the Corporate HSE Managers as "Program Coordinators" to assist him in the execution of these responsibilities.

The Program Coordinator for Alaska-based projects is Brad Burns, who is located in the Anchorage, AK office. The Program Coordinator shall be responsible for Program implementation, conducting routine observations related to the effective selection, use, maintenance, storage, and other aspects of this Program. Observations shall be documented through the use of Safety Observation Reports, (SORs) and other similar documents. The Program Coordinator shall ensure that noted deficiencies are corrected as soon as possible.

7.1 MEDICAL EVALUATION

A medical evaluation and/or a medical examination will be completed to determine the employee's ability to use a respirator before the employee is fit tested or required to use a respirator in the workplace. A medical examination shall include any medical tests, consultations, or diagnostic procedures that the physician or other licensed health care professional (PLHCP) deems necessary to make final determination on the employee's ability to use a respirator. Form 1-1 provides a site program overview for respirator selection, training, testing, usage, and record-keeping.

Form 1-1
Site Program Overview

Medical Evaluations	Medical evaluations will be performed by Alexander T. Baskous, MD, MPH Medical evaluations will be scheduled by Aletha Colvett Denver EH&S Phone: (303) 462-7212
Respirator Selection	List specific types of respiratory equipment available on this project: **Type** **Model** **Size** **MSA** **Ultra Twin (full face)** **S, M, L**
	Respirators will be selected using Form 3-1, by the following person: **SSHO on each project** Respirators will be issued by the following person or organization: Program Coordinator Phone: (907) 751-3387
Fit Testing	**The following person/organization will perform fit testing:** **Name: Brad Burns Phone: (907) 751-3387** **Name: Phone:** **Name: Phone:** **Name: Phone:** **Name: Phone:** ☐ **Qualitative fit testing:** ☐ **Bitrex™** ☐ **Saccharin solution** ☐ **Isoamylacetate (Banana Oil)** ☐ **Irritant smoke** ☐ **Quantitative fit testing:** **Protocol:** ______
Training	**The following person/organization will perform respirator training:** **Name: Brad Burns Phone: (907) 751-3387** **Name: Phone:** **Name: Phone:** **Name: Phone:** **Name: Phone:**

Form 1-1
Site Program Overview
(continued)

Respirator Use	Entry into the following areas routinely require respirator use: Level C Exclusion Zones MSA Full Face
	Store respirators in the following location(s): Site Office Local Temporary Storage (connex box)
	Dispose of used respirator cartridges and canisters at the following location(s):
	The following person/organization is authorized to perform respirator maintenance and repair: **Name: Brad Burns** **Phone: (907) 751-3387** **Name:** **Phone:** **Name:** **Phone:** **Name:** **Phone:** **Name:** **Phone:** Manufacturer specific instructions for respirators used at this site are included in Section 7.
Record Keeping	The Alaska region health and safety administrative assistant will maintain specified records as required: **Medical Questionnaires** **Medical Ability to Wear a Respirator** **Respirator Selection** **Fit Test Records** **Training Records** **Program Evaluation, and Contact Person** **Brad Burns** **Anchorage, AK**

7.1.1 Medical Evaluation Procedures

1. A PLHCP performs all respirator user medical evaluations. Each employee shall complete the Medical Questionnaire for Respirator Users (Appendix A), which is forwarded to Dr. Zavon for written determination of the employee's ability to use the selected respirator, under the defined working conditions.
2. All respirator users will answer questions 1 through 15 on the questionnaire.
3. Every employee who will be using an SCBA and has a positive response to any item in questions 10 through 15 of Part A, section 2 will be provided a medical examination.
4. If a pre-employment or annual physical is required and conducted, it may be used to meet the requirements of this section if it includes the same information as the OSHA Respirator Medical Evaluation Questionnaire.
5. The medical questionnaire and examinations are administered confidentially during the employee's normal working hours or at a time and place convenient to the employee. The medical questionnaire is also administered in a manner that ensures that the employee understands its content.
6. The employee is also provided an opportunity to discuss the questionnaire and examination results with the PLHCP.
7. Any employee who refuses to be medically evaluated for respirator use will not be allowed to use a respirator.

7.1.2 Follow-up Medical Examination

1. A follow-up medical examination is provided for any employee who gives a positive response to any of Questions 1 through 8 in Section 2 Part A of the Questionnaire, or whose initial medical examination demonstrates the need for a follow-up medical examination.

7.1.3 Supplemental Information for the PLHCP

1. Supplemental information concerning the specific type(s) of respirator to be used and the anticipated working conditions is provided to the PLHCP, with each Respirator Medical Evaluation Questionnaire, before the PLHCP makes a recommendation concerning an employee's ability to use a respirator. (See Form 2-1)
2. A copy of the OSHA Respiratory Protection standard and a copy of this site-specific written Program has also been provided to the PLHCP.

7.1.4 Medical Determination

1. Following the evaluation and/or examination a written recommendation regarding the employee's ability to use the respirator must be provided by the PLHCP. The recommendation shall provide the following information:
    - Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator;
    - The need, if any, for follow-up medical evaluations; and

- A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation.

2. For negative pressure respirator work, if the PLHCP finds a medical condition that may place the employee's health at increased risk, a powered air-purifying respirator (PAPR), or equivalent, can be provided with the following restriction. A PAPR can be provided only if the PLHCP's medical evaluation finds that the employee can use such a respirator.

3. If an employee is wearing a PAPR because of medical restrictions and if a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then there is no longer a requirement to provide a PAPR.

7.1.5 Additional Medical Evaluations / Examinations

1. An additional medical evaluation and/or examination shall be made if:

   - An employee reports medical signs or symptoms that are related to ability to use a respirator;
   - A PLHCP, supervisor, Program Coordinator, or the respirator Program Administrator determines that an employee needs to be reevaluated;
   - Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or
   - A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

Form 2-1
Supplemental Respiratory Information

Dr. ____________________ , please provide a written recommendation regarding this employee's ability to use a respirator, as defined below.

Employee Name:____________________ S. S. No. _________________

Company: _____________ Project Name: _________ Job No. __________

****

1) Type respirator: ____________ (Circle one) Half Mask, Full Face (Circle all that apply) Particulate Filter, Gas/vapor Cartridge, Air Supplied

2) Weight of respirator: ______________________________________

3) Duration and Frequency of Use: (Circle "Yes" for best definition of employee's use)

1) Emergency rescue only	Yes
2) Less than 5 hours per week	Yes
3) Less than 2 hours per day	Yes
4) 2 to 4 hours per day	Yes
5) Over 4 hours per day	Yes

4) Expected physical work effort:

Light (less than 200 kcal/hour)

Examples of **Light work include: sitting while typing, writing, drafting, or performing light assembly work, or standing while operating a drill press or controlling machines.*

Moderate (200 to 350 kcal/hour)

Examples of **Moderate work include: Sitting while nailing or filing, driving a truck or bus, standing while drilling, nailing, assembly work, manual lifting (about 35 lbs.) at waist level, pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.*

Heavy (above 350 kcal/hour)

Examples of **Heavy work include: lifting a heavy load (about 50 lbs.) from floor to waist or shoulder, shoveling, standing while bricklaying or chipping, walking up an 8 degree grade, climbing stairs carrying a heavy load (about 50 lbs.)*

5) Additional PPE to be worn ______________________________________

6) Will you be working under hot conditions (above 77 F)? Yes / No

7) Will you be working under humid conditions? Yes / No

- *A copy of the site-specific Respirator Program and OSHA standard 1910.134 have also been provided to the physician, along with the information contained on this document.*

****
*

Reply to __________, (___)_______ fax, (___)_____ phone

7.2 RESPIRATOR SELECTION

This section presents the types of respirators available on-site, and the criteria and procedure to be used to determine respiratory protection needed for specific tasks.

7.2.1 Respirators Available

Respirator Selection documentation (Form 3-1) will be completed by the Respiratory Protection Program Coordinator and includes information relative to respirator selection. Completed Respirator Selection forms are maintained as part of this Program and are updated as necessary. The types of respirators available for (routine) selection on this site include:

Respirator Type	Model/Sizes	Cartridge #s	Applications
MSA Full Face	S, M, L	As required by each site	

7.2.2 Criteria for Respirator Selection

Respirator selection for routine tasks has been determined through application of existing (i.e., Client, Manufacturer) data.

Form 3-1 can be completed by the Respiratory Protection Program Coordinator for all routine tasks/areas and for all tasks in areas not previously worked in and/or with chemical compositions or concentration not previously encountered and shall document respirator selection guidelines for respiratory protection.

Also, note that the particulate filter cartridge Types N, R, and P refer to standard performance designations established by NIOSH. Individual manufactures may have different designations. To aid in decision-making on the appropriate type of respirator, individual manufacturer literature will also be used.

Cartridge service life limit – Currently only a few cartridge end-of-service-life indicators are NIOSH-certified. Professional judgment is required to establish service life limits based on contaminant chemical, physical, and toxicological properties, estimated contaminant concentrations and exposure patterns and contaminant warning properties. Cartridge manufacturer references can also be used as guidance in this evaluation. Note: for chemicals with odor thresholds above the exposure limits (PEL or TLV), chemical cartridges **shall not** be used. Also, certain compounds exhibit relatively poor adsorption capacity and service life must be restricted, e.g., one use only or partial shift, depending on site conditions. Examples of chemicals in this category are:

- Ethanol, propanol, and other light alcohols;
- Ethyl chloride, chloropropane, and other light monochloro hydrocarbons;
- Chloroform, methyl chloride, and other light trichloro hydrocarbons;
- Methyl acetate and other light acetate compounds;
- Acetone and other light ketones;
- Hexane and other light alkanes;
- Methylamine, dimethylamine, and other light amines;
- Methyl iodide; and
- Acrylonitrile.

Form 3-1
Respiratory Hazard And Respirator Selection

Project: ______________________ **Date:** __________ **Task:** __________

Site Area/Process: ______________________ **Estimated Task Duration:** __________

Major Chemical Hazards	Estimated Concentration PPM (mg/m^3)	PEL or TLV PPM (mg/m^3)

Confined Space Issues. Describe: ______________________

Cartridge Respirator Restriction. Describe: ______________________

IDLH Atmosphere Potential. Describe: ______________________

Respirator Selected:

- ☐ Disposable Type/Single-Use (non-IDLH) (see section 5.2)
- ☐ Particulate Filter (see section 5.4)
  - ❍ Type N, non-oil
  - ❍ Type R, oil ok up to 8 hours
  - ❍ Type P, oil ok, no time restriction
- ☐ Chemical Cartridge
- ☐ Air-line
- ☐ SCBA

Cartridge Type (if applicable): ______________________

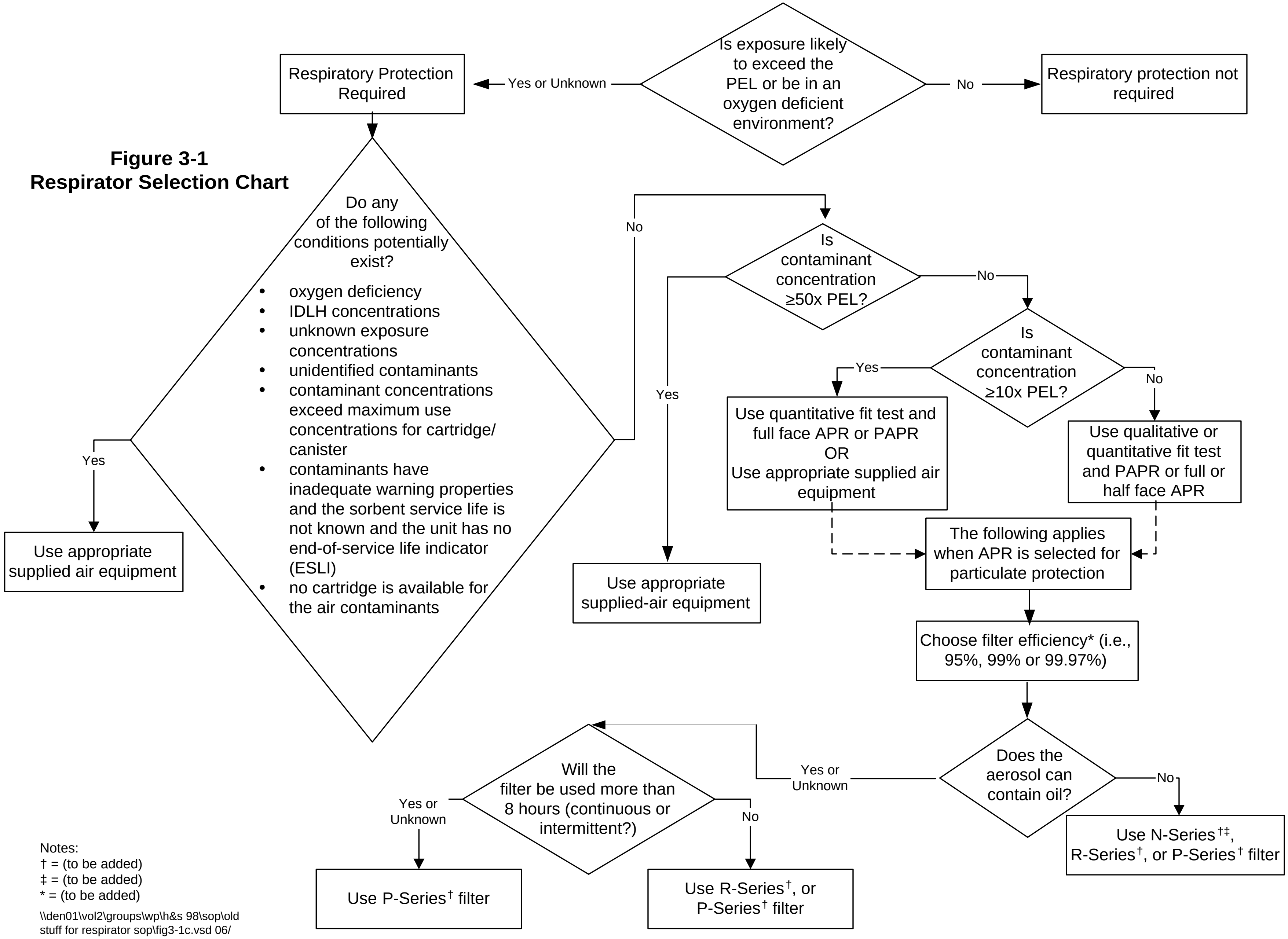
Cartridge Service Life Limit: ______________________

Cartridge Change-out Schedule: ______________________

Comments: ______________________

Prepared by: ______________________

Figure 3-1
Respirator Selection Chart



Notes:
† = (to be added)
‡ = (to be added)
* = (to be added)

\\den01\vol2\groups\wp\h&s 98\sop\old stuff for respirator sop\fig3-1c.vsd 06/02/98

7.2.3 Immediately Dangerous to Life or Health Atmospheres (IDLH)

1. Employees are not permitted to work in oxygen deficient (<19.5%) atmospheres or in areas with chemical concentrations potentially above IDLH levels unless prior approval is obtained from the Respirator Program Coordinator, the TSHM, and the Project Manager. Examples of jobs that are or could become IDLH include activities such as:
   - Breaking into flare lines;
   - Initial opening of H_2S or CO equipment vessels or lines;
   - Working near reactors or vessels having used catalyst;
   - Confined space entry work where inert gas may be present; and/or
   - Working in certain process or sanitary sewers.
2. When work tasks are to be performed in IDLH atmospheres a full-facepiece pressure-demand SCBA, rated for a minimum service life of 30 minutes or a supplied air-line respirator with egress bottle is required.
3. Trained rescue standby person(s) located outside the IDLH area are posted and equipped with an SCBA or air-line on separate supply. This includes work in confined spaces that require air-line respiratory protection for other than nuisance odor or nuisance dust.
4. Stand-by persons will be equipped with the following:
   - Pressure demand or other positive pressure SCBA or a pressure demand or other positive pressure supplied-air respirator with an auxiliary egress bottle; and
   - Appropriate retrieval equipment (harnesses, wristlets, anklets) for removing an employee who enters the hazardous atmosphere.
5. Retrieval equipment must be used unless it would increase the overall risk of rescue. Situations may exist in which retrieval line would pose an entanglement problem, especially if air-lines and electrical cords are present. It shall also be ensured that visual or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
6. The designated Rescue Team is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.
7. Standby personnel will notify ___________ at _________ in case of emergency and/or rescue is necessary.

7.3 FIT TESTING REQUIREMENTS

Respirator fit testing is performed in accordance with OSHA accepted fit test protocols and procedures.

1. Persons performing Qualitative Fit Tests and/or Quantitative Fit Tests must be qualified to perform the tests correctly and to verify accuracy and designated by the Company to do so.
2. The following fit testing requirements shall be met.

- Each respirator wearer shall be fit-tested on each specific (model, size) respirator worn prior to initial use, and **annually thereafter**.
- Spectacles (glasses), goggles, faceshields, or welding helmets shall be worn in a manner that does not interfere with the facepiece seal of the respirator.
- Contact lenses (soft and gas permeable only) may be worn with full-face respirators, according to the OSHA standard. Some clients have policies that prohibit their use on their sites.
- Employees shall be clean shaven; facial hair shall not come between the sealing surface of the facepiece and the face or interfere with valve function.
- User seal checks are performed each time the respirator is donned and prior to entering a hazardous atmosphere.

[Program Coordinator's Note: Fit testing shall be conducted using the procedures found in 29 CFR 1910.134. Documentation of all employee fit tests shall be made and retained until the next fit test is administered. Forms 4-1 and 4-2 (see the end of this section), for Qualitative and Quantitative fit tests, respectively, may be used for this purpose.]

3. The employee shall be allowed to select the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
4. Prior to the selection process, the employee shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the employee in evaluating the fit and positioning of the respirator. This instruction may not constitute the employees formal training on respirator use, because it is only a review.
5. The employee shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
6. The employee shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.
7. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. If the employee is not familiar with using a particular respirator, then he/she shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
8. Assessment of comfort shall include a review of the following points with the employee and allowing adequate time to determine the comfort of the respirator:
   - Position of the mask on the nose;
   - Room for eye protection;
   - Room to talk; and
   - Position of mask on face and cheeks.

9. The following criteria shall be used to help determine the respirator fit:
   - Chin properly placed;
   - Adequate strap tension, not overly tightened;
   - Fit across nose bridge;
   - Respirator of proper size to span distance from nose to chin;
   - Tendency of respirator to slip; and
   - Self-observation in mirror to evaluate fit and respirator position.
10. The employee shall conduct a user seal check, either the negative and positive pressure seal checks described or those recommended by the respirator manufacturer, which provide equivalent protection. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check.
11. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
12. If the employee exhibits difficulty in breathing during the tests, he or she shall be referred to a PLHCP, as appropriate, for a medical re-evaluation to determine whether they can wear a respirator while performing their duties.
13. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.
14. A tight fitting PAPR can be fit tested simply by not turning the fan motor on.

Exercise Regimen

Prior to commencement of the fit test, the employee shall be given a description of the fit test and the employee's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least five minutes before the start of the fit test.

The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use, which could interfere with respirator fit.

Test Exercises

The following test exercises are performed for all fit testing methods prescribed in this procedure, except for the Control Negative Pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol. The employee shall perform exercises, in the test environment, in the following manner:

1. Normal breathing. In a normal standing position, without talking, the employee shall breathe normally.
2. Deep breathing. In a normal standing position, the employee shall breathe slowly and deeply, taking caution so as not to hyperventilate.
3. Turning head side to side. Standing in place, employee shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
4. Moving head up and down. Standing in place, the employee shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
5. Talking. The employee shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

   Rainbow Passage

   When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.
6. Grimace. The employee shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT).
7. Bending over. The employee shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT or QLFT units that do not permit bending over at the waist.

Normal breathing. Same as exercise (1).

Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds. The employee shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

7.3.1 Qualitative Fit Test Requirements (QLFT)

1. Negative-pressure air purifying respirators that will be worn in concentrations that are equal to or less than 10 times the PEL may be fit tested using QLFT.

2. The individual and/or persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.
3. The QLFT equipment is to be kept clean and well maintained so as to operate within the parameters for which it was designed.

[**Program Coordinator's Note**: See 29 CFR 1910.134, Appendix A, to select appropriate site-specific methods.]

7.3.2 Quantitative Fit Test Requirements (QNFT) (if applicable)

The following quantitative fit testing procedures have been demonstrated to be acceptable: Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. The person and/or persons administering QNFT must be able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
2. The QNFT equipment must be kept clean, maintained, and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.
3. Once a mask has been identified to install a fit test probe, it will not be used for any other purpose.

[**Program Coordinator's Note**: See 29 CFR 1910.134, Appendix A, to select appropriate site specific methods.]

Form 4-1 will be used to document qualitative respirator fit-tests. Form 4-2 will be used to document quantitative respirator fit-tests.

Form 4-1
Qualitative Respirator Fit-Test Record

Name: ________________________________ Social Security No.: ________________________

Date: ____________ Project Location: ____

Personal Use Conditions/Limitations: **The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by CHSP 13.9: Respiratory Protection.**

Check all that apply:

________ None ________ Beard / Facial Hair ________ Dentures

________ Prescription Eyeglasses ________ Contact Lenses

SCARS/OTHER; EXPLAIN:________________________________

Fit-Test Record

RESPIRATOR (MAKE, MODEL AND SIZE): ______________________________________

QUALITATIVE FIT-TESTING AGENT:

_____ Bitrex™
_____ Isoamyl Acetate (Banana Oil)
_____ Irritant Smoke
_____ Saccharin solution

Fit-Test Results

_____ PASS: **Fit-Test Agent Not Detected by Fit-Test Subject (employee signature required)**

I have been fit-tested to assure proper respirator size, as well as face piece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

______ **FAIL:** FIT-TEST AGENT DETECTED BY FIT-TEST SUBJECT.

Subject must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended, **do not** have this form signed.

Competent Person Performing Fit-Test: ____________________________

Employee Signature:________________________________

Form 4-2
Quantitative Respirator Fit Testing Record

ISSUANCE ☐ **RETRAINING** ☐ **REFITTING** ☐

Date: ______________________________

Employee Name: ______________________________

Social Security Number: ______________________________

RESPIRATOR IDENTIFICATION

Make/Model: ______________________________ **Size:** ______________

TESTS PASSED

Portacount: ☐ Yes ☐ No Irritant Smoke: ☐ Yes ☐ No

Spectacles ☐ Contact Lenses ☐ No Corrective Lenses

I certify that I have been instructed in the proper use and limitations of Air Purifying respirators and that I have been successfully fit tested and am authorized to wear the above listed respirator(s).

I understand that I am responsible for maintaining this respirator in proper working condition. I also understand that any problem with respirator fit or with respirator malfunction will be reported immediately to my supervisor. In order to ensure proper fit, I acknowledge that this respirator will be worn in the same manner as it was worn during testing and I will conduct a “user seal check” immediately before each use.

Signature of Employee: ____

Signature of Instructor: ____

7.4 PROPER RESPIRATOR USE

7.4.1 General Requirements

1. All respirators, filters, cartridges, and components used at this site are certified by NIOSH. Respirators shall be worn where work is necessary in hazardous atmospheres and in accordance with all manufacturer's instructions.
2. Respirators shall be used only for the purpose intended and shall not be modified in any way.
3. Tight-fitting facepieces respirators are not to be worn by employees who have any condition that interferes with the face-to-facepiece seal or valve function (such as facial hair).
4. If an employee wears corrective glasses or goggles or other personal protective equipment, the Program Coordinator shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.
5. For all tight-fitting respirators, a user seal check is conducted each time the respirator is donned. Respirators that cannot be seal checked are not acceptable for use.
6. Site management shall ensure that appropriate surveillance of work area conditions and degree of employee exposure or stress is maintained. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the Respirator Program Coordinator shall reevaluate the continued effectiveness of the respirator.
7. The Respirator Program Coordinator, SSHO, TSHM, and/or the employee's Supervisor will ensure that employees can leave the work area:
   - To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use; or
   - If they detect vapor or gas breakthrough, changes in breathing resistance or leakage of the facepiece; or
   - To replace the respirator or the filter, cartridge, or canister elements when vapor or gases breakthrough changes in breathing resistance, or leakage of the facepiece. **The respirator must replaced or repaired before allowing the employee to return to the work area.**

The following shall be inspected prior to use for all respirators:

- Tightness of connection;
- Condition of face piece;
- Head straps;
- Valves and connecting tube;
- Cartridge/Canisters;
- Elastic parts (for pliability); and
- Respirator function.

7.4.2 Disposable Type/Single-Use Respirators (Non-IDLH)

1. Limitations: This mask provides protection against low levels of certain dusts/fumes but does not supply oxygen, and is not for use in an oxygen deficient atmosphere. Do not use in any atmosphere that is immediately hazardous to life or health**. This respirator will not be used where airborne concentrations of dust/fumes may equal or exceed five times the permissible exposure limit (PEL)**.
2. Procedures for using the mask:
   - Inspect the mask before use to assure that all parts are present and in good working order.
   - Some disposable single use respirators utilize elastic straps and adjustable buckles. The manufacture's instructions are followed when donning and adjusting the respirator straps.

Note: If detection of vapors inside the mask (by smell or otherwise) is experienced or difficult breathing is experienced, employees are trained to leave the area immediately, report the condition to their Supervisor and the Respirator Program Coordinator or his designee and discard the respirator.

7.4.3 Chemical Cartridge Respirator/Air-Purifying Respirator (Non-IDLH)

1. These respirators provide protection against low levels of certain gases and vapors. Respirator canisters or cartridges shall be specifically selected for concentrations of gases/vapors that may be encountered.
2. Limitations: This mask does not supply oxygen and is not for use in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately hazardous to life or health. Employees are trained to leave the area immediately if an odor is detected inside the mask.
3. Air purifying respirators (APRs) shall not be used for rescue or emergency work.
4. Procedures for using the mask:
   - Masks are inspected before each use to assure all parts are present and in good working order.
   - Employees then don respirator and adjust to obtain a snug but comfortable fit.
   - Employees then perform a user seal check.
5. If employees can smell, taste, or otherwise detect vapors inside the mask, or if difficulty breathing is experienced, the cartridges will be changed. If the employee becomes hot or feels for any reason that the cartridge is not functioning properly, the cartridge will be changed.

7.4.4 Particulate Filter Respirator (Non-IDLH)

1. Limitations: Particulate Filter Respirators provide protection against low levels of certain dusts/fumes. This mask does not supply oxygen and is **not** for use in an oxygen deficient atmosphere. This type respirator **shall not** be used in any atmosphere that is immediately hazardous to life or health.

2. Procedures for using the mask:

   - The mask is inspected by the employee before each use to assure that all parts are present and in good working order.
   - Employees will then don the respirator mask and adjust it to obtain a snug but comfortable fit.
   - Employees will then perform a user seal check.

7.4.5 <u>Air-line Respirator</u>

1. Limitations: An air-line respirator shall **not** be used in any atmosphere that is immediately hazardous to life or health, including an oxygen-deficient atmosphere, unless equipped with a self-contained escape air bottle.
2. Procedures for using the equipment:

   - Employees shall inspect all equipment before each use to assure all parts are present and in good working order.
   - If using an escape bottle, user will ensure that air supply is sufficient to permit safe escape from work area.
   - The employee will then follow the manufacturer's instruction to select correct length of air-line hose. Connect hose to regulator and air supply (maximum air pressure at the point of attachment of hose to air supply depends upon manufacturer's instructions). If using a compressor, the employee, his/her supervisor and/or the Program Coordinator will make sure the inlet is in an uncontaminated area. Air-purifying filters and sorbents shall be used as needed. If the compressor is oil-lubricated, it shall be equipped with high temperature and carbon monoxide alarms.
   - The employee will then don the respirator mask and adjust to obtain a snug but comfortable fit and perform a user fit test.
   - Next the worker shall connect the mask to the regulator and adjust the airflow in the mask.

Note: In case of malfunction, employees are trained to leave the area immediately, report the condition to their supervisor and the Program Coordinator.

3. An adequate supply of breathing air shall be ensured by the installation of an air pressure gauge in the air supply system.

7.4.6 <u>Self-Contained Breathing Apparatus (SCBA)</u>

1. SCBAs are provided primarily for use in emergency response when spills, leaks, or other circumstances present breathing hazards. Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90 percent of the manufacturer's recommended pressure level.
2. Limitations: Air supply is generally rated for 30 minutes. Note: heavy exertion and excitement will increase the breathing rate and deplete the air supply sooner. Employees are trained to leave the area when the alarm indicates low air supply.
3. Procedures for using the equipment:

- Employees shall inspect the unit before each use and ensure a sufficient air supply and that the regulator and low pressure (at or above 90 percent) warning devices function properly.
- The user will then open the cylinder air supply valve.
- Next, don unit so cylinder is on user's back with the valve pointing down and engage harnesses and tighten.
- Then the employee will don the respirator mask and adjust to obtain a snug but comfortable fit and perform a user seal check.
- The employee will then connect mask hose to regulator.

Note: Employees are trained to use the bypass only in the event of regulator failure and to leave area immediately, whenever the low-pressure alarm sounds.

4. A designated Competent Person performs care and maintenance of SCBAs.
5. Bottles are refilled only with breathing air that meets the specifications for Grade D Breathing Air in Compressed Gas Association Commodity Specification G-7.1-1989.
6. SCBA emergency use respirators are kept accessible to the work area and stored in compartments or in covers that are clearly marked as containing emergency respirators.
7. All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use.
8. Emergency escape-only respirators shall be inspected before being carried into the workplace for use.
9. For respirators maintained for emergency use, the Program Coordinator or Supervisor will certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator.
10. This information is provided on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.

7.4.7 <u>Breathing Air Quality</u>

1. Air supply shall be free of harmful quantities of contaminants, and shall meet specification for Grade D Breathing Air as described in the Compressed Gas Association publication G-7 1988: Compressed Air for Human Respiration.
2. Compressed oxygen **shall not** be used in supplied-air respirators or in open circuit self-contained breathing apparatus. Oxygen must **never** be used with air-line respirators.
3. Breathing air may be supplied to respirators from cylinders or air compressors. Cylinders must have a dated label/sticker affixed to them indicating "Certified Breathing Air" or equivalent.

4. If used, a breathing air type compressor shall be situated so as to avoid entry of contaminated air into the system. An alarm shall also be installed to indicate imminent compressor failure and/or overheating. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm or automatic shutdown control feature.
5. Oil lubricated air compressors should have a continuous carbon monoxide (CO) monitor with both audible and visual alarms. However, if this is not possible, then manual CO testing must be performed and documented at least twice daily; once at beginning of job, and also after lunch break.
6. In-line air purifying sorbent filters with water traps shall be installed between the compressor and user(s).
7. Employees are instructed to stop work immediately if they experience difficulty in breathing, smell any unusual odors, or experience an ill feeling such as a headache or upset stomach, etc. and report the situation to their Supervisor.

7.4.8 User Seal Checks

Employees shall test the seal of their respirator to their face prior to using by performing both negative and positive-pressure user seal checks according to the following guidelines.

1. Negative-Pressure Seal Check Procedure:
   - Close off inlet openings of the respirator; canister(s), cartridge(s), or filter(s) by covering with palm of hands; by replacing the inlet seal on the canister(s); or by squeezing a breathing tube or blocking its inlet so as not to allow the passage of air.
   - Inhale gently and holds breathe for ten seconds.
   - A satisfactory fit is achieved if the facepiece collapses slightly and no inward leakage of air into facepiece is detected.

If inward leakage is detected the respirator wearer will reposition the face seal and/or straps and repeat this sequence until a satisfactory fit check is obtained.

2. Positive-Pressure Seal Check Procedure
   - Close exhalation valve or breathing tube, or both, then exhale gently.
   - A satisfactory fit is achieved if a slight buildup of positive pressure is generated on the inside of the facepiece, without detection of outward leakage between the sealing surface and the face.
   - If outward leakage is detected, the respirator wearer will reposition the face seal and/or straps and repeat this sequence until a satisfactory seal check is obtained.

7.4.9 Manufacturer Specific Procedures

[**Program Coordinator's Note**: Procedures relative to respirator use and care, as directed by the equipment manufacturer, are available as references and shall be attached by the SSHO to this document.]

7.5 TRAINING

Training is provided to all employees who are required to use respirators before requiring the employee to use the respirator in the workplace. The training will be comprehensive, understandable, and done on an annual basis or more often, if necessary. (Refer to Jacobs Respiratory Protection work instructions.) The training will include the following topics, as a minimum:

- The nature of the hazard(s), including physical properties, odor characteristics, physiological effects on the body, and known concentration levels of toxic material or airborne radioactive level;
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The physical characteristics, functional capabilities, and limitations of various types of respirators;
- How to use the respirator in emergency situations;
- Procedures for maintenance and storage of the respirator; and
- How to recognize the medical signs and symptoms of that may limit or prevent the effective use of respirators.

7.5.1 Training Documentation

Training documentation is maintained for all employees who are assigned to work that requires the use of a respirator. (Forms A-1, A-2, A-3, and A-4, at the end of this section, may be used to document training and training exercise completion for air-purifying respirators and supplied-air respirators.)

If documentation, which demonstrates that an employee has received training within the last 12 months is available and addresses the elements of this Program, and if the employee can demonstrate knowledge of those elements, repeat training is not required. Previous training not repeated upon initial task assignment must be provided no later than 12 months from the date of the previous training.

Retraining is administered annually, **and** when the following occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill; or

- Situations arise in which retraining appears necessary to ensure safe respirator use.

7.6 RESPIRATOR MAINTENANCE

7.6.1 Cleaning and Sanitation

The following provides guidelines for cleaning and sanitation of respirators. Recommendations provided by the equipment manufacturer may be used provided such procedures are as effective as those listed here.

1. Respirators will be cleaned and sanitized after each use. Commercially available mild detergents or cleaner/sanitizer recommended by the manufacturer are used.
2. Storage shall be in a convenient, clean, and sanitary location. At a minimum respirators shall be stored in a protective bag.
3. Chemical cartridges/mechanical filters chemical cartridges shall be discarded and replaced as defined in Section 7.4.3.
4. Cleaning, disinfecting, and storage of respirators shall be performed as follows:
   - Remove filters, cartridges, or canisters. Disassemble facepiece by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
   - Wash components in warm (43º C [110º F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
   - Rinse components thoroughly in clean, warm (43º C [110º F] maximum), preferably running water. Drain.
   - When the cleaner used does not contain a disinfecting agent, respirator components will be immersed for two minutes in one of the following:
     - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43º C (110º F); or
     - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43º C (110º F); or
     - Other commercially available cleansers of equivalent disinfectant quality when used as directed, as recommended or approved by the respirator manufacturer.
   - Rinse components thoroughly in clean, warm (43º C [110º F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
   - Components are hand-dried with a clean lint-free cloth or air-dried.
   - Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
   - Test the respirator to ensure that all components work properly.

7.6.2 <u>Inspecting and Storing</u>

Respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve. Inspection and replacement of respirator parts shall be performed according to the following:

1. All respirators must be inspected by the wearer prior to each use.
2. Self contained breathing apparatus (SCBAs) shall be inspected monthly and after each use by Competent Person(s). Employees shall self-inspect SCBAs prior to each use. SCBA inspections shall include checking cylinder pressure and units shall be brought to the rated pressure. Units shall be recharged after each use.
3. Air-line respirators: Complete systems are inspected before and after each use.
4. Replacement of parts shall be made only with those specifically designed for the respiratory device used. All maintenance and repair shall be performed only by appropriately trained persons and shall be documented. It should be noted that some respiratory equipment maintenance requires the manufacturer's certification of training (i.e. SCBAs).

7.6.3 <u>Repairing, Discarding, and Maintaining Respirators</u>

Defective equipment shall be immediately removed from service and repaired prior to use. Repairs shall be made only by an appropriately trained, designated Competent Person, and only utilizing the manufacturer's NIOSH approved replacement parts. Defective equipment not repaired immediately shall be red tagged as noted: "Danger - Do Not Use – Defective", and the specific defect(s) noted on the tag.

Users may self-perform repairs only if they have been appropriately trained and approved parts are available. Reducing and admission valves, regulators, and alarms for air supplied respirators shall only be repaired by the manufacturer or a technician trained by the manufacturer.

7.7 VOLUNTARY RESPIRATOR USE REQUIREMENTS

Employees shall not wear air purifying respirators with cartridges or canisters, or air supplied respirators unless a health hazard is present. Employees may voluntarily use a respirator, with the approval of both their Supervisor and the Program Coordinator. The Program Coordinator will evaluate requests for voluntary respirator use to determine if the employee can perform the activities safely and respirator use will not in itself create a hazard.

- If it is determined that voluntary use will be permitted, the following will apply:

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, of if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator. [63 FR 1152, Jan. 8, 1998]

- A medical evaluation and PLHCP's written determination will also be provided for all employees who are permitted to use respirators voluntarily, prior to their use of a respirator. (See section 2.0 of this Program).
- Additionally, all requirements for cleaning, maintaining and storage of respirators contained in this Program shall also apply to employees permitted to use respirators voluntarily. (See section 8.0 of this Program).
- Respirators worn on a voluntary basis do not require fit testing.

Exception: Employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks) are not covered by the requirements of this Program.

7.8 RESPIRATOR PROGRAM EVALUATION

The effectiveness of this site-specific Respiratory Protection Program will be evaluated with routine observations and formal Program evaluations.

7.8.1 Routine Observations

The Program Coordinator shall be responsible for conducting routine observations related to the effective selection, use, maintenance, storage and other aspects of this Program. Observations shall be noted through the use of SORs or equivalent documented routine safety inspections. Noted deficiencies shall be corrected as soon as possible.

7.8.2 Program Evaluations

Formal Program evaluations shall also be conducted on a periodic basis. A written evaluation shall be conducted to address the overall effectiveness of the Program. This evaluation may be incorporated into the Company's standard Safety Evaluation Report (SER) format, Environmental Project Audit format, or be conducted as an independent review.

7.8.3 Content of Program Evaluations

Program evaluations shall conform to the content requirements of the American National Standards Institute (ANSI Z88.2-1992) recommendations and those listed in 29 CFR 1910.134/1926.103. The areas of evaluation include:

- Program administration and evaluation;
- Training of workers in the proper use of respirators and the associated hazards;
- Initial and periodic fit testing;
- Medical evaluation;
- Hazard classification and sampling;
- Respirator selection;
- Respirator use procedures including seal protection, evaluation of effectiveness, and IDLH procedures;
- Cleaning, maintenance, storage, and inspection;
- Breathing air supplies;
- Emergency preparedness and procedures;
- Special problems;
- Voluntary use procedures; and
- Other applicable observations.

Forms A-1 through A-4 will be used to document training on air supplied, supplied air, and air purifying respirators.

Form A-1
Air Supplied Respirator Training

Employee Name:

Instructor(s): Date:

I have been trained in and understand the following:	SCBA	Air-line
Importance and need for respiratory protection		
Where/when to use the respirator, including emergencies		
Proper inspection, donning, doffing, and use of respirator		
Proper maintenance and storage of the respirator		
How to recognize medical signs and symptoms that may limit or prevent effective use of respirators		
Limitation and restriction of the respirator		
Requirements for a proper respirator fit		
Respirator check - normal atmosphere		
Respirator check - test atmosphere		

I wear corrective lenses: Yes No

I have been trained in, & worn (normal atmosphere), the following supplied air respirators:

Make: Model: Size:

Make: Model: Size:

I have been retrained in (normal atmosphere) the following respirators:

Air Supplied - Air-line: Make: Model: Size:

Air Supplied - SCBA: Make: Model: Size:

Air Supplied - Egress: Make: Model: Size:

Instructor’s Signature Employee’s Signature

Form A-2
Supplied Air Respirator Exercise Training Exercise

Name of Employee:

Instructor(s): Date:

RESPIRATORY PROTECTION

DID THE EMPLOYEE:	SCBA
Properly don respirator	
Check respirator fit (positive and negative pressure checks)	
Describe minimum respirator entry requirement to unknown hazardous atmospheres	
Describe correct response to sound of low pressure warning device	
Conduct a high pressure check	
Conduct a low pressure check	
Properly inspect a manifold system and set up and air-line	
Properly inspect cascade system and recharge an SCBA bottle	
Describe correct responses to respirator emergencies	

Instructor Signature

Employee Signature

Name:______________________________

Form A-3
Health Hazards & Personal Protection Training
Air Purifying Respirators

____

Print Name:

____ ______________________________

Instructor(s) Name: Date:

I have been trained in and understand the following:	**Full Face**	**Half Face**
Importance and need for respiratory protection		
Where/when to use respirator, including emergencies		
Proper inspection, donning, and use of respirator		
Proper maintenance and storage of the respirator		
Limitation and restriction of the respirator		
Requirements for a proper respirator fit		
Respirator check - normal atmosphere		
Respirator check - test atmosphere		

I wear corrective lenses: ☐ Yes ☐ No

I have been trained in, and worn in a normal atmosphere, and been fit tested (with ________________________________) for the following air purifying respirators:

Make: ______________ Model: ______________ Size: ______________

I have been trained in, and worn in a normal atmosphere, and been fit tested with ____________________________________, the following air purifying respirators:

Make: Model: Size:

____

Name: Model: Size:

____

______________________________ ______________________________

Instructor's Signature Employee's Signature

Form A-4
Air Purifying Respirator Training Exercise

Name of Employee: ____________________

Instructor(s): ____________________ Date: ____________________

Respirator Make: ____________________ Respirator Model: ____________________

Respirator Make: ____________________ Respirator Model: ____________________

DID THE EMPLOYEE:	HALF FACE	FULL FACE
Inspect the respirator (condition, cleanliness, straps, valves, etc.)?		
Check respirator fit (positive and negative pressure checks)		
Correctly describe the respirator limitations (i.e., not for IDLH or ODA conditions, or concentrations greater than APF or MUC)?		
Correctly describe indications that cartridges require changing (i.e., breakthrough, increased resistance, length of service)?		
Correctly describe when to discontinue using a respirator, and what to do in cases of emergency?		

The student inspected and donned the respirator(s) in accordance with the manufacturer's instructions, and correctly stated limitations for wearing APRs.

____________________ ____________________

Instructor's Signature Date

Attachment B16

HAZARDOUS MATERIAL EXPOSURE AND FIELD ACTIVITY REPORT

EMPLOYEE'S
OFFICE LOCATION: ANCHORAGE

For: ______Month _____Year

NAME OF EMPLOYEE:

CHECK HERE FOR: ____"NO SITE VISITS"

PART I - SITE VISITS TO NON-EXCLUSION ZONES

SITE NAME/ LOCATION	ACTIVITY	DURATION OF SITE VISIT (HOURS)

PART II - SITE VISITS TO EXCLUSION ZONES (For additional room, use back of form)

SITE NAME/ LOCATION	ACTIVITY	CHEMICAL OR OTHER MATERIALS PRESENT	EXPOSSURE POTENTIAL (I.M.S.)	DURINGTION OF SITE VISIT HOURS	LEVEL OF PROTECTION USED

***I** = **Incidental** Potential for exposure is 1/10 or under the exposure limit level.
M = **Moderate** Potential for exposure is >1/10 up to, but not including, the exposure limit level.
S = **Significant** Potential for exposure at or above exposure limit level.

EMPLOYEE SIGNATURE DATE

Return to: Terry Watkins, Jacobs Engineering, 4300 B Street, Suite 600, Anchorage, AK 99503 (907) 751-3449

Attachment B17

SITE TAILGATE MEETING and EXCLUSION ZONE ENTRY LOG

Facility: ____________________ Conducted by: ____________________
Date: ____________________ Time: ____________________
Client: ____________________ Project Number: ____________________
Specific Location: ____________________
Type of Work: ____________________
Chemicals Brought to Site: ____________________
MSDSs available: ______Yes ______No

HEALTH AND SAFETY TOPICS PRESENTED

Protective Clothing/Equipment: ____________________

Chemical Hazards: ____________________

Physical Hazard: ____________________

Emergency Procedures: Apply First Aid and notify Health and Safety immediately ____________________
911 Emergency Response
Hospital/Clinic: Metlakatla Clinic
Address: ____________________
Special Equipment: ____________________

Evacuation Route: ____________________
General Discussion Information:

ATTENDEES

Entered Exclusion Zone	Printed Name	Company	SS#	Signature
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________
__Yes __No	______________	______________	______________	______________

Attachment B18

Air Force Notification Form

ATTACHMENT C

Project-Specific Supplemental Information

Table C1: Site SS83 Elmendorf AFB Air Monitoring Requirements and Action Levels

Table C2: Cooling Power of Wind on Exposed Flesh Expressed

Table C3: Threshold Limit Values Work / Warm-up Schedule

Attachment C1: Site SS83 Elmendorf AFB Safe Plan of Action Procedure

Attachment C2: Project-Specific Chemical Hazards

Attachment C3: Site SS83 Hazard Communication Program

Attachment C4: Site Control HSEP 7.3.2

Attachment C5: Confined Space HSEP 7.2.2

Attachment C6: Safety Evaluation Reports HSEP 2.2

Attachment C7: Medical Monitoring Program for Environmental Project Work HSEP 4.1

Attachment C8: Working Safely Around Wild Animals HSEP 7.4

Table C1
Site SS83 Elmendorf AFB Air Monitoring Requirements and Action Levels

Instrument	Tasks	Action Levels		Frequency [1]	Calibration [2]
PID: Minimum 10.6 eV, calibrated wit IsoButylene	All Tasks	0-10 ppm BZ >10-25 ppm BZ >25 to 50 ppm BZ >50 ppm BZ Note: Detections above background levels.	Level D Level C, Level B Stop work; reevaluate	Monitor the breathing zone at the beginning of operations and whenever site conditions change. Levels C and B require continuous monitoring.	Daily - pre- and post-use
Direct reading instrument: Colorimetric Tubes: Benzene	All Tasks	<0.5 ppm BZ 0.5 – 2.5 ppm BZ >2.5 to 25 ppm BZ >25 ppm BZ	Level D Level C, Level B Stop work; reevaluate	Monitor initially at all POL sites to eliminate or establish the presence of Benzene, unless site characterization has eliminated the concern. Also passive dosimeters will be used if benzene is detected.	Conduct a leak check on pump prior to use
Combustible Gas Meter [3]	Confined space	≥10% LEL	Stop work; reevaluate (explosion hazard)	Continuous monitoring of a confined space. Screening during excavations or before performing hot work.	Daily - pre- and post-use
Oxygen Meter	Confined Space Entry	<19.5% >23.5%	Provide alternate air source (Level B) Explosion hazard, stop work, reevaluate	Screening before entering confined space.	Daily - pre- and post-use

Notes:

[1]Air monitoring shall be documented using field logs or monitoring forms.

[2]Calibrations shall be documented in the field logs or calibration logs.

[3]Oxygen must be > 15 percent for LEL reading to be accurate.

BZ	= Breathing Zone	PID	= photoionization detector
eV	= electron volts	ppm	= parts per million
LEL	= lower explosive limit	<	= less than
mg/m^3	= milligram per cubic meter	>	= greater than

Table C2
Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (Under Calm Conditions)

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
Trenchfoot and immersion foot may occur at any point on this chart.												

Notes: For definitions, see Acronyms and Abbreviations section.

Source: American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1999.

Table C3
Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Maximum Work Period	No. of Breaks	Maximum Work Period	No. of Breaks	Maximum Work Period	No. of Breaks	Maximum Work period	No. of Breaks	Maximum Work Period	No. of Breaks
1. -26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min.	2	55 min.	3	40 min.	4
2. -29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
3. -32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
4. -35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
5. -38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
6. -40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
7. -43° & below	-45° & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light to moderate work (limited physical movement): apply the schedule one step lower. For example, at -30° F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

For definitions, see Acronyms and Abbreviations section.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-1991, Cincinnati, Ohio, 1990.

Attachment C1: Site SS83 Elmendorf AFB Activity Hazardous Analysis Procedure

Attachment C1

SAFE PLAN OF ACTION PROCEDURE

PURPOSE

To describe the use and benefits of developing and using Safe Plan of Action (SPA). Statistics demonstrate that faithful use of the SPA is a best practice and that they can minimize workplace injuries and illnesses.

SPA/AHA BENEFITS

- Provide a written HSE plan for each task
- Require participation by each member of the crew in identifying hazards and control measures
- Serve as a documented hazard assessment plan
- Serve as a reference document for similar future work.

APPLICATION

SPA/AHA should be used for any task that could reasonably present a risk of injury, illness or environmental damage. Specifically, they should be used before proceeding any field task.

SPA/AHA METHOD

SPA/AHA is a task planning procedure conducted for each task to help the workgroup and its supervisor to collaboratively ensure proper HSE planning before beginning work and to identify:

- Potential chemical and physical hazards associated with a task
- Controls for the hazards
- Appropriate personal protective equipment (PPE)
- Necessary resources to efficiently complete the task without incident.

Team members sign the completed SPA Attendance Record form to indicate their participation, understanding and agreement to follow the plan. When signed by the supervisor, the SPA becomes a documented hazard assessment plan. Completion of the SPA form is performed in the following manner:

- The SPA analysis is completed first. Determine the specific, individual steps involved with the task. And record them in the job steps column. Next analyze each step for any potential physical or chemical hazards and record them in the Hazard column.

- Identify appropriate controls for each potential hazard and record in the Action To Eliminate or Minimize Hazard column.
- Record resources or positions assigned to the job.
- Record equipment to be used, inspection requirements and training requirements in the appropriate columns.
- Finally, after thorough analysis of the foregoing information, complete the checklist on the reverse side of the form.
- Subcontractors are required to follow this same procedure.

COMMUNICATION AND REVIEW OF ACTIVITY HAZARD ANALYSIS

The Safety Tailgate Meeting Awareness (TSM) is a collaborative review of the SPA by the entire crew and supervisor before performing the task. These are conducted:

- At the beginning of the work shift
- After any change in personnel
- When there is a change of hazards or work conditions.
- The SPA shall be modified in the field to reflect any tasks or hazards not identified.
- SPA Form Attachment

Attachment C1 (continued)

Safe Plan Of Action

(HSEP 21.2 f1)

Project No. All________________________

Job/Task ________________________ **Work Area** ________________________ **Date** ____________

Steps of Task	Hazard/Reaction to Change	Safe Plan	Resources

Attachment C1 (continued)

Team Members' Signatures

____________________ ____________________ ____________________ ____________________ ____________________ ____________________

____________________ ____________________ ____________________ ____________________ ____________________ ____________________

____________________ ____________________ ____________________ ____________________ ____________________ ____________________

The signature of the supervisor confirms the completion of the hazard assessment and SPA by the crew.

Supervisor's Signature: ______________________________ Date________

INSTRUCTIONS: 1. WRITE NAME OF JOB OR TASK IN SPACE PROVIDED. 2. CONDUCT WALK-THROUGH SURVEY OF WORK AREA. 3. WRITE THE STEPS OF THE TASK IN A SAFE SEQUENCE. 4. LIST ALL POSSIBLE HAZARDS INVOLVED IN EACH STEP AND REACTION TO CHANGE. 5. IN THE SAFE PLAN COLUMN, STATE ACTIONS THAT WILL BE TAKEN TO PREVENT THE HAZARDS OR INJURY FROM REACTION TO CHANGE. 6. IN RESOURCES COLUMN, LIST EQUIPMENT, TOOLS, ETC. NEEDED TO DO THE JOB. 8. ASK EACH TEAM MEMBER, WHO HELPED DEVELOP AND WILL USE THIS SPA, TO SIGN IN SPACES PROVIDED. 9. REVIEW THE SPA AT THE END OF THE TASK FOR IMPROVEMENTS.

WORK SHALL STOP WHEN CONDITIONS CHANGE, THE JOB CHANGES, OR A DEFICIENCY IN THE PLAN IS DISCOVERED, AND THE CURRENT SPA WILL BE MODIFIED OR A NEW SPA CREATED
CONTINUATION AND OR ADDITIONS TO SPA DISCUSSED DURING PREPARATORY INSPECTION AND CREW BRIEFING

Attachment C1 (continued)

EQUIPMENT TO BE USED	INSPECTIONS REQUIREMENTS	TRAINING REQUIREMENTS

SPA ATTENDANCE RECORD

Personnel Present (print):	Representing	Signature

Attachment C1 (continued)

Safe Plan of Action Analysis Checklist (check all that apply)

(Review checklist while completing second page of Activity Hazard Analysis)

A new SPA/AHA is required if the job scope, employee staffing or work conditions change.

Required Permits

☐	Confined Space
☐	Critical Lift
☐	Hot Work
☐	Lock Out/Tag Out
☐	Soil Disturbance (Over 12")
☐	Utility Clearance

Required PPE

☐	Hard Hat, Class C
☐	Hard Hat, Class E *(Elect. Protect)*
☐	Ear Plugs/Ear Muffs
Eye Protection:	
☐	Safety Glasses
☐	Face Shield
☐	Chemical Goggles
☐	Welding Hood
Hand Protection:	
☐	Cut Resistant Gloves
☐	Welders Gloves
☐	Nitrile Gloves
☐	Surgical Gloves
☐	Rubber Gloves
☐	Elect. Insulated Gloves
☐	Arm Sleeves
Foot Protection:	
☐	Sturdy Work Boots
☐	Safety Toe Boots
☐	Rubber Boots
☐	Rubber Boot Covers
☐	Dielectric Footwear
Respiratory. Protection: ☐ N/A	
☐	Dust Mask
☐	Air Purifying Respirator
☐	Supplied Air Respirator
☐	SCBA
☐	Emergency Escape Respirator
Special Clothing: ☐ N/A	
☐	Tyvek ®
☐	Poly Coated Tyvek ®
☐	Fire Resistant Coveralls
☐	Rain Suit
☐	Safety Vest
Fall Protection: ☐ N/A	
☐	Harness
☐	Double Lanyard Required
☐	Anchorage Point Available
☐	Additional Anchorage Connector Needed e.g. Cross Arm Strap, etc.
☐	Retractable Device Needed
☐	Horizontal Life Line System Req'd.
☐	Fall Clearance Distance Adequate
☐	Fall Rescue/Retrieval Plan Set Up

Hazards / Safe Plan

Hazards	Safe Plan
☐ Overhead Utilities	☐ Power de-energization required ☐ Insulation blankets required ☐ Wire watcher required ☐ Required clearance distance = _20___Ft. ☐ Safe work zone marked
☐ Crane or other Lifting Equipment	☐ Signalman assigned ☐ Tag lines in use ☐ Area around crane barricaded ☐ Lifting equipment inspected ☐ Personnel protected from overhead load
☐ Underground Utilities☐	☐ Reviewed as-builts ☐ Subsurface surveys ☐ Received dig permit Required clearance distance = _______ Ft. ☐ Safe work zone Marked
☐ Electrical	☐ Lock Out/Tag Out/Try Out ☐ Permit required? ☐ Confirm that equipment is de-energized ☐ Reviewed electrical safety procedures
☐ Excavations	☐ Permits ☐ Inspected prior to entering ☐ Proper sloping/shoring ☐ Barricades provided ☐ Access/egress provided ☐ Protection from accumulated water
☐ Fire Hazard	☐ Hot Work Permit ☐ Fire Extinguishers ☐ Fire watch ☐ Adjacent area protected ☐ Unnecessary flammable material removed
☐ Vehicular Traffic or Heavy Equipment	☐ Traffic Barricades ☐ Cones ☐ Signs ☐ Flagmen ☐ Lane closure ☐ Communication with equipment operator
☐ Noise >85 dB	Hearing protection is required: ☐ Ear plugs ☐ Ear Muffs ☐ Both
☐ Hand & Power Tools:	☐ Inspect general cond. ☐ GFCI in use ☐ Identified PPE required for each tool ☐ Reviewed safety requirements in operators manual(s) ☐ Guarding OK
☐ Hand Hazards	List sharp tools, material, equipment: ____ ☐ PPE gloves, etc. ☐ Protected sharp edges as necessary
☐ Manual Lifting	☐ Reviewed proper lifting tech. ☐ Identified material requiring lifting equipment ☐ Hand protection required ☐ Back support belts
☐ Ladders	☐ Inspect general cond. before use ☐ Ladder inspected with in last quarter ☐ Ladder tied off or held ☐ Proper angle and placement ☐ Reviewed ladder safety
☐ Scaffolds	☐ Inspect general condition before use ☐ Tags in place ☐ Properly secured ☐ Toe boards used ☐ Footings adequate ☐ Materials properly stored on scaffold
☐ Slips, Trips Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Tools & material properly stored ☐ Extension cords properly secured ☐ Work zone free of debris
☐ Pinch Points	List potential pinch points: ____ ☐ Working near operating equipment ☐ Hand/Body positioning
☐ Working w/ Chemicals	☐ The task creates potential for direct contact with hazardous chemicals. ☐ Reviewed MSDS hazards and precautions ☐ Have proper containers and labels. ☐ Have identified proper PPE (respirators, clothing, gloves, etc.)
☐ Heat Stress Potential	☐ Heat stress monitoring (>85°) ☐ Liquids available ☐ Cool down periods ☐ Sun Screen ☐ Reviewed Heat Stress symptoms
☐ Cold Stress Potential	☐ Proper clothing (i.e.. gloves, coat, coveralls) ☐ Wind chill <32° ☐ Reviewed Cold Stress symptoms ☐ Warm up periods
☐ Environmental	☐ Air emissions ☐ Water discharge ☐ Hazardous wastes ☐ Other wastes ☐ Pollution prevention ☐ Waste minimization
☐ Natural or Site Hazards	☐ Weather ☐ Terrain ☐ Adjacent operations or processes ☐ Biological hazards ☐ Animals/reptiles/insects hazards
☐ Adjacent Work/Processes and/or co occupancy	☐ Notified them of our presents ☐ Other workers adjacent, above, or below. ☐ Coordinated with adjacent work supervisor/customer operator ☐ Can work safely
☐ Barricades/covers	☐ Caution barricade tape required ☐ Danger barricade tape required ☐ Rigid railing required ☐ Covers over opening ☐ Warning signs required

Additional Information:

Attachment C2: Project-Specific Chemical Hazards

Potential Site Contaminant	Health Hazard Rating at this Site	Route of Entry	Symptoms/Effects of Exposure	PEL/TLV ppm or mg/m^3	IDLH ppm or mg/m^3
Benzene	Low	Inh, Ing, Con, Abs	Irritation of eyes and skin, headache, vertigo, fatigue, giddiness, tremors, nausea, vomiting, liver injury	1 ppm	5 ppm, STEL
Ethylbenzene	Low	Inh, Ing, Con, Abs	Irritation of eyes or mucous membranes, flush face, dizziness, headache, potential liver damage	100 ppm	800 ppm
Trichloroethene (TCE)	Low	Inh, Ing, Con, Abs	Irritation of eyes and skin, headache vertigo, fatigue, giddiness, tremors, nausea, vomiting, liver injury	100 ppm	200 ppm, ceiling
Naphthalene	Low	Inh, Ing, Con, Abs	Irritation of eyes, headache, excitement, nausea, vomiting, abdominal pain, sweating, jaundice, corneal damage, kidney damage	500 ppm	
Toluene	Low	Inh, Ing, Con, Abs	Irritation of eyes and nose, fatigue, weakness, confusion, euphoria, dizziness, headache, liver and kidney damage.	200 ppm	300 ppm, ceiling
Xylene	Low	Inh, Ing, Con, Abs	Irritation of eyes and nose, dizziness, excitement, drowsiness, nausea, vomiting, abdominal pain, dermatitis	100 ppm	900 ppm
Diesel-Range Organics (DRO)	Low	Inh, Ing, Con, Abs	Irritation of eyes, skin, or mucous membranes, headache, fatigue, dizziness, nausea, possible liver and kidney damage	N/A	N/A
Gasoline-Range Organics (GRO)	Low	Inh, Ing, Abs	Irritation of eyes, skin, or mucous membranes, headache, fatigue, dizziness, nausea, possible liver and kidney damage	300 ppm	500 ppm, STEL

NOTE: Previous soil sampling has indicated that the above chemicals were detected in laboratory analysis, however at low levels

Attachment C3: Site SS83 Elmendorf AFB Hazard Communication Program

Attachment C3
SS83 HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE AND SCOPE

The purpose of this Health, Safety, and Environment Program (HSEP) is to provide the minimum requirements to employees for maintaining and implementing this site-specific Hazard Communication Program.

This program applies to all Elmendorf projects.

2.0 RESPONSIBILITIES

Responsibilities specific to this HSEP include the following:

2.1 Site Management

Site Management is responsible for ensuring that this site-specific Hazard Communication Program has been effectively communicated and implemented to all employees assigned to the site.

Site Management must ensure that Material Safety Data Sheet (MSDS) are maintained in the Jacobs Anchorage office and employee know and understand to request and/or access them.

Ensure employees are trained in the recognition of hazardous materials and the method and means to protect themselves from these hazards.

Continuously monitor the work to assure compliance with this program.

Confirm each job is properly prepared and that employees are aware of any hazardous substances that may be encountered as part of their work or as a result of someone else’s work in the area.

Maintain a list of all workplace chemicals,

Label workplace chemical containers,

Maintain Material Safety Data Sheets for the workplace chemicals,

2.2 Site Safety and Health Officer

The Site Safety and Health Officer shall assist Site Project Management in compliance with this Hazard Communication Program.

2.3 Subcontractors

Will comply with the provisions of this program and communicate hazards associated with their work during daily pre-job meetings.

Providing copies to the SSHO of MSDS for hazardous chemicals brought on-site

Attending site-specific orientation

2.4 Employees

Employees must know and be able to recognize hazards associated with their work and to ensure that these hazards are properly addressed according to this program and the training received.

Employees must know where the MSDSs are located for chemicals used in the workplace.

Employees must be able to understand all forms of labeling and warning for hazards in the workplace.

3.0 DEFINITIONS

Acute	Severe, often dangerous conditions in which relatively rapid changes occur.
Acute Exposure	An intense exposure over a relatively short period of time.
Asphyxiant	A chemical (gas or vapor) that can cause death or unconsciousness by suffocation. Simple asphyxiants, such as nitrogen, either use up or displace oxygen in the air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulfide, interfere with the body's ability to absorb or transport oxygen to the tissues.
Boiling Point	The temperature at which the vapor pressure of a liquid equals atmospheric pressure or at which the liquid changes to a vapor. The boiling point is usually expressed in degrees Fahrenheit. If a flammable material has a low boiling point, it indicates a special fire hazard.

"C" or Ceiling	A description usually seen in connection with a published exposure limit. It refers to the concentration that should not be exceeded, even for an instant. It may be written as TLV-C or Threshold Limit Value - Ceiling. (See also Threshold Limit Value.)
Carcinogen	A substance or physical agent that may cause cancer in animals or humans.
C.A.S. Number	Identifies a particular chemical by the Chemical Abstracts Service, a service of the American Chemical Society that indexes and compiles summaries of worldwide chemical literature called "Chemical Abstracts."
CC – Cubic Centimeter	A volumetric measurement, which, in the case of water, is also equal to one milliliter (ml).
Chemical	As broadly applied to the chemical industry, a naturally occurring substance or a compound produced by chemical reactions for either direct industrial and consumer use or for reaction with other chemicals.
Chemical Reaction	A change in the arrangement of atoms or molecules to yield substances of different composition and properties. (See Reactivity)
Chronic	Persistent, prolonged, or repeated conditions
Chronic Exposure	A prolonged exposure occurring over a period of days, weeks, or years.
Combustible Liquid	According to the DOT and NFPA, combustible liquids are those having a flash point at or above 100 ºF (37.8 ºC). Combustible liquids do not ignite as easily as flammable liquids. However, combustible liquids can be ignited under certain circumstances and must be handled with caution. Substances, such as wood, paper, etc., are termed "ordinary combustibles."
Concentration	The amount of one substance mixed with, and in the presence of, another substance. For example, 5 parts (of acetone) per million (parts of air).
Corrosive	A substance that, according to the DOT, causes visible destruction or permanent changes in human skin tissue at the site of contact.
Dermatitis	An inflammation or irritation of the skin.
Dyspnea	Shortness of breath; difficult or labored breathing.
EPA	The Environmental Protection Agency is the governmental agency responsible for administration of laws to control and/or reduce pollution of air, water, and land systems.
EPA Number	The number assigned to chemicals regulated by the EPA.
Flammable Liquid	By DOT and NFPA, a flammable liquid is one that has a flash point below 100 ºF. (See Flash Point)
Flash Point	The lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture and burn when a source of ignition (sparks, open flames, cigarettes, etc.) is present. Two tests are used to determine the flash point: open and closed cup. The test method is indicated on the MSDS after the flash point.
Hazardous Material	Any substance or compound that may produce adverse effects on the health and safety of humans.
Ingestion	Taking a substance into the body through the mouth as food, drink, medicine, or unknowingly as on contaminated hands or cigarettes, etc.
Inhalation	The breathing in of an airborne substance that may be in the form of gases, fumes, mists, vapors, dusts, or aerosols.
Irritant	A substance that produces an irritating effect when it contacts the skin, eyes, nose, or respiratory system.

Lower Explosive Limit (LEL)	(Also known as Lower Flammable Limit.) The lowest concentration of a substance that will produce a fire or flash when an ignition source (flame, spark, etc.) is present. It is expressed in percent of vapor or gas in the air by volume. Below the LEL or LFL, the air/contaminant mixture is theoretically too "lean" to burn. (See also UEL)
Odor Threshold	The minimum concentration of a substance at which a majority of test subjects can detect and identify the substance's characteristic odor.
OSHA	The Occupational Safety and Health Administration is a Federal Agency under the Department of Labor that publishes and enforces safety and health regulations for most business and industries in the United States.
Oxygen Deficiency	An atmosphere having less than the normal percentage of oxygen found in normal air. Normal air contains 20.8% oxygen at sea level.
Reactivity	A substance's propensity to under a chemical reaction or change that may result in effects, which can be dangerous, such as explosion, burning, or generation of corrosive or toxic emissions. Reaction initiators, such as heat, other chemicals, dropping, etc., will usually be specified as "Conditions to Avoid" when a chemical's reactivity is described in an MSDS.
Time Weighted Average (TWA)	The average concentration, over a given work period, e.g., 8-hour workday, of a person's exposure to a chemical or a potentially harmful agent. The average is determined by sampling for the contaminant during the period of exposure.
Upper Explosive Limit (UEL)	(Also known as Upper Flammable Limit.) The UEL is the highest concentration of a mixture that will burn or explode when an ignition source is present. Theoretically, above this limit, the mixture is said to be too "rich" to support combustion. The airborne concentration range between the LEL and the UEL constitutes the flammable range or explosive range.

4.0 PROGRAM

4.1 General

The purpose of Hazard Communication program is to communicate the hazards of workplace chemicals and communicate protective measures to control the hazards. Hazard Communication is accomplished by:

- Maintaining a list of all workplace chemicals,
- Labeling workplace chemical containers,
- Maintaining Material Safety Data Sheets for the workplace chemicals, and
- Implementing a training program to communicate the hazards of chemicals and appropriate protective measures.

Upon completion of Hazard Communication training, Jacobs employees and subcontractors will understand the components of Hazard Communication, will understand the hazards of the chemicals in their workplace and the protective measures to control the hazards

4.2 Hazard Evaluation

Chemical manufacturers are responsible for assessing a chemical's:

- Physical hazards, such as flammability, combustibility, explosion, reaction, radioactivity; and
- Health hazards, such as irritation, corrosion, sensitization, or toxicity.

The Company relies on our clients for chemical, product, and process unit intermediate stream hazard information.

Material Safety Data Sheets (MSDSs) shall be requested for chemicals and products purchased or brought onto the site. The site relies on the evaluation performed by the chemical manufacturers or importers, who originated the MSDS, for the accuracy of this information.

MSDSs will be maintained at the Amaknak Island office.

4.3 Written Hazard Communication

A list of the chemicals used on Amaknak Island TERC will be maintained and updated at least annually or when there are new chemicals. The Site Project Manager/designee is expected to maintain the list of chemicals.

4.4 Labels

Labels and other forms of warnings are to be conspicuously placed on containers so the message is readily visible.

The chemical manufacturer, importer or distributor will label, tag or mark the chemical container identifying the hazardous chemicals, appropriate hazard warnings, and name and address of the chemical manufacturer, importer or responsible party.

4.1.1 Labeling Systems

There are multiple labeling systems currently in use including the National Fire Protection Association (NFPA) 704M labeling system, the Hazardous Materials Information System (HMIS), the U.S. Department of Transportation labeling system, the United Nations Hazard Class Number system and others.

NPCA/HMIS

The National Paint & Coatings Association (NPCA) Hazardous Materials Information System (HMIS) uses standard labels to communicate hazards through the use of colors, numbers, letters of the alphabet, and symbols.

The HMIS is a five-part rectangle that provides identification of the chemical, acute health hazard, flammability, reactivity, personal protective equipment designations, and chronic health hazard information.

The chemical identity is conveyed by the chemical name and should be the same as the name on the MSDS. The acute health (blue), flammability (red), reactivity (yellow) hazards are communicated by numerical ratings similar to the NFPA system.

An alphabetical designation is used to denote recommended personal protective equipment.

Chronic health hazards may be any abbreviated technique such as an asterisk communicated by placed on the label denoting reference to the specific Material Safety Data Sheet, or the actual chronic information may be written on the label if space allows.

4.1.2 Labels for Transfer Containers

When hazardous materials are transferred from one container to another, the new container will be marked appropriately with the hazard warning.

4.5 Material Safety Data Sheets (MSDS)

A Material Safety Data Sheet will maintained be at the Jacobs Anchorage office for each hazardous chemical used by an employee. The MSDS will include:

- The chemical name and common name of all ingredients, which are health hazards,
- The chemical name and common name of all ingredients which are physical hazards,
- The physical and chemical characteristics of the hazardous chemical such as vapor pressure, flash point,
- The physical hazards of the hazardous chemical including fire, explosion, reactivity,
- The primary routes of entry,

- The Permissible Exposure Limit, Threshold Limit Value, and other exposure limit used by the manufacturer,
- Whether the hazardous chemical is listed in the National Toxicology Program Annual report on Carcinogens, International Agency for the Research on Cancer Monographs or by OSHA,
- Applicable precautions for safe handling and use,
- Applicable engineering controls, work practices, or personal protective equipment control measures known to the manufacturer,
- Emergency and first aid procedures,
- Date the MSDS was prepared and name, address and telephone number of the manufacturer.

4.6 Work Place Inventory

An up-to-date hazardous chemical inventory must be maintained.

4.7 Employee Information and Training

Employees shall be informed of operations in their work area where hazardous chemicals are present, the location of the written Hazard Communication program, list of hazardous chemicals, and MSDSs.

Training will include methods and observations to detect a hazardous chemical in the workplace, the physical and health hazards of the hazardous chemicals in the workplace, the measures employees can take to protect themselves, an explanation of the labeling system and MSDSs.

Training will be documented using the Hazard Communication and Right-To-Know Training Form, of this document.

4.8 Trade Secrets

The chemical manufacturer may withhold specific chemical identity from the MSDS. For emergency or first aid treatment or non-emergency conditions, the chemical manufacturer will disclose the specific chemical identity to a health professional.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.1200, Hazard Communication

29 CFR 1926.59, Hazard Communication

Jacobs HSEP 1.3, Hazard Communication

JACOBS ENGINEERING GROUP INC.

HAZARD COMMUNICATION
and
RIGHT TO KNOW STANDARDS TRAINING FORM

Name: ______________________________ S.S. No.: ___________________________

Company: ______________________________

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), and Physical Agent Data Sheets (PADS) their use, location, and procedures for obtaining copies.

2. I have been informed that some of my work may involve exposure to toxic substances.

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.

4. I understand that the employer must act upon a request in a reasonable amount of time to avoid the interruption of normal work operations but within 15 days.

Signature: ____

Date: ____

Attachment C4: Site Control HSEP 7.3.2

HSE Procedure		Document No: HSEP 7.3.2	Page: 1 of 8
Site Control		Supersedes: CHSP 7.3.2	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 13 Aug 01

Table of Contents

1.0 PURPOSE AND SCOPE **1**
2.0 RESPONSIBILITIES **1**
2.1. Project Health, Safety, and Environment Manager 1
2.2. Site Manager 1
2.3. Program Health, Safety, and Environment Manager 1
2.4. Site Health, Safety, and Environment Officer 1
3.0 DEFINITIONS **2**
4.0 PROCEDURE **2**
4.1. Control at the Site 3
4.2. Establishing Work Zones 3
4.3. Zone 1—Exclusion Zone 3
4.4. Zone 3—Support Zone 4
4.5. Zone 2—Contamination Reduction Zone 4
4.6. Other Considerations in Work Zone Definition 5
5.0 REFERENCES **1**
6.0 FIGURES .... ERROR! BOOKMARK NOT DEFINED.
Basic Code of Safe Practices 2

1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (CHSEP) presents requirements for worksite entry and safe site work practices and the criteria for the establishment of contamination-control work zones for hazardous waste site work.

This CHSEP applies to all hazardous waste work sites and indicated sections dealing with safe work practices apply additionally to all work sites. Subcontractors may follow their company Health, Safety, and Environment (HSE) procedures but they must be consistent with these requirements and meet or exceed the requirements set forth in this CHSEP.

2.0 RESPONSIBILITIES

2.1. Project Health, Safety, and Environment Manager

The Project Health, Safety, and Environment Manager (HSEM) is responsible for assuring that the requirements of this section are incorporated in the site Health, Safety, and Environment Plan (HSEP) requirements.

2.2. Site Manager

The Site Manager (SM) shall also sign off on the HSEP & is responsible for implementation of this HSEP.

2.3. Program Health, Safety, and Environment Manager

The Program HHSE Manager (PHSEM) is responsible for evaluation of requests for any variances from requirements presented in this HSEP.

2.4. Site Health, Safety, and Environment Officer

The Site Health, Safety, and Environment Officer (HSEO) shall assure full compliance with the HSEP & report any deficiencies to the SM.

3.0 DEFINITIONS

None

4.0 PROCEDURE

Attachment 1 contains the Basic Code of Safe Practices, which are applicable to all site work.

The following procedures will also be followed for work on hazardous waste sites.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material are prohibited in any area designated as contaminated.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, and any other activities.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, mud, or other discolored surfaces. Avoid kneeling on the ground and leaning, sitting, or placing equipment on drums, containers, vehicles, or on the ground.
- Entrance and exit must be planned and emergency escape routes delineated. Warning signals for site evacuation must be established.
- Personnel on site must use the “buddy” system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.
- Personnel should practice unfamiliar operations prior to actual procedure.
- During continual operations, on site workers act as safety backup to each other. Off-site personnel provide emergency assistance. Communications using radios or other means must be maintained between initial entry members at all times. Emergency communications should be prearranged in case of radio failure, necessity for evacuation of site, or other reasons.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Visual contact must be maintained between “pairs” on-site and safety personnel. Entry team members should remain close together to assist each other during emergencies.
- Wind indicators visible to all personnel should be strategically located throughout the site. Personnel and equipment in the contaminated area should be minimized, consistent with effective site operations.
- Work area for various operational activities must be established (see Section 7.4 below).
- Procedures for leaving a contaminated area must be planned and implemented prior to going on site. Work areas and decontamination procedures must be established based on prevailing site conditions.
- Continual practice and training must be provided in using personal protection equipment, especially the self-contained breathing apparatus and chemical-resistant protective clothing.
- Wearing personal protective equipment (PPE) puts a hazardous material worker at considerable risk of developing heat stress. During warm weather conditions, a heat stress control program must be implemented (see HSEP for heat stress).
- Cold injury (frostbite and hypothermia) and impaired ability to work are dangers at low temperatures and when the wind-chill factor is high. Procedures for cold stress monitoring and control are presented in the HSEP for cold stress.

The site-specific HSEP must specify testing for site hazards and a task hazard analysis that presents a task breakdown of the scope of work and the H&S control procedures to be implemented for each task, which must be adhered to during site initiation.

The site HSEP presents air-monitoring requirements for known contaminants. This data, together with site logistics information and information related to prevailing weather conditions, helps dictate the initial entry airborne monitoring program.

Work zones for hazardous waste sites are to be established since activities required during hazardous waste site operations may contribute to the movement of contaminants from the site to otherwise unaffected areas. Personnel and equipment may carry contaminated material into clean areas. Materials may become airborne due to their volatility, or the disturbance of contaminated soil may cause them to become wind blown.

To minimize the transfer of hazardous substances from the site, contamination control procedures are needed. Two general methods are used: establishing site work zones (discussed here) and removing contaminants from people and equipment (see HSEPs for personnel and equipment decontamination). This information is to be detailed in the HSEP. Whenever possible, a site map depicting the work zones will be developed and included in the HSEP.

4.1. Control at the Site

Personnel or equipment from the site must control a site to reduce the possibility of exposure to contaminants and their transport. Exposure or movement of substances can be reduced or eliminated in a number of ways, including:

- Setting up security and physical barriers to exclude unnecessary personnel from the general area.
- Minimizing the number of personnel and equipment on site consistent with effective operations.
- Establishing work zones within the site.
- Establishing control points to regulate access to work zones.
- Conducting operations in a manner to reduce the exposure of personnel and equipment and to eliminate the potential for airborne dispersion.
- Implementing appropriate decontamination procedures.

4.2. Establishing Work Zones

One method of preventing or reducing the migration of contamination is to delineate zones on the site where prescribed operations occur. Access control points should limit movement of personnel and equipment between zones and onto the site. By these means, contamination would be expected to be contained within certain relatively small areas on the site and its potential for spread minimized. Three contiguous zones are recommended.

Zone 1: Exclusion

Zone 2: Contamination Reduction Zone

Zone 3: Support Zone

4.3. Zone 1—Exclusion Zone

The Exclusion Zone, the innermost of the three concentric areas, is the zone where contamination does or could occur. All people entering the Exclusion Zone must wear prescribed levels of protection. An entry and exit check point must be established at the periphery of the Exclusion Zone to regulate the flow of personnel and equipment into and out of the zone and to verify that the procedures established to enter and exit are followed.

The outer boundary of Zone 1, the Hotline, is initially established by visually surveying the immediate environs of the incident and determine where the hazardous substances involved are located; where any drainage, leached, or spilled material is; and whether any discolorations are visible. Guidance in determining the boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapor/gases or particulates in air, combustible gases, and radiation, or the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire of an explosion from affecting personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined, it should be well marked. During subsequent site operations, the boundary may be modified and adjusted as more information becomes available.

Sub Areas Within The Exclusion Zone

All personnel within the Exclusion Zone must wear the required level of protection. Personal protective equipment is designated based on site-specific conditions, including the type of work to be done and the hazards that might be encountered. Frequently with the Exclusion Zone, different levels of protection are justified. Sub areas are specified and conspicuously marked as to whether Level A, B, C, or D protection is required. The level of protection is determined by the measured concentration of substances in air, potential for contamination, and the known or suspected presence of highly toxic substances.

Different levels of protection in the Exclusion Zone might also be designated by job assignment. For example, collection samples from open containers might require Level B protection, while for walk-through ambient air monitoring; Level C protections might be sufficient. The assignment, when appropriate, of different levels of protection within the Exclusion Zone generally makes for a more flexible, effective, and less costly operation, while still maintaining a high degree of safety.

4.4. Zone 3—Support Zone

The Support Zone, the outermost part of the site, is considered a non-contaminated or clean area. Support equipment is located on the zone and traffic is restricted to authorized response personnel. Since normal work clothes are appropriate within this zone, potentially contaminated personnel clothing, equipment, and samples are not permitted, but are left in the Contamination Reduction Zone until they are decontaminated.

- Accessibility: topography; open space available; locations of highways, railroad tracks; or other limitations.
- Wind direction: preferably the support facilities should be located upwind of the Exclusion Zone. However, shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.
- Resources: adequate roads, power lines, water, and shelter

4.5. Zone 2—Contamination Reduction Zone

Between the Exclusion Zone and the Support Zone is the Contamination Reduction Zone, which provides a transition between contamination and clean zones. Zone 2 serves as a buffer to further reduce the probability of the clean zone becoming contaminated or being affected by other existing hazards. It provides additional assurance that the physical transfer of contaminating substances on people, equipment, or in the air is limited through a combination of decontamination, distance between Exclusion and Support Zones, air dilution, zone restrictions, and work functions.

Initially, the Contamination Reduction Zone is considered to be a non-contaminated area. At the boundary between the Exclusion and Contamination Reduction Zones, decontamination stations are established, one for personnel and one for heavy equipment. Depending on the size of the operation, more than two stations may be necessary. Exit from the Exclusion Zone is through a decontamination station.

As operations proceed, the area around the decontamination may become contaminated, but to a much lesser degree than the Exclusion Zone. On a relative basis, the amount of contaminants should decrease from the Hotline to the Support Zone due to the distance involved and the decontamination procedures used.

The boundary between the Support Zone and the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone. Access to the Contamination Reduction Zone from the Support Zone is through a control point. Personnel entering there would wear the prescribed personnel protective equipment, as required, for working in the Contamination Reduction Zone.

4.6. Other Considerations in Work Zone Definition

- **Modifications:** The use of a three-zone system, access control points, and exacting decontamination procedures provides a reasonable assurance against the translocation of contaminating substances. This site control system is based on a “worst case” situation. Less stringent site control and decontamination procedures may be utilized if more definitive information is available on the types of substances involved and hazards they present. This information can be obtained through air monitoring, instrument survey and sampling, and technical data concerning the characteristics and behavior of material present.
- **Area Dimension**: The distance between the Hotline, Contamination Control Line, and command post and the size and shape of each zone have to be based on conditions specific to each site. Considerable judgment is needed to assure that the distances between zone boundaries are large enough to allow room for the necessary operations, provide adequate distances to prevent the spread of contaminants, and eliminate the possibility of injury due to explosion or fire. Long-term operations would involve developing reasonable methods to determine if material is being transferred between zones and to assist in modifying site boundaries. The following criteria should be considered in establishing area dimensions and boundary distances:
  - Physical and topographical features of the site.
  - Weather conditions.
  - Field/laboratory measurements of air contaminants and environmental samples.
  - Air dispersion calculations.
  - Potential for explosion and flying debris.
  - Physical, chemical, toxicological, and other characteristics of the substances present.
  - Cleanup activities required.
  - Potential for fire.
  - Area needed to conduct operations.
  - Dimensions of contaminated area.
  - Potential for exposure.
- **Monitoring and Sampling:** To verify that the site control procedures are preventing the spread of contamination, a monitoring and sampling program should be established. The Support Zone should be periodically monitored for air contaminants using direct reading instruments and/or collecting air samples for particulate, gas, or vapor analysis. Analysis of soil samples collected in the most heavily traveled area would indicate contaminants being carried from the Exclusion Zone by personnel, equipment, or wind. Occasional swipe tests should be taken in trailers and other areas used by personnel.
- These same types of samples should be collected along with air monitored in the Contamination Reduction Zone. Increased concentrations in air or other environmental media may indicate a breakdown in control over the Contamination Reduction Corridor, ineffective decontamination procedures, or failure to restrict site access.

5.0 REFERENCES

U.S. Army Corps of Engineers, Safety & Health Requirements Manual EM 385-1-1, Section 28. October 1992.

U.S. EPA, Standard Operating Safety Guides, November 1984.

NIOSH/OSHA/USCG/EPA. Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

6.0 FIGURES

Basic Code of Safe Practices

Figure 1

Basic Code of Safe Practices

Following is the Basic Code of Safe Practices that applies at all times to site. These safety rules are not inclusive, and all Federal and State safety regulations shall also be applicable. Where a conflict exists between a Federal, State, and/or other applicable safety rule, the more restrictive shall be in force on the job site.

This is a recommended format. It is general in nature and intended also as a basic for the preparation of a code of safe practices by subcontractors that fit his/her operation more exactly. As a minimum performance standard, they shall be adopted and enforced by any subcontractor performing work on Company projects.

- Hard hats shall be worn at all times in construction areas.
- Sleeved shirts shall be worn at all times.
- Long pants shall be worn at all times.
- Leather shoes be worn at all times in construction areas; no tennis or running shoes will be allowed.
- Adequate eye protection shall be worn when cutting, grinding, sawing or conducting any other activity that poses a potential eye hazard.
- Safety harness with lanyard shall be used at unprotected heights of more than 6'-0"; this includes working on a ladder when more than 6'-0" above the ground or floor. 100% tie off is required when unprotected more than 6' above work surface.
- Hearing protection shall be worn when employees are exposed to noise levels requiring hearing protection as defined by Federal or State HSE standards.
- Illegal drugs, alcohol, firearms, or other dangerous substances shall not be allowed on the job site.
- Good housekeeping practices shall be maintained continually.
- When work is performed overhead, the subcontractor conducting such work shall erect a barricade. The barricade shall consist of caution or danger barricade tape and appropriate warning signs.
- All barricades shall be removed when not in use.
- Subcontractor employees shall be required to honor the barricades erected by other contractors on the job site.
- All persons shall follow these safe practices and rules, render every possible aid to safe operations and report all unsafe conditions or practices to the supervisor.
- Foremen shall assure that employees observe and obey every applicable Company, State, or Federal regulation and order as is necessary to the safe conduct of the work, and shall take such action as is necessary to obtain.
- All employees shall be given frequent accident prevention instruction. Instructions shall be given at least every five work days.
- Anyone known to be under the influence of drugs or intoxicating substance, which impair the employees ability to safely perform the assigned duties, shall not be allowed on the job while in that condition.
- Horseplay, scuffling, and other acts which tend to have an adverse influence on the safety or well being of the employees shall be prohibited.

- Work shall be well planned and supervised to prevent injuries in the handling of materials and in working together with equipment.
- No one shall knowingly be permitted or required to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that they might unnecessarily expose the employee or others to injury.
- Employees shall not enter manholes, underground vaults, chambers, tanks, silos or other similar spaces without a confined space entry permit being issued.
- Employees shall be instructed to ensure that all guards and other protective devices are proper and adjusted and shall report deficiencies promptly to the supervisor.
- Electric cords shall not be exposed to potential damage from vehicles.
- In locations where the use of a portable power tool is difficult, the tool shall be supported by means of a rope or similar support of adequate strength.
- Only trained and authorized persons shall operate machinery or equipment.
- Loose or frayed clothing, loose or hanging long hair, dangling ties, finger rings, etc., shall not be worn around moving machinery or other areas where they may become entangled.
- Machinery shall not be serviced, repaired, or adjusted while in operation, nor shall oiling of moving parts be attempted, except on equipment that is designed or fitted with safeguards to protect the person performing the work.
- Where appropriate, lockout procedures shall be used.
- Employees shall not work under vehicles supported by jacks or chain hoists without protective blocking that will prevent injury if jacks or hoists should fail.
- Air hoses shall not be disconnected at compressors until the hose line has been bled.
- Excavating, trenching, and shoring operations shall be supervised by a "competent person" (refer to OSHA and/or Company regulations during all stages of field activity).
- All excavations shall be visually inspected before entry or backfilling to ensure that it is safe.
- Excavating equipment shall not be operated near tops of cuts, banks, or cliffs if employees are working below.
- Tractors, bulldozers scrapers, and carryalls shall not operate where there is a possibility of overturning in dangerous areas like edges of deep fills, cut banks, and steep slopes.
- When loading where there is a probability of dangerous slides or movement of material, the wheels or treads of loading equipment, other than that riding on rails, should be turned in the direction which will facilitate escape in case of danger, except in a situation where this position of the wheels or treads would cause a greater operational hazard.
- Workers shall not handle or tamper with any electric equipment in a manner not within the scope of their duties, unless they have received instructions from a qualified, licensed electrician.
- All injuries shall be reported promptly to the foreman and the Prime Contractor so that arrangements can be made for medical or first aid treatment.
- No burning, welding, or other source of ignition shall be applied to any enclosed tank or vessel, even if there are some openings, until it has first been determined that no possibility of explosion exists and authority for the work is obtained from the foreman or superintendent.

Attachment C5: Confined Space HSEP 7.2.2

JACOBS

HSE Procedure		Document No: HSEP 7.2.2	Page: 1 of 15
Confined Space Entry General Industrial Services		Supersedes: CHSP 7.2.2	Rev.
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 30 July 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
2.1. Site Management 1
2.2. Entry Supervisor 2
2.3. Stand-by Attendants 2
2.4. Employees/Entrants 2
2.5. Site HSE Representative 3
2.6. Corporate Health, Safety and Environment 3
3.0 DEFINITIONS 3
4.0 PROCEDURE 4
4.1. General Requirements 4
4.2. Permit System 5
4.3. Control of Environmental Conditions 5
4.4. Burning and Welding 6
4.5. Isolation Requirements 7
4.6. Emergency Rescue 7
5.0 REFERENCES 7
6.0 FIGURES 8
Confined Space Entry Permit For General Industrial Services 9
Confined Space Authorized Entrants Sign-in/Sign-out Log 11
Confined Space Entry Safety Checklist 12
Minimum Training Topics for Confined Space Entry Stand-By Attendants 15

1.0 PURPOSE AND SCOPE

This Corporate Health, Safety and Environment Procedure (HSEP) provides the minimum procedures to ensure the safety and health of employees who enter confined spaces or perform activities to support confined space operations, such as Stand-by Attendants and Supervisors.

This HSEP applies to all employees and subcontractors engaged in operations covered by the Company Health and Safety Program, except for the following types of projects:

- New industrial construction projects, which are located outside of an operating unit.
- Commercial construction projects.

These projects shall follow the procedures set forth in: Corporate Health, Safety and Environment Procedure Number 7.2.1; Confined Space Entry; New & Commercial Construction Projects.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Site Management

Site Management must assume ownership and responsibility for implementation of the policy and procedures found in this HSEP.

Site Management must be familiar with this HSEP and utilize expertise at their disposal to ensure employees are protected from confined space hazards.

Site Management must evaluate confined space rescue services assigned for site entries.

2.2. Entry Supervisor

The Entry Supervisor shall obtain and sign the confined space permit prior to entry.

The Entry Supervisor must know the hazards involved with confined space entry.

The Entry Supervisor must verify that all required tests have been performed and that all procedures and equipment are in place before the permit is issued.

The Entry Supervisor must also terminate entry and cancel permits if necessary.

The Entry Supervisor must verify that rescue services are available and the means for summoning them are in operating condition. Entry Supervisors are responsible for the removal of unauthorized person(s) who enter the confined space.

Entry Supervisors must assure that the medical facility treating any exposed Entrants are provided any MSDSs or other information that may aid in treatment.

Entry Supervisors must assure that entry operations remain consistent with the terms of the entry permit and that acceptable entry conditions are maintained.

2.3. Stand-by Attendants

The Stand-by Attendant (Attendant) must know the hazards of the confined spaces and be able to recognize behavioral effects of potential exposures.

The Attendant must maintain a continuous count and identification of authorized Entrants within the confined space. This count should be maintained as a sign in/sign out log and must remain with the permit at all times.

The Attendant must remain outside the space until relieved by another Attendant and should communicate with Entrants as necessary.

The Attendant must monitor activities both inside and outside the confined space and order an exit if conditions become hazardous.

The Attendant must summon the rescue team if needed.

The Attendant must be able to prevent unauthorized entry into the confined space. If an unauthorized person enters the confined space, the Attendant must advise them to exit immediately and inform the Entrants and the Entry Supervisor of the unauthorized Entrant.

The Attendant cannot perform other duties that interfere with their primary duty to monitor and protect the safety of authorized Entrants.

The Attendant may perform non-entry rescues as specified in the rescue plan.

Prior to being designated as a Confined Space Entry Attendant, they must successfully complete the Attendant Training Program.

The Attendant should be required to wear a vest or some other identification to signify he/she is an Attendant.

Each Attendant must be equipped with an air horn, radio or some other means of communication to summon help in the event of an emergency. The communication device shall be used only in an emergency.

2.4. Employees/Entrants

All Entrants must know and be able to recognize the hazards involved with confined space entries.

All Entrants must be able to recognize signs, symptoms and consequences of possible exposure to chemicals that may be present within the confined space.

Entrants must know how to use all personal protective equipment involved with the entry.

Entrants must be able to communicate with Stand-by Attendants. They must alert Stand-by Attendants to the warning signs or existence of a hazardous condition and exit as quickly as possible if the need arises.

Employees/Entrants shall have access to initial/periodic atmospheric test results.

Employees/Entrants shall have the ability to observe pre-entry or subsequent testing of the confined space.

2.5. Site HSE Representative

The Site HSE Representative shall assist Site Management and Entry Supervisors in compliance with this HSEP.

The Site HSE Representative shall be responsible for maintaining site documentation required by this HSEP.

2.6. Corporate Health, Safety and Environment

Corporate Health, Safety and Environment will assist Site Management Entry Supervision, and the Site Safety Representative in the safe execution of confined space entry operations, and compliance with this HSEP.

Corporate Health, Safety and Environment will function to assist in the training and monitoring of confined space entry operations and ensure any concerns are communicated to Site Management and Supervision and properly resolved.

3.0 DEFINITIONS

Confined Space	Is large enough and so configured that an employee can bodily enter and perform assigned work. Has limited or restricted means for entry or exit (for example; tanks, vessels, silos, storage bins, hoppers, vaults and pits or spaces that may have limited means of entry). Is not designed for continuous employee occupancy.
Confined Space Entry Permit	The form provided by the Company (Attachment 1) to allow and control entry into a confined space with required information completely filled out.
Emergency	Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the confined space that could endanger Entrants.
Entrant (Authorized Entrant)	An employee who is authorized to enter a confined space.
Entry	The action by which a person passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the Entrant's body breaks the plane of an opening into the space.
Entry Supervisor	The person responsible for determining if acceptable entry conditions are present in a confined space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this procedure.

Published Exposure Limits	Sources for employee exposure limit data: OSHA 29 CFR 1910.1000 (Subpart Z) Toxic and Hazardous Substances/Permissible Exposure Limits (PELs) Table Z-1. Material Safety Data Sheets (MSDS); follow recommendations for employee exposure published in the most recent publication of this Manufacturer's data. National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) as published in the most recent publication of the NIOSH Pocket Guide to Chemical Hazards. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) as published by same. Federal (NRC) or State radiation exposure regulations.
Stand-by Attendant	An employee stationed outside the confined space, which monitors the Entrants, and performs all Stand-by Attendant responsibilities assigned by this procedure (Section 6.3).

4.0 PROCEDURE

4.1. General Requirements

This written program shall be available for inspection by employees and their authorized representatives.

Each jobsite shall be evaluated and all exposed employees shall be informed of the existence, location and danger posed by the confined spaces.

Prior to performing confined space work, information regarding confined space hazards and entry operations shall be obtained from the owner.

If personnel from more than one employer will be working in or near the confined space, procedures must be implemented to coordinate entry operations so that employees of one employer do not endanger the employees of any other employer.

The owner must be informed of any hazards confronted or created during the confined space entry either through a debriefing or during the entry operation.

Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

When entry covers are removed, the opening shall be promptly guarded by a railing or temporary cover that will prevent an accidental fall through the opening and foreign objects from falling into the space.

If lighting and power requirements cannot be met by the use of battery lights and pneumatic equipment, reduced voltage at a maximum of 12 volts must be used.

Higher voltages may be used only with a ground fault circuit interrupter (GFCI). The ground fault circuit interrupter, transformer and disconnects must be located outside of the confined space.

If the confined space is equipped with a grounding cable, a firm mechanical joint should be verified.

If plant air is used for pneumatic equipment, it must be verified that inert gases, such as nitrogen, cannot enter the plant air system.

Prior to entry into a confined space, all entrants must complete the Respiratory Protection Program.

Personnel with respiratory problems as determined by a physician shall not be permitted in confined spaces.

All permit specified personal protective apparel and respiratory equipment shall be worn when entering any hazardous enclosure as required.

4.2. Permit System

Prior to personnel entering any confined space, a Confined Space Entry Permit (permit) (Attachment 1) must be obtained.

Before entry begins, the Entry Supervisor identified on the permit shall sign the permit to authorize entry.

The duration of the Confined Space Entry Permit may not exceed the time required to complete the job identified on the permit.

The Confined Space Entry Permit shall be posted at the time of entry for review.

All incidents or problems encountered during an entry operation shall be noted on the permit so that appropriate revisions can be made.

All permits must be retained for one year to facilitate review of the Confined Space Entry Program.

All Confined Space Entry Permits (permits) must include the following specific information:

- Identification of the space.
- Purpose of entry.
- Date and duration of the permit.
- A list of Authorized Entrants.
- NOTE: The permit may contain a reference to the means used, such as a roster, to keep track of authorized Entrants.
- Names of current Attendants and the Entry Supervisor.
- A list of hazards in the permit space.
- A list of measures used to isolate the permit space and eliminate or control the hazards.
- The acceptable entry conditions.
- The results of monitoring tests, initialed by the person(s) performing the test.
- The rescue and emergency services available and the means to summon them.
- Communication procedures for Stand-by Attendants and Entrants.
- Any equipment to be used to comply with entry procedures (i.e., respirators, radios, horns, alarms, etc.).
- Any other necessary information.
- Any additional permits required (i.e., hot work, excavation).

The Confined Space Entry Permit will be automatically canceled in the event that an emergency alarm, area fire alarm, or plant emergency is sounded, with the exception of a test alarm. Personnel inside the confined space must exit and follow emergency procedures. When the all-clear signal is sounded, the Confined Space Entry Permit can be reinstated or reissued after atmospheric tests are retaken and noted on the permit.

4.3. Control of Environmental Conditions

A review of the confined space and its previous contents must be made by the Client Representative, Site Safety Representative, and the Entry Supervisor to ascertain that the necessary ventilation, protective clothing, respiratory equipment, emergency standby equipment, fire prevention precautions, etc., have been specified and provided.

Cleaning and decontamination shall be performed as required prior to personnel entering the confined space.

Mechanical ventilation systems may be required to eliminate hazardous atmospheric conditions. Air supplied for ventilation must be from a clean source and must not increase the hazards in the confined space.

The forced air ventilation shall be directed as to ventilate the immediate areas where an Entrant is or will be present within the space.

Before an employee enters the space, the internal atmosphere shall be tested with a calibrated direct reading instrument(s), in the order listed below, to assure the following hazardous atmospheres do not exist:

- Oxygen (O2): Atmospheric oxygen content below 19.5% and above 23.5%.
- Flammables: Flammable gases or vapors at 0% Lower Explosive Limit (LEL), or no needle movement off of 0% on analog type meters.
- Toxic and Hazardous Substances: Any potential toxic air contaminants equal or above *Published Exposure Limits* (See 5.0 Definitions). Note: Potential radiation exposure is also covered as part of this requirement, and shall not exceed established Federal and/or State regulatory exposure limits.

An employee who has successfully completed gas detector training for the monitor being used must conduct these tests.

If the atmosphere within the confined space cannot be maintained within the allowable ranges for oxygen content, toxicity levels and flammable limits (as defined above), employees must not enter.

If forced ventilation does not maintain an atmosphere below the established exposure limits for any toxic/hazardous substances or such conditions can reasonably be expected to develop, appropriate respirators shall be provided and properly used.

When respirators are used, frequent monitoring of the atmosphere within the confined space must be maintained, which will alert affected employees if conditions change.

If a hazardous atmosphere is detected during entry, all Entrants must evacuate the confined space and the space shall be evaluated to determine how the hazardous atmosphere developed. In addition, measures shall be implemented to protect the Entrants from the hazardous atmospheres before a subsequent entry takes place.

4.4. Burning and Welding

Burning and welding in confined spaces entails unusual hazards and a detailed analysis shall be made of each specific case to insure safe performance of the work.

When burning, welding or heating operations are required in a confined space, either a mechanical method of ventilation, such as a blower, or local exhaust ventilation method, such as exhaust hood must be provided to ensure adequate ventilation. When sufficient ventilation cannot be obtained without blocking the means of access to the confined space, employees in the confined space shall be protected by air supplied respiratory equipment.

When burning or welding is required in any confined space, the gas cylinders and welding machines shall be located outside of the space. Hose connections shall be checked for leakage prior to entry into confined space. Hoses shall be removed from the confined space at the end of work, during lunch periods, breaks, or whenever all personnel leave the confined space.

All surfaces coated with toxic preservatives or any residual materials from previous use must be removed for a distance of two feet from the point of burning or welding to prevent evolution of vapors/fumes.

Vessels and/or tanks of laminated shell construction should be given special consideration for the possibility of trapped residuals from the previous contents.

4.5. Isolation Requirements

A detailed review of the means for isolating the confined space must be communicated to each employee involved in the confined space task. Isolation of the space consists of blanking and blinding; utilizing double block and bleed methods; and misaligning or disconnecting all mechanical linkages. In addition, lockout or tagout of all sources of energy must be accomplished to ensure isolation is achieved throughout the duration of confined space entry. (Safety Lock and Tag Procedures, Section 8.9 of the Company Safety Manual or its equivalent must be followed.)

Methods of communicating the isolation process for the confined space may be accomplished by using Piping and Instrumentation Drawings (P&IDs) which can be marked up to show isolation points, means of isolation, and location of locks and tags.

4.6. Emergency Rescue

A site-specific rescue plan must be developed and explained to all confined space entry participants. This plan will address as a minimum all the requirements in this section.

The rescue team must be established prior to the entry and the Entry Supervisor must verify that rescue services are available and that the means for summoning them are operable.

If an onsite Rescue Team is used, the Entry Supervisor must assure that each member of the Rescue Team is provided with and trained to use the personal protective equipment and rescue equipment necessary for making rescues from permit spaces. In addition, each member of the Rescue Team must practice making confined space rescues at least once every twelve (12) months. Members of the Rescue Team must also be trained in basic first-aid and CPR and will assist during any medical emergencies during confined space entries.

Site management on a periodic basis must evaluate rescue services that will be assigned for the site entry. The evaluation shall include: training of rescuers, response times, and equipment availabilities.

Any confined space entries conducted that contain or likely will develop into IDLH atmospheres require rescue services present during the confined space entry.

To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements:

Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is unfeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

The other end of the retrieval line shall be attached to a mechanical retrieval device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical retrieval device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

Whenever conditions exist within a confined space that expose an entrant to environmental conditions that are Immediately Dangerous to Life and Health (IDLH) or have a possibility of becoming IDLH, a 30-minute Self Contained Breathing Apparatus or a combination airline respirator with a 5-minute escape pack must be immediately available for rescue.

5.0 REFERENCES

29 CFR 1910.146: Permit-Required Confined Spaces

29-CFR 1926.350(b)(4), 352(g), 353(b): Welding

Training Program No. 022: Confined Space Entry

All confined space Entrants, Stand-by Attendants and Entry Supervisors must be trained in the hazards of confined space work, the permit system being used and their specific duties and responsibilities as part of the entry team.

Training must be completed before any confined space duties are assigned, when there is a change in assigned duties, or when there is a change that presents a hazard about which, an employee has not been trained.

Re-training shall be provided whenever there are deviations from the confined space entry procedures or there are inadequacies in the employee's knowledge or use of these procedures.

Certification of training must be maintained. The certification must contain each employees name, signature of trainer, and the date of the training.

6.0 FIGURES

Confined Space Entry Permit For General Industrial Services

Confined Space Authorized Entrants Sign-in/Sign-out Log

Confined Space Entry Safety Checklist

Minimum Training Topics for Confined Space Entry Stand-By Attendants

Figure 1

Confined Space Entry Permit For General Industrial Services

1. Client/Space/Purpose

Client:		
Location:		
Space to Be Entered:		
Purpose of Entry		
Date:	Issue Time:	Expiration Time:

2. Personnel

Entry Supervisor:	Authorized Entrants:	Stand-by Attendants:

3. Hazards

Hazards of the Space:
Means used to isolate energy sources:
Means used to isolate chemical/process hazards:
Means used to isolate other hazards: (specify)
Other Permits required:

4. Atmospheric Conditions

		Testing Conducted		
Type	Acceptable Limit	Test Result	Time Test Done	Person Conducting Test
Oxygen	〈 19.5%			
Comb. Gas	0%			
Toxic Atoms.				

5. Equipment Required

Personal Protective Equipment Required For Entry:
Rescue Equipment Required:
Rescue Summoned By:

All potential hazards of the confined space entry must be identified on permit.

All hazards identified must be effectively isolated and means listed on permit.

All atmospheric tests required must be conducted and levels meet acceptable limits.

All equipment specified must be available and worn when applicable.

Any additional permits required for the work must be obtained.

Issuance/Acceptance

Permit Issued By:

(Print Name) (Signature)

Permit Accepted By:

(Print Name) (Signature)

Job Completed

Entry Complete:	Date:	Time:
Description of Incidents:		
Entry Supervisor Signature:		

Figure2

Confined Space Authorized Entrants Sign-in/Sign-out Log

Stand-By Attendant Name:_____________ Job: __________________ Date ____________

Name	Authorized Entrant? Yes No	In Out	In Out	In Out	In Out	In Out	In Out
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___
	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___	___ ___

Figure 3

Confined Space Entry Safety Checklist

This checklist covers the practices and procedures to protect employees from those hazards while entering, exiting and working in confined spaces.

__________ 1. Has a survey been conducted to identify permit required confined spaces and an inventory established?

__________ 2. Are confined spaces re-evaluated when necessary?

__________ 3. Has each hazard of the confined space been identified and procedures developed to eliminate or control them?

__________ 4. Have confined spaces been posted notifying employees that a permit is required for entry?

__________ 5. Have written procedures and practices been implemented for entering a non-permit confined space safely?

__________ 6. Is the Company standardized permit being utilized?

__________ 7. If hot work is to be performed in the permit space, has this been noted on the permit and a hot work permit generated?

__________ 8. Are the permits canceled at the completion of the entry after all entrants have exited?

__________ 9. Are atmospheric testing and verification of permit precautions conducted prior to entry?

__________ 10. Are permits immediately revoked when conditions or work activity are different than those specified on the permit and a new hazard could be introduced?

__________ 11. Is a new permit issued or the original permit re-issued when changes in work conditions or activity introduce new hazards to the space?

__________ 12. Is testing for hazardous atmospheres conducted prior to each entry by a qualified person and with approved equipment?

__________ 13. Is the atmosphere of the confined space maintained to within acceptable limits?

__________ 14. Is entry prohibited until appropriate controls are implemented if the atmospheric testing so indicates?

__________ 15. If the source of the contaminant creating the unacceptable atmosphere cannot be determined, are precautions taken to deal with the worst possible condition?

__________ 16. If the confined space atmosphere becomes unacceptable while the work is in progress, are there procedures and equipment provided to allow the employee to safely exit the space?

__________ 17. Are all hazardous materials, high pressure, high temperature, and other piping that may introduce a hazard properly isolated to prevent re-entry of hazardous materials to the confined space?

__________ 18. Are pipelines or similar conveyances between the confined space and points of isolation drained, cleaned or flushed of hazardous materials.

__________ 19. Are precautions taken to ensure that if drains, vents or piping are left open that reversal of flows or air contamination cannot enter the space?

__________ 20. Are special precautions taken when entering double walled, jacketed, or internally insulated confined spaces that may discharge hazardous material through leaks or cracks in the internal wall?

__________ 21. Is the equipment in the confined space locked out or tagged out (or both), per CFR 1910.147 and HSEP 15.1, Lock-Out/Tag-Out?

__________ 22. When ventilation is used to remove atmospheric contaminants from the confined space, is the space ventilated until the atmosphere is within acceptable limits?

__________ 23. Is ventilation maintained during the entire entry process if there is a potential for atmospheric conditions to exceed the acceptable limits?

__________ 24. Have alternate methods been established to remove air contaminants when ventilation is not feasible?

__________ 25. Are confined spaces cleaned and decontaminated of hazardous materials prior to entry?

__________ 26. If the purpose of the entry is for cleaning/decontamination, can this be done (if possible) before entry?

__________ 27. When cleaning/decontamination is not practical, is adequate personal protective equipment being utilized?

__________ 28. Is the equipment selected determined by a qualified individual based upon the requirements of the job to be performed, and in accordance with applicable standards?

__________ 29. Are entry/exit points evaluated to determine the most effective methods/equipment for safe entry and exit?

__________ 30 Have retrieval methods or equipment been determined for use in rescue?

__________ 31. Are mechanical lifting devices available for all entries to vertical type confined spaces?

__________ 32. Are warning systems/barricades available to prevent employees/objects from falling into the space?

__________ 33. Is fall protection equipment worn by employees entering permit required confined spaces?

__________ 34. Is the equipment to be used approved for use in the environment the space was classified?

__________ 35. Has a written emergency response plan been established for emergencies that may arise?

__________ 36. If respiratory protection is utilized, does it meet the requirements of OSHA 29 CFR 1910.134, and Company HSEP 13.14: Respiratory Protection.

__________ 37. Are entrants, attendants, and those in charge of entries properly trained and periodically retrained?

__________ 38. If contractors are used to enter confined spaces, are they informed of the known potential hazards and is it established who will serve as the rescue responder?

__________ 39. Are the assigned rescuers properly trained and equipped to perform efficient and timely rescues?

__________ 40. Has the confined space testing documentation and/or atmospheric checks been made available to employees/entrants?

Figure 4

Minimum Training Topics for Confined Space Entry Stand-By Attendants

Confined spaces Stand-by Attendants provide a vital communications link between those inside of a confined space and conditions outside of the space. Stand-by Attendant responsibilities include:

Confined spaces Stand-by Attendants provide a vital communications link between those inside of a confined space and conditions outside of the space. Stand-by Attendant responsibilities include:

_______ The Stand-by Attendant (Attendant) must know the hazards of the confined spaces and be able to recognize behavioral effects of potential exposures.

_______ The Attendant must maintain a continuous count and identification of authorized

Entrants remain with the permit at all times.

_______ The Attendant must remain outside the space until relieved by another trained Attendant and should communicate with Entrants as necessary.

_______ The Attendant must monitor activities both inside and outside the confined space and order an exit if conditions become hazardous.

_______ The Attendant must summon the rescue team if needed.

_______ The Attendant must be able to prevent unauthorized entry into the confined space. If an unauthorized person enters the confined space, the Attendant must advise them to exit immediately and inform the Entrants and the Entry Supervisor of the unauthorized Entrant.

_______ The Attendant cannot perform other duties that interfere with their primary duty to monitor and protect the safety of authorized Entrants.

_______ The Attendant may perform non-entry rescues as specified in the rescue plan.

_______ The Attendant should be required to wear a vest or some other identification to signify he/she is an Attendant.

Each Attendant must be equipped with an air horn radio or some other means of communication to summon help in the event of an emergency. The communication device shall be used only in an emergency.

Additional site or job specific requirements discussed. List: _______________

____

The above Confined Space Entry Training Topics have been discussed with me, and I understand my responsibilities as a Confined Space Stand-By Attendant.

________________________	________________	______________
Signature	**Social Security No.**	**Date**

____

Instructor’s Name

Attachment C6: Safety Evaluation Reports HSEP 2.2

JACOBS

HSE Procedure		Document No: HSEP 2.2	Page: 1 of 12
Safety Evaluation Report		Supersedes: HSEP 2.2 Rev 2 and JVEP 29	Revision: 3 Issue Date: 22 Mar 04
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 27 Sep 02	Effective Date: 22 Mar 04

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 2
2.1. Senior Operations Management 2
2.2. Project or Office Manager 2
2.3. HSE Department 2
2.4. Evaluation Team Members 2
2.5. Lead Evaluator 2
3.0 DEFINITIONS 3
4.0 EVALUATION PROCEDURE 3
4.1. Frequency 4
4.2. Evaluation Team 4
4.3. Schedule and Duration 4
4.4. Format 4
4.5. Opening Conference 5
4.6. Photography 5
4.7. Imminent Danger 5
4.8. Worker Interviews 5
4.9. Closing Conference 5
5.0 SER DISTRIBUTION 5
6.0 CORRECTIVE ACTIONS 6
7.0 FOLLOW-UP SER 6
8.0 RECORDKEEPING 6
9.0 REFERENCES AND RELATED DOCUMENTS 6
10.0 FIGURES 6
Guidelines for Evaluator 7
Project HSE Checklist 10

1.0 PURPOSE AND SCOPE

The Safety Evaluation Report (SER) is a management tool that evaluates the Health, Safety, and Environment process at a work location. Findings identify effective process implementation, specific hazards, and issues of concern, and provide a basis to continuously improve HSE performance.

Evaluations are comprehensive in scope and include the HSE plans, policies, procedures, and requirements of the Company, the client, subcontractors, and applicable regulatory agencies. Both current and future work areas and activities shall be included in the scope of the evaluation. All work activities and all HSE-related documentation are subject to evaluation and review.

This process is designed for use where we have responsibility for HSE. Activities of employees, subcontractors, and any other HSE-related exposures that could create hazards to them or a liability for our client or for the Company are included in the SER.

Concerns identified during the evaluation that are not within the contractual responsibility of the Company and do not present an exposure to employees or subcontractors should be forwarded to the appropriate responsible party but are not included in the SER.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Senior Operations Management

The senior operations manager is responsible for:

- Identifying operations management representatives as potential members of the evaluation team,
- Reviewing the findings of the SERs conducted at their office and/or project locations, and
- Confirming implementation of corrective actions with the assigned project or office manager.

2.2. Project or Office Manager

The project or office manager is responsible for:

- Providing escorts to the evaluation team, as necessary,
- Ensuring access to all HSE records and all work areas,
- Prompt correction of all hazards identified during the evaluation and/or developing and implementing corrective action procedures for items that can not be promptly resolved, and
- Providing a Corrective Action Plan or written response to the SER within the designated time frame.

2.3. HSE Department

The HSE department is responsible for:

- Providing SER evaluator training and designating appropriate evaluation team participants,
- Defining the schedule for conducting SERs in each HSASP document,
- Reporting SER summary totals to management, and
- Evaluating the findings of all SERs conducted within their area of responsibility to identify trends or common deficiencies that may require attention across all similar operations.

2.4. Evaluation Team Members

Members of the evaluation team are responsible for:

- Coordinating and scheduling the SER with the responsible project or office manager,
- Conducting the evaluation in a professional manner and documenting findings objectively,
- Discussing possible corrective actions for deficiencies identified during the evaluation with the appropriate personnel,
- Conducting a closing conference with the responsible project or office manager before leaving the location, and
- Completing and issuing the SER in a timely manner.

2.5. Lead Evaluator

One HSE Manager shall be designated as the Lead Evaluator and is responsible for overall coordination of the SER process, including

- Selecting evaluation team members based on requisite expertise,
- Determining the appropriate size of the team,

- Providing a copy of the location's previous SER to all team members,
- Providing technical and procedural guidance,
- Ensuring that team members have received SER evaluator training, and
- Distribution of the final report.

3.0 DEFINITIONS

Contractors	Contractors and/or their employees, who are *not* Jacobs subcontractors or employees
HSE Department	Refers to the Jacobs Health, Safety, and Environment Department, typically referred to as "HSE," and includes the Vice President, HSE, and the staff of Senior HSE Managers, Managers of HSE, and Industrial Hygiene Managers.
HSE Manager	A full-time Jacobs staff employee, who provides HSE management to multiple projects/offices and provides supervision to multiple HSE supervisors.
Imminent Danger	Situations or conditions which could, in the opinion of the evaluation team, reasonably be expected to cause death or immediate serious physical harm to personnel or significant damage to property or the environment.
Lead Evaluator	An HSE Manager, who has thorough knowledge of the Company HSE program and is trained in the use of this procedure and associated evaluation protocols and who serves as the leader of the evaluation team.
Project/Office Manager	The Jacobs employee responsible for overall project execution including implementation of the project's or office's HSE program. The Project Manager's office may or may not be located at the project site. In some cases, the Project Manager and the Site/Construction Manager may be the same person.
Senior HSE Manager	A senior-level, full-time Jacobs staff employee, who provides management to multiple HSE Managers and reports to the senior HSE representative in the Company.
Site Manager	The on-site Jacobs employee responsible for project execution and HSE program implementation. In some cases, the Project Manger and the Site/Construction Manager may be the same person. At office locations, this position is typically the Office Manager.
Senior Operations Management	The senior levels of management within each operating unit, including the Group Vice President and those Operations management personnel above the site/office management level.
Subcontractor	Any person, partnership, or corporation, which has a contract with the Company and/or their subcontractor(s), to furnish labor, material, or equipment as part of the work.

4.0 EVALUATION PROCEDURE

Guidelines for the evaluation team are provided in Figure 1, Guidelines for Evaluator and are further defined in the SER Evaluator's training.

Use of a checklist to aid the evaluators with their review of relevant forms, manuals, procedures, and documentation requirements is recommended. A sample checklist for field/project operations has been provided as Figure 2, Project HSE Checklist. Evaluators completing SERs outside the US are encouraged to use the items in Figure 2 to create their own country-specific checklist.

4.1. Frequency

Newly established office locations and new field projects will have an initial SER conducted during the early stages, typically within 30 days of occupancy or mobilization, to confirm that the HSE program elements are in place.

Office locations shall have an SER conducted at least annually.

SERs should be conducted on field operations or field projects at least every six-months.

More frequent evaluations may be requested by the responsible HSE or Operations Management and are always encouraged.

The project/office HASAP shall specify the planned SER schedule.

4.2. Evaluation Team

The SER team should be comprised of at least one operations management representative and one corporate HSE manager. Typically, this would be those home office Operations and HSE management representatives responsible for oversight of the location being reviewed.

Project Managers, Site Managers from other projects, or Operations Managers from other areas may serve as an operations team member, but Site Managers should not be members of the evaluation team for their own location. An evaluation team including at least one “cold eyes” member is encouraged.

Members of the evaluation team should have completed the SER evaluator’s training.

The Lead Evaluator will assess factors such as workforce size, relative hazards, site geography, project complexity, etc. when determining whether more than two evaluators will be required.

4.3. Schedule and Duration

The evaluation team should coordinate scheduling of the SER with the project/office management team. The evaluation team must note that advance security arrangements are required by some clients to access certain areas of their facilities.

The size and complexity of the project or office location and the size of the evaluation team will determine the time required to complete a thorough evaluation. Some SERs can be completed in one day, while larger or more complex locations more time. The team should strive to observe a majority of the workforce actively engaged in their work tasks.

4.4. Format

Standard SER formats are essential to ensure consistency throughout the Company and to provide for results trending and comparisons of multiple evaluations. Formats for “Field” SERs (HSEP 2.2 f1) and for “Office” SERs (HSEP 2.2 f2) can be found in the HSEP Manual’s Table of Contents as documents related to this procedure.

It is recognized that unique conditions exist at various locations and that factors such as project delivery methods, e.g., agency agreements, joint venture agreements, etc., may require special considerations. Findings for unusually large or segregated locations may be broken into two or more separate SERs.

Category 24, Other, has been provided to allow evaluators to address unusual or unique HSE hazards or issues not found in the standard categories.

A Senior HSE Manager must approve insertion of additional categories or other modifications of the standard SER forms.

4.5. Opening Conference

A formal opening conference will be conducted by the evaluation team with the responsible project or office operations and HSE management team representatives. The evaluation team will explain the scope, purpose, schedule, closing conference process, and other details of the evaluation process. The project/office team should explain any client concerns, special hazards, security issues or local requirements to the evaluation team.

Client and subcontractor personnel are typically not involved in the opening/closing conference stages of the SER process. Open and direct questions and discussions about potential shortcomings of the location's HSE program are critical to the ultimate effectiveness of the evaluation. Therefore, any involvement that could distract from conducting totally candid conversations must be avoided.

4.6. Photography

Photography may be allowed during the evaluation; however, many owners/clients do not allow photography on their sites. If the evaluation team is considering using photos to document their findings, approval must be secured from the location owner and the project/office manager.

As with all evaluation findings, hazards identified in photographs must be appropriately addressed and corrective actions must also be confirmed and documented.

4.7. Imminent Danger

Any imminent danger situations identified during the evaluation will cause immediate suspension of the SER process and must be addressed immediately. All personnel will promptly be removed from the hazard and the situation must be secured to prevent further exposures until the situation is remedied.

The Site Manager must promptly be informed of such findings and is responsible to inform the client and/or other employers' management representatives, if those parties are involved.

4.8. Worker Interviews

As part of the field portion of the evaluation, the evaluation team members will randomly select workers for informal one-on-one or small group interviews. A mandatory percentage of the workforce that is to be interviewed is not prescribed, however, the evaluation team will determine what a representative number is for the particular location.

Personnel from various categories (helpers, craftsmen, foremen, supervisors) should be interviewed, including personnel from various units, departments, disciplines, crafts, etc.

Interview findings will be treated in a confidential manner. The names of personnel interviewed will not be included in the evaluators' field notes or on the SER.

4.9. Closing Conference

At the conclusion of the evaluation, a closing conference shall be conducted between the evaluation team and the project/office team. All items of concern identified during the evaluation must be reviewed with the project/office manager, or their designee, prior to the departure of the evaluation team. This is required to ensure a clear understanding of the evaluators' concerns, and is not intended to serve as an opportunity to debate the validity of these concerns. Recommended corrective actions may also be discussed during this conference.

An informal list of items identified during the evaluation will be left with the project/office team to further confirm the items identified and to assist the site team in expediting corrective actions.

5.0 SER DISTRIBUTION

A formal Safety Evaluation Report will be issued by the Lead Evaluator within seven calendar days of the closing conference.

Distribution will include the site management team and the next two levels of operations and HSE management personnel. SERs with an unusually high or low number of findings may be distributed to even higher levels of management.

The HSE Department will also include SER results in monthly reports to management.

6.0 CORRECTIVE ACTIONS

The project or office manager is responsible for ensuring that all items identified by the evaluation team are corrected. Most of the deficiencies identified during the SER will have been corrected immediately and those prompt corrective actions will be noted on the SER. However, some items may also need programmatic changes to correct the underlying cause(s) or may require involvement by third parties, such as clients, vendors, etc. The emphasis should be placed on corrective actions intended to eliminate the *causes* of the unsafe acts and unsafe conditions identified and not only on correcting the item identified.

The project/office manager must prepare a written response to the evaluation report. The Corrective Action Plan, forms HSEP 2.2 f1b and 2.2f2b, is the second worksheet in the SER workbook and is provided as a sample format. The written Corrective Action Plan will include the responsible party and targeted completion date for each item listed on the SER and must be submitted to the project/office manager's supervisor and to the Lead Evaluator within seven calendar days of the receipt of the SER.

7.0 FOLLOW-UP SER

Any location, for which the evaluation result total is 75% or below, shall participate in a follow-up SER within 45 days.

Based on the findings of their evaluation, the SER team may determine that other situations may also require a follow-up SER be conducted. Generally, locations with an unusually large number of deficiencies will be scheduled for a follow-up evaluation within the next 60 to 90 days. However, locations with only one or a few deficiencies of a more serious nature may also be considered for a follow-up SER, at the discretion of the evaluation team.

The evaluation team will discuss the potential of a follow-up SER with the site management team during the closing conference, if a second evaluation is anticipated. If a follow-up SER is ultimately determined to be required by the evaluation team, it will be noted in the written report.

The proposed schedule for the follow-up SER will be determined by the evaluation team, after discussion with the project team, and will be indicated in the cover letter of the written report.

8.0 RECORDKEEPING

Each project or office shall keep copies of their SER history, including evaluation reports and the associated corrective action reports for each. The HSE Department will also maintain copies of all SERs generated. Records of SERs should be kept for a minimum of three years.

9.0 REFERENCES AND RELATED DOCUMENTS

HSEP 2.2 f1, Field SER Form (including the report's cover letter, the Corrective Action Form, and the photo log)

HSEP 2.2 f2, Office SER Form (including the report's cover letter, the Corrective Action Form, and the photo log)

10.0 FIGURES

Guidelines for Evaluator

Project HSE Checklist

Figure 1

Guidelines for Evaluator

General

Before beginning the evaluation process, review the Safety Evaluation Report HSEP and in particular the Purpose and Scope paragraphs.

Concerns identified during the evaluation that are not within the contractual responsibility of the Company and do not present an exposure to employees or subcontractors should be forwarded to the appropriate responsible party and are not to be included in the SER.

The names of personnel interviewed will not be included in the evaluators' reports or on the SER. If appropriate, the numbers of workers interviewed and their general classifications, e.g., two electricians, one foreman, etc., may be included. One-on-one interviews are preferred, however, small group interview sessions are acceptable. Workers shall be informed at the outset of the interview that their honest responses are critical to the quality of the evaluation and that information provided will be treated as strictly confidential. The objectives of this activity are to determine whether the workers are knowledgeable of the HSE program elements and are active participants and to gage the overall HSE attitude and culture at the location.

All comments in the report must be factual and objective. Do not include any subjective comments or opinions stated either by the evaluator(s) or by the workers. Do not mention previous incidents or potential incident scenarios. If circumstances dictate, verbally review the situation with line management.

The evaluation should not be all negative. The objective is to report a factual and comprehensive picture of the current state of the overall HSE program at the location. Use positive statements and observations, where appropriate.

If an imminent danger finding is made the deduction is noted in the appropriate category and the deficiency is also listed in the "Discrepancies That Require Immediate Response" section near the end of the SER form, the immediate corrective action taken must be stated under "Action Taken". Also, a summary of any disciplinary action taken should be appended to the SER, if appropriate.

References to state, Federal, or other regulatory standards should not be listed on the SER form. Deficiencies and corrective actions should be conveyed in non-technical terms.

Completion of SER Form

Both positive and negative items should be listed for each category, as identified during the evaluation. Generally, the more information and comments placed in the SER document, the better the report will convey the actual conditions observed during the evaluation.

In the body of the SER, describe any deficiency identified for an SER category that is being evaluated. If none of the example items listed for a category apply to the location being evaluated, state "Not Applicable" (NA) in the deficiency section or comment section for that category. Also, in the SER Scoresheet at the end of the SER form, the check-box for that category should be ***unchecked***. This will automatically remove that category from the scoring calculation.

For each deficiency identified, an appropriate deduction will be defined by the evaluation team. Deduct 2 points for items determined to be minor, 5 points for moderate, and 10 points for serious. The following probability and severity risk assessment index can be used as an aid to determine minor, moderate, or serious deduction points.

Risk Assessment Index

Severity

1	Low
2	Medium
3	High

Probability

1	Low
2	Medium
3	High

Deduction Matrix

Probability \ Severity	**1**	**2**	**3**
1	*2*	*2*	*5*
2	*2*	*5*	*10*
3	*5*	*10*	*10*

Deductions for uncorrected findings or repeat deficiencies reported in previous SERs should be raised to the next higher level of deduction, e.g. 2 to 5, 5 to 10, 10 to 20. Such findings will be identified as recurring items in the "Describe Deficiency" section.

Each category contains example evaluation questions to guide the evaluator. Each of the items listed as examples should be reviewed, as applicable to the location. Since some items may fit into either of two categories, Lead Evaluators shall use their judgment to determine which category is most suitable for each item.

The evaluator should provide either an entry or a "Not Applicable" comment in all shaded areas of the form. No sections shall be left blank.

If a subcontractor is associated with an identified deficiency, it is helpful if the subcontractor's name is provided along with the description of the deficiency.

For scoring purposes, the evaluator may either cite multiple findings of the same type (e.g., eye protection, respirators not in use, fire extinguishers, eye wash stations, emergency showers, emergency lighting), as individual deficiencies or as a single program deficiency. Typically, multiple individual deficiencies are scored as minor or moderate, whereas a single program deficiency reflecting multiple findings is often scored as moderate or serious.

No matter how many infractions a category may have, no negative points should result in the SER calculation page for that category. The lowest score any individual category should receive is zero.

Excel comment boxes with helpful guidelines for the evaluator have been provided for some of the cells in the worksheet.

Figure 2, Project HSE Checklist, should be used as a source of examples when completing Documentation, Postings, and Signs, Category 22, in the SER worksheet. Evaluators completing SERs outside the US are encouraged to use the items in Figure 2 to create their own country-specific checklist.

Category 24, Other, in the Field SER form has been provided to allow evaluators to address unusual or unique HSE hazards or issues. A Senior HSE Manager must approve insertion of additional categories or other modifications of the standard SER forms.

To increase the number of rows in order to increase spaces for listing discrepancies, be sure to insert Excel rows ***within*** the range of the total points formula (within the existing rows) for that category to assure that the sum formula includes the newly added rows.

Score Calculation

The form is "automated." For instance, entering the size of the workforce will compute an Exposure Modification Factor, which is then used automatically in the scoring. For the purposes of determining workforce size as it relates to the EMF, count the number of workers included in the scope of the evaluation (SER). For example, staff, office, or subcontractor employees may or may not be part of a field project being evaluated. The lead evaluator shall make this determination.

To provide an example for the calculation process, sample values have been left in some categories on the form, which the evaluator will have to remove/replace.

Calculations in the scoresheet will be automatic. Since computations are based on whether or not a category was evaluated and scored, it is important that this step is followed:

> *If the category was evaluated and scored, place a check in the box in the first column of the scoresheet, whether or not points were deducted. If the category was not evaluated, remove the check from the category box and the category will automatically become not applicable. Removing the check from the box automatically generates zero points possible and zero score for that category.*

Possible points that can be earned in each category is the product of 10 (base factor) times the Exposure Modification Factor (EMF). Score *weighting* is determined by size of workforce (EMF) and the severity (minor, moderate, serious) of deficiencies assigned by the evaluator. Both weighting factors are automatically calculated in the scoring process.

Final Score

On the rows above the final score, check the box in the left column if the Total Recordable Incident (TRI), Lost-time Incident (LTI), and the Motor Vehicle Accident (MVA) rates are ***each/all*** equal to or less than half of the current corresponding Company fiscal year-to-date rate. If **each/all** of these rates are less than half of the Company YTD average, two percentage points will automatically be added to the final score.

If **any one** of the specified rates is greater than the Company average, one percentage point will be deducted from the final score for each rate that is greater, for a maximum deduction of three percentage points. The previous fiscal year's metrics will be used as the current "Company average" for SERs conducted during the first 90 days of a new fiscal year.

Do not check the second, third, or fourth boxes if the first box has been checked indicating that the TRI, LTI, ***and*** MVA rates are ***all*** equal to or less than ***half*** of Company average.

Photographs

If the evaluation team will be using photos to document their findings, a third tab in the SER workbook has been left available for pasting photographs.

Each photo must be accompanied by a caption. The caption should address who, what, where, when, why, and how and must include a description of the corrective action taken.

Report Preparation

It is suggested that the evaluator, who drafts the final report, ask another manager to review the final version of the SER before distribution.

As a final step, the evaluator is encouraged to delete unused rows to shorten the report and improve its appearance. After unnecessary rows have been deleted, the report can be saved and printed. A page break has been intentionally placed above the SER Scoresheet page. The print range is not set to include column K.

Figure 2

Project HSE Checklist

This checklist (US version) has been provided as an aid to be used for evaluation of site documentation and postings, which can be found as Category 22 on the Field SER form.

Project Name: **Client:**
Project Location: **Project Number:**

All jobsites must have	(Yes)	(No)	(N/A)
OSHA Regulations 29 CFR 1910 and 1926			
Access via JNet to the electronic collection of corporate HSE Procedures (HSEPs)			
A completed Jacobs Hazcom site-specific manual			
A complete collection of MSDS			
A copy of the client's HSE manual			
A blood borne pathogens exposure control plan			
A site-specific respiratory protection program			

Assure that all jobsites have the following notices posted in an area frequently visited by all employees			
Government-required posters. These may not apply in all States			
Employee Polygraph Protection Act			
Americans With Disabilities Act			
Job Safety & Health Protection			
Equal Employment Opportunity			
Notice of Payday (California only)			
State Unemployment Insurance Benefits			
State Notice Of Compensation To Employees			
Global Field Services' "Project Absolutes" poster			
Site evacuation procedures and routes			
Recent relevant incident reports/Safety Alerts/Lessons Learned/Safety Shorts			
Right to access medical records (1910.20)			
Emergency telephone numbers (1926.50)			
Hearing conservation standard (1910.95)			
Crane hand signals (1926.550)			

Documentation	(Yes)	(No)	(N/A)
OSHA 300 Log (1904)			
First aid log (1904)			
Weekly HSE meetings			
Weekly supervisor HSE meetings			
HSE committee meetings			
Accident/incident investigation reports			
Personal exposure monitoring for regulated chemicals			
Employee orientation training (1926.21)			
Hazard communication training (initial and refresher, 1910.1200)			
Access to exposure and medical records training (initial and refresher,1910.20)			
Blood borne pathogen exposure control training (initial and refresher, 1910.1030)			
Hearing protection training (1910.95)			
Audiometric testing (1910.95)			
Noise monitoring (1910.95)			
Respirator use training (1910.134)			
Respirator fit testing (1910.134)			
Respirator program designated competent person (1910.134)			

Aerial lift inspection (quarterly, 1910.67, 1026.453)			
Aerial lift inspection designated competent person			
Aerial lift operator qualification (1910.67)			
Asbestos training certification (1910.1001)			
Assured grounding/GFCI program. (1910.304)			
Come-along/chainfall inspection (1926.552)			
Come-along/chainfall inspection designated competent person			
Confined space entrant, attendant, & supervisor training (1910.146)			
Crane inspections (annual, 1910.180)			
Crane inspections (monthly, 1910.180)			
Crane inspection designated competent person			
Crane operator qualification (1910.180)			
Drum hoist inspection (monthly, 1926.553)			
Drum hoist inspection designated competent person			
Electrical equipment inspection (1926.431)			
Electrical equipment inspection designated competent person			
Electrical Qualified Person training (1910.303)			
Electrical training conducted by a designated competent person			
Excavation daily inspections (1926.651)			
Excavation inspection competent person (1926.650)			
Fall protection equipment inspections (quarterly minimum)			
Fall protection designated competent person (1926.500 – 503; 1910.66)			
Fall protection training (1926.500 – 503; 1910.66)			
Fire extinguisher training (1910.157)			
Fire protection equipment inspection (1910.157)			
Forklift inspections (daily and monthly, 1910.178)			
Forklift operator qualification (1910.178)			
Ladder inspections (monthly, 1910.27)			
Ladder designated competent person			
Ladder/Stairway use training (1926.1060)			
Lock-out/Tag-out training (1910.147)			
Powder-actuated tool operator certification (1926.302)			
Scaffold builder training (1926.451)			
Scaffold user training (1926.451)			
Scaffold inspection designated competent person			
Sling and wire rope inspection (monthly, 1910.184; 1926.251)			
Sling and wire rope inspection designated competent person (1910.184; 1926.251)			
Storage/handling of anhydrous ammonia (1910.111)			
Storage/handling of LP gas (1910.110)			

Hazardous Waste Operations (1910.120 and Compliance Directive CPL 02-02-071)			
Medical surveillance program			
Written site-specific health & safety program (HSP)			
Training records for all hazardous waste site workers			
Emergency response procedure			

Evaluation Performed By ____________________ Date ____________________

JACOBS

Attachment C7: Medical Monitoring Program For Environmental Project Work HSEP 4.1

JACOBS

HSE Procedure		Document No: HSEP 4.1	Page: 1 of 4
Medical Monitoring Program for Environmental Project Work		Supersedes: CHSP 4.1	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 28 Aug 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
2.1. Corporate Health, Safety, and Environment Manager (CHSEM) 2
2.2. Corporate Health, Safety, and Environment Administrator CHSEA) 2
2.3. Corporate Medical Consultant (CMC) 2
3.0 DEFINITIONS 2
4.0 PROCEDURE 2
4.1. New Hires and New Participants 2
4.2. Baseline (Initial) Examination 2
4.3. Annual Examinations 3
4.4. Baseline (Exit) Examination 4
4.5. Post Exposure Examinations 4
4.6. Access to Employee's Exposure and Medical Records 4
5.0 REFERENCES 4
6.0 ATTACHMENTS 4

1.0 PURPOSE AND SCOPE

This HSEP presents requirements for the medical surveillance program, physical examinations, and notification of results. Detailed descriptions of medical protocols and administrative procedures, and copies of all Company forms are given in Appendix A, Medical Monitoring Program Protocols and Administrative Procedures. A copy of 29 CFR 1910.120 and the medical surveillance portions of 29 CFR 1910.1001-1045, 1910.1001 and 1910.1027 are contained in Appendix B.

This HSEP applies to all employees assigned to hazardous waste site operations who are exposed to or are potentially exposed to hazardous substances or health hazards at or above the established exposure levels for those substances.

Employees exposed to specific hazardous materials will be evaluated on a case-by-case basis for inclusion in a medical surveillance program under the direction of the CHSEM with guidance by the CMC. All work activities covered by OSHA regulation will be conducted in accordance with the specific hazard's medical monitoring requirements as outlined in the respective OSHA standards. Hazardous materials not covered by OSHA shall be subject to requirements outlined by the CHSEM and CMC.

Procedures for employees exposed to or potentially exposed to lead and/or asbestos are contained within the scope of this HSEP and will not be evaluated on a case-by-case basis.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Corporate Health, Safety, and Environment Manager (CHSEM)

The Corporate Health, Safety, and Environment Manager (CHSEM) is responsible for overall management of the medical surveillance program. The CHSEM shall select the Corporate Medical Consultant (CMC) to provide guidance in establishing and maintaining the medical surveillance program, and shall be responsible for monitoring the overall implementation and effectiveness of the program.

2.2. Corporate Health, Safety, and Environment Administrator CHSEA)

The Corporate Health, Safety, and Environment Administrator (CHSEA), appointed by the CHSEM, is responsible for overall administration of the medical surveillance program. This includes selecting and establishing medical clinics, establishing medical protocol and administrative procedures in coordination with the Corporate Medical Consultant, managing the scheduling of physical examinations, maintaining a current database and confidential medical records system, notifying the employee's supervisor of any work restrictions as noted by the examining physician, and monitoring hazardous materials exposure information.

2.3. Corporate Medical Consultant (CMC)

The Corporate Medical Consultant (CMC), appointed by the CHSEM, is responsible for medical quality control review and medical auditing of the performance of the medical clinics and laboratories. The CMC may also be asked by the Corporate Health, Safety, and Environment Department to advise on additional testing, medical restrictions and abnormalities, emergency event consultation, new clinic selection, and new program medical protocol.

Program participants must agree to take a Baseline (Initial) examination, annual and post-exposure examinations, and a Baseline (Exit) examination upon termination of their enrollment in the program.

3.0 DEFINITIONS

Environmental Project Work	Projects that are primarily regulated by requirements set forth in 29 CFR 1910.120.

4.0 PROCEDURE

4.1. New Hires and New Participants

New participants to the medical monitoring program will be entered into the database by completion of the New Hire/Termination/Transfer (Appendix A). This form should be initiated by the local Health, Safety, and Environment Manager or Coordinator, and in some instances by the human resources representative.

Upon initial enrollment into the medical monitoring program each employee will receive a baseline (initial) examination, an interim or periodic examination each year thereafter, and a baseline (exit) examination upon terminating enrollment in the program.

The interim and periodic examinations are to be used for comparison with the baseline exam in order to detect any early indication of change in health status, whether work related or of a non-occupational origin. The interim exam will be given the year following the baseline exam and every other year thereafter. The periodic exam will be given the second year after the baseline exam and every other year thereafter.

Employees assigned to operations where they are exposed to or are potentially exposed to asbestos or lead at or above the established limits require *additional* testing. These additional requirements can be found in sections: lead, 7.3.1, 7.4.1.1, 7.4.2.1, 7.5.1; asbestos, 7.3.2, 7.4.1.2, 7.4.2.2. If the employee is currently enrolled in the medical monitoring program, the CMC will review the employee's last physical examination to ensure it is adequate and to order supplementary tests for any inadequacies.

4.2. Baseline (Initial) Examination

An initial or baseline exam is given to each participant prior to any work assignment involving potential exposure to hazardous materials. The exam is intended to determine that the employee will be able to perform their job without undue risk to themselves, fellow employees, or to the public and to provide a baseline against which future examinations can be measured.

The exam consists of a complete medical examination designed to establish baseline measurements and to screen for evidence of adverse effects of occupational exposure to toxic substances or health hazards. It includes a medical and occupational history review, a complete physical examination (including PA chest x-ray), basic blood and urine laboratory tests, and a physician's evaluation to determine the individual's fitness to perform field work. In addition, the exam shall assess the individual's ability to wear and use personal protective equipment. The results of the exam shall be reviewed by a physician qualified in the practice of occupational and industrial medicine to determine the individual's fitness to perform field work. The Corporate Health & Safety Department may request to include additional tests as necessary for specific anticipated exposures.

The Baseline (Initial) Examination will also include blood lead/zinc protoporphyrin determination if the employee has been exposed to lead at or above the permissible level for more than 30 days in any consecutive twelve months. If an employee has been exposed to lead at or above the level, blood lead/zinc protoporphyrin levels will be taken every two months for the first six months and every six months thereafter. At minimum, if precise exposure levels and timeframes are not known, blood lead zinc/protoporphyrin will be taken annually.

If the employee has been exposed to asbestos at or above the permissible exposure limit for a combined 30 days or more per year, the Baseline (Initial) Examination will also include Part 1, Initial Medical Questionnaire of the medical questionnaire contained within 29 CFR 1910.1001, appendix D.

4.3. Annual Examinations

Each individual shall receive an Interim Medical Review or a Periodic Medical Examination annually, alternating every other year.

4.3.1. Interim Medical Review

The Interim Medical Review includes an interim questionnaire, updated Hazardous Materials Exposure Summary (Appendix A), and laboratory analysis to compare to the Baseline (Initial) Examination. The physician may request approval from the Corporate Health, Safety, and Environment Department for special examination procedures or additional testing if he/she finds it necessary. The Interim Medical Review will be given the first year after the baseline exam and every other year thereafter.

The Interim Medical Review will also include a blood lead/zinc protoporphyrin test if the employee has been exposed to lead for at least 30 days in any consecutive twelve months.

Interim Medical Reviews will not be given to employees exposed to asbestos at or above the permissible limit for a combined 30 days or more per year. A Periodic Medical Review will be administered annually.

4.3.2. Periodic Medical Examination

The Periodic Medical Examination includes a thorough examination similar to the Baseline (Initial) Examination (section 7.2) but not including an EKG. Chest x-rays will be taken every five years (except in the case of asbestos exposure, see section 7.4.2 below). The Periodic Medical Examination will be given the second year after the Baseline (Initial) Examination and every other year thereafter. The examination will be performed as closely as possible to the anniversary of the baseline or Interim Medical Review and, if possible, at the same clinic or facility. If the examination is to be performed at a different facility, arrangements should be made to have the previous records transferred to the new examining location. The Periodic Medical Examination will also include:

- A blood lead zinc/protoporphyrin test if the employee has been exposed to lead for at least 30 days within any consecutive twelve months.

- An annual PA chest x-ray for employees exposed to asbestos at or above the permissible limit for a combined 30 days or more per year. Additionally, the Periodic Medical Examination will also include Part 2, Periodic of the Medical Questionnaire contained within 29 CFR 1910.1001, appendix D.

4.4. Baseline (Exit) Examination

Upon termination of enrollment in the program, the employee must complete an Exit Examination whether or not the employee has completed any field work since his/her last exam.

The exam is identical to the Baseline (Initial) Examination except that it does not include the ability to wear a respirator test, or an EKG.

Exam requirement may be waived by the Corporate Health & Safety Department if the employee has completed a Baseline (Initial) or Periodic Examination within the preceding six months. If the employee refuses the Baseline (Exit) Examination, he must put the refusal in writing.

The Baseline (Exit) Examination will also include blood lead zinc/protoporphyrin tests if the employee has been exposed to lead for at least 30 days within any consecutive twelve months.

Upon completion of a Baseline (Initial), Interim, Periodic, or Exit Examination, a Physician's Examination Summary (Appendix A), completed by the examining physician, will be mailed to the Corporate Health & Safety Administrator within one week of the examination. The Physician's Examination Summary serves as formal documentation of the employee's fit for work status and medical field clearance.

A letter from the examining physician outlining the results of the examination will be sent to the patient's home address within two weeks. A copy of the laboratory results will be included.

4.5. Post Exposure Examinations

Following exposure to hazardous materials, a post exposure examination may be required. The examination may be requested by the exposed individual, the project/site manager or the manager of health, safety, and environment. The tests included in the post exposure examination will be determined by the nature of the exposure and may include all tests performed in the Baseline (Initial) Examination and additional tests as necessary. In most cases, additional testing to monitor tissue damage after an exposure will be established on a case-by-case basis and reviewed by the corporate medical consultant.

4.6. Access to Employee's Exposure and Medical Records

All employees enrolled in the medical surveillance program shall have access to their exposure and medical records as described in Occupational Safety and Health Standard 29 CFR 1910.20. Requests for exposure and medical records are to be made in writing and sent to the HSA.

5.0 REFERENCES

29 CFR 1910.120, Hazardous Waste Operations And Emergency Response; 29 CFR 1910.134, respiratory protection; 29 CFR 1910.1001-1045, toxic and hazardous substances,

NIOSH, OSHA, USCG, USEPA. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. U.S. Department of Health and Human Services, Public Health Services Centers, National Institute for Occupational Safety and Health, Washington, D.C.

ANSI. American National Standard for Respiratory Protection. ANSI Z88.6-1984. American National Standards Institute, New York, N.Y., 1984.

6.0 ATTACHMENTS

Contact the Corporate Health, Safety, and Environment Department for the Medical Monitoring Program Protocols and Administrative Procedures and OSHA Standards. Due to its size, this document has not been appended to this HSEP.

Attachment C8: Working Safely Around Wild Animals HSEP 7.4

JACOBS

HSE Procedure	Document No: HSEP 7.4		Page: 1 of 18
Working Safely Around Wild Animals		Supersedes: CHSP 7.4	Rev. Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Feb 01	Current Revision Date: 28 Aug 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
3.0 WILD ANIMAL DEFENSE MEASURES 1
3.1. Basic Protection Requirements 1
3.2. Supplemental Protection 3
3.3. Firearms Used by Jacobs Employees or Contractor Employees 3
4.0 PROCEDURE 4
5.0 REFERENCES 4
6.0 FIGURES 4
Hazard and Precautions – Bear Safety 4
Hazards and Precautions – Moose, Elk, and Deer Safety 4
Hazards and Precautions – American Bison and Feral Wild Cattle Safety 4

1.0 PURPOSE AND SCOPE

This work instruction addresses encounters with bears and other wild animals and the controls necessary to minimize human injury, loss of property, and unnecessary loss of wildlife, while maintaining a safe work environment.

This work instruction applies to all employees who prepare Health, Safety, and Environmental Plans or perform fieldwork in environments in which wild animals may be encountered.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 WILD ANIMAL DEFENSE MEASURES

Procedures in this work instruction have been developed through interactions with Alaska Fish and Game Department and through bear and wild animal guide services providers.

These procedures are believed to provide the best actions to provide protection to our workers and limit company liability.

3.1. Basic Protection Requirements

Work teams in the field should work together in groups of four or more, whenever possible. Large numbers of humans present deterrence to wild animals.

When feasible, fieldwork activities should be scheduled around seasonal activity cycles of animals in the area. For example, to the extent possible, work activities should not be scheduled in seasonal breeding areas or in seasonal feeding areas, such as hillsides during berry season or near salmon streams during salmon runs.

When wild animal avoidance measures cannot be achieved through scheduling, all Jacobs and contractor personnel who may be involved with field activities, at which encounters with wild animals may result, will take the following steps and will be equipped and trained, as set forth below.

3.1.1. Clear the Area

Evaluate and control the area before entry by

- Determining areas of recent sightings through local Fish and Game, state troopers, etc.;
- Conducting a site observation from an off-site elevated point, if possible;
- Conducting a controlled walkthrough in the area by a trained observer;
- Arranging briefing by a local specialist, e. g., Fish and Game, etc.; and
- Utilizing appropriate noisemakers.

3.1.2. Basic Equipment

Each employee in a field environment in which encounters with wild animals are possible—as determined by the Project Manager and the HSEM—will be provided, as a minimum:

- Noisemakers, such as air horns, bells, etc.; and
- Bear spray of not less than 16-ounce capacity (with holster), equivalent to capsicum pepper (red pepper extract), which is capable of spraying at least 15 feet.
  - Field crews may carry bear sprays without the need for client authorization. Law prohibits transport of such sprays in aircraft passenger compartments. Employees shall notify small plane pilots of placement of sprays in baggage. All packaging and shipment shall comply with applicable DoT regulations.
  - In order to avoid complications related to transport of hazardous materials, sprays must be locally purchased, if possible, and disposed properly after fieldwork completion. Sprays shall not be brought to a Jacobs fixed office but may be taken to a Jacobs field office.

At all times, employees shall know the whereabouts of noisemakers and sprays until they are returned.

3.1.3. Training

Each employee covered by this work instruction will be provided bear and wild animal awareness training before field assignment

- which will include hazards, precautions, and protection measures set forth in Attachments 1 – 3, as appropriate,
- with content which will have been approved by the HSEM, and
- which will be documented.

As a minimum, the training must include information related to:

- animal habitat,
- behavior patterns, including when wild animals are most active, etc.
- warning signs, such as tracks, bedding areas, scat, claw marks, offspring, paths, etc.,
- situations to avoid, such as work after dark, going into brush, etc.
- food storage procedures, and
- (at the jobsite) spray demonstration and safety instruction.

A record of the training will be maintained at the job site and a copy will be filed by the HSEM in the employee's training records maintained in the program office.

3.2. Supplemental Protection

Professional site security services may be necessary in areas where significant possibility of injury from wildlife may exist. An evaluation of need for such supplemental protection will be made jointly by the Project Manager and the Health and Safety Manager.

Prospective bear and wild animal protection contractors shall provide to the HSEM, five days before providing such services, evidence of

- firearm safety course training and firearm proficiency and
- a minimum of three years experience as a bear guide or an assistant guide.

3.3. Firearms Used by Jacobs Employees or Contractor Employees

3.3.1. In some situations of significant potential hazard, the Project Manager and HSEM, after collaboration with the client, may authorize selected Jacobs employees or contractor employees to carry firearms.

3.3.2. Persons carrying firearms shall have attended a firearm safety training class administered by the Fish and Game Department, a local firearm range instructor, or other trainer approved by the HSEM.

- Training will be documented and records of training will be maintained on site.
- Training must include, as a minimum
  - shooting safety,
  - firearms handling safety, and
  - safe storage.

3.3.3. Firearms authorized for site use

- **will not** be carried with a round in the chamber unless extreme danger is present, such as when a bear has been sited in the immediate area, and
- **must** be unloaded and have a trigger lock installed and in use when not actively being used for protection to prevent unauthorized persons from using the firearm.

3.3.4. Some military installations and some clients require the approval of the base security force before allowing a firearm to be brought onto a military installation. In addition to base requirements, some clients require that their own approvals be obtained, as well.

The Project Manager must determine with sufficient lead-time whether firearm protection of employees from wild animals will be required. If such is determined to be necessary, the PjM must submit a request for authorization to the HSEM with sufficient lead-time to permit personnel training and other steps required prior to departure for the field.

3.3.5. All firearms and firearm-carrying personnel shall be registered and approved by the HSEM. Approvals will be maintained in the regional HSE office.

The project manager shall provide to the HSEM a description of the type of firearm, the caliber and serial number of the firearm, the ammunition to be used, and the qualification of the person(s) to be approved by the HSEM.

3.3.6. Approved Firearms

Firearms that are appropriate for protection against large animals include:

- A 0.3-mangum ("300 magnum") or larger rifle, or
- A 12-guage shotgun with rifled slugs.
- Other firearms that may be authorized by the Jacobs HSE Manager. This authorization will be in writing and will be obtained before going to the field.

3.3.7. Ammunition

- The number of rounds and type of ammunition brought to job sites shall be registered with the on-site SSHO.
- When not in use, ammunition and firearms will be effectively secured/locked up in a vehicle, cabinet, etc.

4.0 PROCEDURE

Non-lethal methods of deterrence will be used before other options are exercised. In the case where immediate danger to an individual exists, the wild animal may have to be killed. Refer to local provisions of the Defense of Life or Property Regulation in your state. In Alaska, refer to 5 AAC 92.410.

An immediate report of such action will be made to the Jacobs HSEM. The individual who shot the animal will make the report. In the case of bears shot in the state of Alaska, a report will also be submitted to the Alaska Department of Fish and Game. The head and the hide must be salvaged and delivered the Alaska Department of Fish and Game.

5.0 REFERENCES

Alaska Administrative Code 5 AAC 92.230 and 5 AAC 92.410.

Alaska Department of Fish and Game, Division of Wildlife Conservation, Policy for Managing Bear and Human Conflicts in Alaska.

Safety in Bear Country, Alaska Department of Game and Fish, Division of Wildlife Conservation, Anchorage Alaska, Larry Van Daele.

Research by Dominic Domenici, U.S. Fish and Wildlife Services (Red vs. Lead Article, Field & Stream Magazine, January 2001) Vehicle safety.

Use extreme caution, particularly in darkness, when operating vehicles in areas where wild animals may be present. Collisions with large animals have been known to cause significant property damage and personal injuries to vehicle passengers, including fatalities.

6.0 FIGURES

Hazard and Precautions – Bear Safety
Hazards and Precautions – Moose, Elk, and Deer Safety
Hazards and Precautions – American Bison and Feral Wild Cattle Safety

Figure 1

Hazards and Precautions – Bear Safety

From time to time, field projects may be conducted in locations where bears may be encountered. This directive draws on experiences and conditions for field work in the state of Alaska for the bulk of its technical information, precautions, and guidelines for all operations in which bears could be encountered. When bears may be present, we all have a responsibility to the bears and ourselves to behave in a rational and proper manner. The more bears are understood the less they will be feared. Bears are intelligent, wild animals that are potentially dangerous, and would rather be left alone. With this background, rational decisions about how to avoid bear encounters and how to properly address face-to-face encounters can be made.

Bear Life History

Although bears are creatures of habit, they are also intelligent, and each has its own personality. The way a bear reacts is often dictated by what it has learned from its mother, the experience it has had on its own, and the instincts nature has provided. So, like other intelligent animals, such as dogs, we can make general statements about bears, but few people can accurately predict their behavior.

The most important sense organ for a bear is his nose. They have an incredible sense of smell, and they seem to trust it more than any other sense. Hearing and sight are also important, but to a lesser degree. A bear’s hearing is probably better than ours, but not as keen as a dog’s hearing. Their sight is probably comparable to that of a human.

Both black and brown bears have similar life styles, although they do not usually get along with each other. Where both species occur in the same area, black bears tend to favor forested habitats while brown bears favor open areas. Since the likelihood of encountering a polar bear is remote, we will deal with only black and brown bears throughout the rest of this HSEP.

Bears are opportunists, relying on their intelligence and their senses to find food. They use different habitats throughout the year, depending on the availability of food and other necessities of life. The amount of area a bear covers in a given year is partially dependent on how far it has to go to satisfy these basic needs. In some areas, individual bears have home ranges of less than a square mile. In other areas, home ranges can encompass hundreds of square miles. Males usually range over larger areas than females.

In the spring, black and brown bears begin coming out of their dens. Males are usually the first bears to emerge, usually in April, and females with new cubs are usually the last, sometimes as late as late June. When bears emerge from their dens, they are lethargic for the first few days, frequently sleeping near their dens and not eating. When they do start eating, they seek carrion (dead moose, caribou, sea mammals, deer, etc.), roots, and emerging vegetation. In coastal areas, beaches become travel corridors as bears seek these foods.

In early summer, bears continue to eat new grasses and forage as they develop in higher elevations. Moose and caribou calves are also important foods where they are available.

In areas where they are available, salmon are the most important food to bears from June through September. This period is one of the few times that bears are found in large groups, and it is the time that most people see bears. Bears often travel, eat, and sleep along streams for weeks at a time.

Other summer foods for bears include salmonberries, grasses, forbs, ground squirrels, and occasionally, adult moose and caribou. When bears kill or scavenge large prey, they commonly cover the portions they cannot eat with sticks and duff. A bear may remain near a food cache for days and it will defend it from all intruders.

During the late summer and early fall, bears move inland and consume large amounts of blueberries, elderberries, soapberries, and other types of succulent fruits. As the seasons progress towards winter, a bear’s diet becomes more varied. The last berries and salmon are sought, as are live and hunter-killed moose, deer, and caribou. This is the time that bears are adding final deposits of fat before their long winter naps.

In October and November, bears move into their denning areas and begin preparing a suitable den. Black bears usually den in holes under large trees or rock outcrops, or in small natural cavities. Brown bears usually dig their dens in steep alpine areas. Dens are just large enough for the bears to squeeze into. Bears rarely eat, drink, urinate, or defecate while they are denning. They sleep deeply, but do not truly hibernate, and they can be awakened by loud noises or disturbances.

Cubs are born in the den, usually in January. Black bear cubs usually stay with their mothers for a year and a half, and brown bear cubs usually stay with their mothers for 2.5 to 3.5 years. Black bears are sexually mature at age 2 and brown bears are sexually mature at age 4 – 8. Mating season is in the spring (May or June) and both species are polygamous (multiple mates). Both black and brown bears can live for 25 – 30 years, although most live less than 20 years.

Bear and Human Interactions

Given the choice, most bears would prefer to be left alone, but they share their homes with other creatures, including humans, who intrude on virtually every aspect of the bear's life. Bears are normally tolerant of these activities, and if they can find a secure way to avoid them, they will.

Humans can help the bears make a graceful retreat and avoid many close encounters by letting them know we are coming. Walking in groups, talking, and wearing noise making devices, such as bear bells, all serve to warn a bear of your approach. Whenever possible, avoid hiking and camping in areas where bears are common, such as bear trails through heavy brush or along salmon streams. Keep an eye out for bears and bear signs. If you happen upon a dead animal, especially one that is covered with sticks and duff (a bear cache), immediately retreat the way you came, but do not run, and make a detour around the area. If you see a cub up a tree or a small bear walking by itself, immediately retreat and detour around the area. Like all young animals, cubs wander away from their mothers, but female bears are furiously protective when they believe their cubs are threatened.

Even if we do everything possible to avoid meeting a bear, sometimes bears come to us. Bears are both intelligent and opportunistic, and they express these qualities through their curiosity. This curiosity frequently brings them into "human habitat." When this happens, we often feel vulnerable, and the bear is sometimes viewed as a threat or nuisance.

In most cases, a curious bear will investigate a "human sign," perhaps test it out (chew on a raft, bite into some cans, etc.), and leave, never to return. If the bear was rewarded during his investigation by finding something to eat, it is hard to stop them from returning once they have been food-rewarded.

That is why we emphasize the importance of keeping human food and garbage away from bears. When in bear country, always think about the way you store, cook, and dispose of your food. **Never feed bears!** This is both illegal and foolish. Food should be stored in airtight containers, preferably away from living and sleeping areas. Garbage should be thoroughly incinerated as soon as possible. Fish and game should be cleaned well away from camp, and clothing that smells of fish and game should be stored away from sleeping areas. Menstruating women should take extra precautions to keep themselves as clean as possible, and soiled tampons and pads should be treated as another form of organic garbage.

Once a bear has obtained food from people, it may continue to frequent areas occupied by people. If a bear does not find food or garbage after the next few tries, it may give up and move back into a more natural feeding pattern. Occasionally, though, the bear will continue to seek human foods and can become a "problem bear." Some bears become bold enough to raid campsites and break into cabins to search for human food.

Shooting bears in the rump with cracker shells, flares, rubber bullets, and birdshot are common methods of "aversive conditioning." These are also very dangerous techniques, because they may seriously injure a bear if not done properly and/or they may cause a bear to attack the shooter.

Avoiding Bear Encounters When

- *The Bears see you but you do not know the bear is around.* Most bears avoid detection by people and will simply move away when they sense a human.
- *You see a bear and it does not know you are there.* Move away slowly. Avoid intercepting the bear if it is walking. If possible, detour around the bear. If the bear is close to you, stand where

you are or back away slowly. Do not act threateningly toward the bear, it may know you are there but it has chosen to ignore you as long as you are not a threat.

- *You see the bear and the bear sees you.* Do not act threateningly, but let the bear know you are human. Wave your arms slowly, talk in a calm voice, and walk away slowly in a lateral direction, keeping an eye on the bear. Unless you are very close to a car or a building, never run from bears. In a bear's world, when something runs it is an open invitation to chase it. Like dogs, bears will chase a running object even if they have no previous intention of catching it. Bears can run as fast as a racehorse, so humans have little or no chance of outrunning a bear.

- *You see the bear, the bear sees you and stands on its hind legs.* This means that the bear is seeking more information. Bears stand on their hind legs to get a better look, or smell, at something they are uncertain of. It is your cue to help it figure out what you are. Help the bear by waving your arms slowly and talking to it. Standing is not a precursor to an attack. Bears do not attack on their hind legs. It is also important to remember that when a bear goes back down on all fours from a standing position, it may come towards you a few steps. This is normal, and probably not an aggressive act.

- *The bear sees you, recognizes you as a human, but continues to come towards you slowly.* This may mean several things, depending on the bear and the situation. It may mean that the bear does not see you as a threat, and just wants to get by you (especially if the bear is used to humans, as in a National Park); the bear wants to get food from you (if it has gotten food from people before); the bear wants to test your dominance (it views you as another bear); or if it is a black bear it may be stalking you as food (a rare occurrence). In all cases, your reaction should be to back off the trail very slowly, stand abreast if you are in a group, talk loudly, and/or use some sort of noise making device. If the bear continues to advance, you should stop. At this point, it is important to give the bear the message that if he continues to advance it will cost him. Continue to make loud noises and present a large visual image to the bear (standing abreast, open your coat). In bear language, bears assert themselves by showing their size. If an adult brown bear continues to come at you, climbing 20 feet or higher up a tree may also be an option if one is next to you (remember, never run from bears). Keep in mind, though, brown bear cubs and black bears can climb trees, and adult brown bears can reach 10 – 15 feet.

- *The bear recognizes you as a human and acts nervous or aggressive.* When bears are nervous or stressed they can be extremely dangerous. This is when it is important to try to understand what is going on in the bears mind. Nervous dogs bark and snarl. Nervous bears growl, woof, make popping sounds with their teeth, rock back and forth on their front legs, and often stand sideways to their opponent. A universal sign of a nervous bear is excessive salivation (sometimes it looks like they have white lips). When a bear shows any of these signs, stand where you are and talk in a calm voice. Do not try to imitate bear sounds, this may only serve to confuse and further agitate the bear. If you are in a group, stand abreast. If you have a firearm available, be prepared to use it.

- *The bear charges.* If all other signals fail, a bear will charge. Surprisingly, however, most bear charges are just another form of their language and they do not end up making contact. The vast majority of these are "bluff charges," that is, the bear stops before making contact with their opponent. There are many different types of bluff charges ranging from a loping uncertain gait to a full-blown charge. If a bear charges, stand still. If you have a firearm, take appropriate action, but remember, if a bear is wounded, a bluff charge may immediately turn into a real charge as the bear's mind shifts from an offensive mode to a defensive mode.

- *The bear attacks.* When all else fails, a bear may attack. Attacks may be preceded by all of the behaviors previously described or they may be sudden. Seemingly unprovoked attacks are often the result of a bear being surprised (and feeling threatened), a bear defending its food cache, or a female defending her cubs. When a bear attacks, it typically runs with its body low to the ground, legs are stiff, ears are flattened, hair on the nape of the neck is up, and the bear moves in a fast, determined way. Front paws are often used to knock the opponent down and jaws are used to subdue it.

After A Bear Encounter

If a bear attacks you, your reaction depends on the type of bear that is attacking.

If it is a black bear, fight vigorously, for your life may depend on it. Black bears have been known to view humans as prey, and if you struggle with the attacking black bear, it will probably go elsewhere for its meal.

Brown bears are a completely different story. Brown bears attack because they feel threatened, and they will continue to press the attack until the threat has been neutralized. If you fight and struggle, the bear will continue to fight, and a human has little or no chance to defeat a brown bear in battle. Lie on your face and stomach, place your hands behind your neck, and lie still when you are attacked. A brown bear will no longer see you as a threat and may stop the attack.

Although it sounds foolish to play dead while being attacked by a bear, this has been proven to be the best way to survive a brown bear attack. It should be noted, however, that if you fall down and play dead before a bear actually makes contact, the bear may come over to determine what is going on.

Actual maulings by bears are very rare. Alaska has more bears than anywhere else in the world, and there are hundreds of thousands of people living, working, and playing in these bears' back yard. Yet, since 1900, there have only been an average of about two people per year mauled by bears in the state, and very few of those instances have resulted in death.

Types of Bears

The three most prevalent species of are bears are the black bear, the brown (grizzly) bear, and the polar bear. Each has a different life-style and somewhat different behavior pattern.

Black Bear

Identification

Black bears are the smallest and most abundant of the bear species in Alaska. They are five to six feet long and stand about two to three feet high at the shoulders. They weigh from 200 to 500 pounds. While they are most commonly black, other color phases include brown (cinnamon), and, rarely, gray (blue), and white. Muzzles are usually brown. Black bears can be distinguished from brown bears by:

- their head shape (a black bear's nose is straight in profile, a brown bear's is dished);
- their claws (black bear's claws are curved and smaller, brown bears are relatively straight and longer);
- their body shape (when standing, a black bear's rump seems to be higher than its shoulders; a brown bear's shoulders are usually higher than its rump); and
- by their ears (a black bear's ears are more prominent than a brown bear's ears).

Range in Alaska

Black bears live throughout Alaska, except on Kodiak Islands, the Alaska Peninsula, some islands, and the extreme northern and western portion of the state.

Typical Habitat

Black bears can occupy a wide range of habitats, but they seem to be most common in forested areas. Black bears are not uncommon in and around human settlements in Alaska.

Brown Bear

Identification

Brown and grizzly bears are the same species. They can be over eight feet long and stand five feet high at the shoulder. Weights are typically 600 to 800 pounds, but can reach 1500 pounds. Colors range from blonde to dark brown. Coastal bears (referred to as brown bears) are the largest land carnivores and are usually medium-to-dark brown in color. Interior bears (referred to as grizzly bears) are smaller and usually have light tips on their hair, giving them a grizzled appearance. A brown bear's muzzle is the same color as its body. Cubs frequently have a white collar around their neck and shoulders. The dished-face and large shoulder hump are distinguishing features of the brown bear.

Range in Alaska

Brown bears live throughout Alaska, except for the southern portion of the panhandle in southeastern Alaska, and on the Aleutians, and some other islands. Biologists estimate that there are from 30,000 and 45,000 brown bears in the state, and in most areas the numbers are stable. Highest densities occur on Admiralty Island, the Kodiak Islands, and the Alaska Peninsula.

Typical Habitat

Brown bears can, and do, use virtually every type of habitat. Although they are less common around human settlements than black bears, brown bears can live in close proximity to people.

Polar Bear

Identification

Polar bears are about the same size as coastal brown bears. Colors range from white to yellow. Black nose is prominent. Head shape is similar to that of a black bear, but their long tapering necks make polar bears' heads appear to be small in relation to their body size.

Range in Alaska

Polar bears are found in coastal Alaska and offshore waters from Bristol Bay to the Arctic. Ice conditions dictate local polar bear abundance.

Typical Habitat

Islands, coastlines, and waters near pack-ice and ice-floes, rarely occurring far inland, except for denning females, are typical habitat.

Firearms for Bear Protection

As a last resort, a bear may have to be shot. When this is the only option, it will likely be in a situation that has a sudden onset. Therefore, it is important that you are familiar and comfortable with whatever firearm you decide to carry. Remember that if you wound a bear, you make the situation worse.

There is an on-going debate as to what is the best firearm to use for protection from bears. The following are a few of the pros and cons for some of the more popular firearms:

Pistols

PROS - convenient to carry, always with the person, can be used in close quarters during an attack, rapid-fire is possible.

CONS - dangerous to humans (accidents), much practice is needed to be proficient; may not be powerful enough to stop a large bear.

Shotguns

PROS - can be loaded with a variety of projectiles, effective at close range in brushy situations, rapid-fire is possible, easy to use.

CONS - inaccurate and ineffective at medium to long range, heavy to carry, potentially dangerous to humans, may not be powerful enough to stop a large bear.

Rifles

PROS - very powerful calibers are available, accurate at both close and long range.

CONS - much practice required for accuracy in an emergency, range of bullet makes it dangerous to humans, heavy and awkward to carry, rapid fire is difficult with bolt action rifles.

There are different thoughts as to the best place to shoot a charging bear. In reality, a person usually has little time to contemplate shot placement in a true bear attack. If you have a choice, it is best to aim at the shoulder and chest area. Bear's skulls are thick and covered with large muscles, so head shots may not be effective. Once you have made the decision to shoot a bear, you have a responsibility to finish the job you have started. Keep firing until you are out of bullets or you are positive the bear is dead. A wounded bear can be dangerous to you and anyone else who comes into the area.

Bear Sprays

PROS - easy to carry and use, little risk of permanent damage to bears and humans, effective in many situations.

CONS - may change a false charge into a real charge, ineffective at ranges greater than 20 feet, ineffective in windy conditions, dangerous if accidentally discharged in a closed area such as an aircraft cockpit.

Regardless of the firearm you choose, it is imperative that you realize that the most effective tool you have against an attacking bear is your brain. Although bears are intelligent animals, we are smarter and can often think our way out of a bad situation if we try. We must never let the firearm we carry become a replacement for common sense.

Laws Concerning Bear/Human Interactions In Alaska

There are two regulations governing bear and human interactions in Alaska.

The first, ACC 92.230, prohibits feeding bears or leaving garbage that attracts them. The other, 5 ACC 92.410, sets guidelines for taking a bear in defense of your life or property (DLP).

These DLP provisions specifically state that a bear cannot be killed legally if the problem is caused by the improper disposal of garbage or some other attractive nuisance, or if it is brought about by harassment or provocation of the animal or an unreasonable invasion of its habitat.

The regulation also defines what is considered “property.” If a bear is killed under the DLP provisions, the hide and skull are the property of the state and must be turned over to Fish and Game as soon as possible.

The person who shot the bear is also required to submit a written incident report with 15 days. (Obtain a paper copy of this attachment through Corporate Health, Safety, and Environment.)

Figure 2

Hazards and Precautions – Moose, Elk, and Deer

From time to time, field projects may be conducted in locations where dangerous wildlife may be encountered. This attachment addresses Moose, Elk, and Deer and draws on experiences and conditions for fieldwork in the state of Alaska for the bulk of its technical information, precautions, and guidelines for all operations in which the big game species could be encountered.

We all have a responsibility to the wild life and ourselves to behave in a rational and proper manner at all times. The more these species are understood, the easier it will be for us to avoid contact with them thus preventing injury to ourselves and to the animals themselves. All of Alaska big game species are unpredictable and can be dangerous under certain conditions. It is up to all of us to understand this and learn as much as possible so we can work safely while in their domain.

Moose

Moose (Alces alces) are the world's largest members of the deer family. The Alaska race is the largest of all the moose. Moose are generally associated with northern forest in North America, Europe, and Russia. In Alaska, they occur in suitable habitat from the Stikine River in the Panhandle to the Colville River on the Arctic Slope, and as far south on the Alaska Peninsula as Herendeen bay. They are most abundant in recently burned areas that contain willow and birch shrubs, on timberline plateaus, and along the major rivers of South-central and interior Alaska.

General Description

Moose are long-legged and heavy-bodied with a drooping nose, with a "bell" or dewlap under the chin, and a small tail. Their color ranges from golden brown to almost black, depending on the season and the age of the animal. The hair of newborn calves is generally red-brown, fading to a lighter rust color within a few weeks. Newborn calves weigh 28 to 35 pounds and within five months grow to over 300 pounds. Males in prime condition weigh from 1,200 to 1,600 pounds. Adult females weigh 800 to 1,300 pounds. Only the bull has antlers.

Life History

Cow moose generally breed at 28 months, though some may breed as young as 16 months. Calves are born anytime from mid-May to early June. Cows give birth to twins 15 to 75 percent of the time, and triplets may occur once in every 1,000 births. The incidence of twinning is directly related to range conditions. A cow moose defends her newborn calf vigorously. Calves begin taking solid food a few days after birth. They are weaned in the fall at the time the mother is breeding again. The maternal bond is generally maintained until calves are 12 months old at which time the mother aggressively chases her offspring from the immediate area just before she gives birth. By late October, adult males have exhausted their summer accumulation of fat and their desire for female company. Once again, they begin feeding. Antlers are shed as early as November, but mostly in December and January.

Food Habits

During fall and winter, moose consume large quantities of willow, birch, and aspen twigs. In some areas, moose actually establish a "hedge" or browse line six to eight feet above the ground by clipping most of the terminal shoots of favored food species. Spring is the time of grazing as well as browsing. Horsetail, pond weeds, and grasses. During summer, moose feed on vegetation in shallow ponds, forbs, and leaves of birch, willow, and aspen.

Movement

Most moose make seasonal movements to calving, rutting, and wintering areas. They travel from only a few miles to as many as 60 miles during these transitions.

Working Safely Around Moose

Every year someone is injured by a moose and in some cases fatalities are caused by attacks from moose. Most cases of moose attack are from cows defending their calves and they are well equipped to do so. Cow moose attack with their front feet and sharp hooves; they can kill wolves and in some cases drive grizzly bears away from their offspring. Bull moose attack with their massive antlers and can do great damage in a short amount of time.

One should always be alert when working in moose country. If you encounter a moose, never approach too closely. Moose will generally declare their displeasure of your presence by lowering their ears and raising their hackles (the long hair on their neck and back). Immediately retreat if you see a moose displaying this behavior. If you are about to be attacked by a moose and there are trees present, stay behind the tree. A human can move around a tree faster than a moose can.

Use common sense. Avoid contact with any wild animal. Most have the ability injure a human. Never play dead if attacked by a moose. Put something substantial between you and the moose.

Roosevelt Elk

Roosevelt Elk are larger, slightly darker in color, and have shorter, less symmetrical yet more massive antlers than the Rocky Mountain Elk found east of the Cascade Mountains in Canada and the United States.

General Description

Elk are members of the deer family and share many physical traits with deer, moose, and caribou. They are much larger than deer, but not as large as moose, which occur in Alaska. Distinguishing features include a large yellowish rump patch, a grayish to brownish body, and dark brown legs and neck. Unlike some members of the deer family, both sexes have upper canine teeth. The males have antlers, which in prime bull are very large, sweeping gracefully back over the shoulders with spikes pointing forward. Alaska elk antlers have a tendency toward crowning, the formation of the three points at the end of each antler. Elk shed their antlers during the winter each year and grow new ones the following summer. The soft growing antler is covered with velvet, which is scraped off by rubbing and jousting after the antlers harden in the fall.

Bull elk on Afognak Island are estimated to weigh up to 1,300 pounds. Cow elk are similar in appearance to the bulls, but are smaller and have no antlers.

Life History

Elk calves are born in late May or early June when abundant food is available for the mother and the mild weather increases the calves' chances for survival. Birth usually occurs under the cover of dense spruce forest, hidden from predators and protected from the elements. Calves are born with protective coloration (light spotted areas on the back, which act as camouflage). A few days after giving birth, the mother joins other cow elk with calves. A single cow will often "baby-sit" with the calves while the remaining cows seek food. As summer progresses, elk bands move above timberline and feed on the alpine slopes where breezes keep biting insects at bay and young plants are highly nutritious. By July, the calves, although still nursing, begin feeding on succulent forbs.

Beginning in August, bands of elk congregate and form herds consisting of cows, calves, yearlings, and an occasional mature bull. Nearby, but separate from the heard mature bulls can be found. During September, the bulls join the main herds and mating activities (the rut) begin. Large herds are scenes of vigorous activity as mature bull challenge each other vocally, emitting a high-pitched whistle or bugle, an eerie but thrilling sound. Occasionally, pushing and shoving matches are initiated as the mature bull attempt to take advantage of the larger bull's preoccupation and run past them to win the favors of a female. By mid-October most breeding activities have ceased. Herds may begin to disperse into smaller bands as they move into wintering areas. Winter months are spent in lower valleys and in the dense spruce forest and small openings near the coastline searching for food.

Food

Elk are hardy animals whose large body size and herding tendencies require tremendous amounts of food. From late spring to early fall, with a wide variety of food available, elk are mainly grazers, using grasses, forbs, and other leafy vegetation. By late fall they become browsers, feeding on sprouts and branches of shrubs and trees.

Population

From the original eight transplanted animals, Afognak elk have expanded to about 1,200.

Working Safely Around Elk

Although elk are not as widely distributed as moose in Alaska, they are large and potentially dangerous when the bulls are in the rut and when you may be near cows with young calves. Follow the same precautions as set forth above for moose. Elk bulls have a tendency to be more aggressive during the rut (September & October) than either moose or deer, and caution should be used when working near bulls during this time of year. Aggressive cows with calves should be avoided as well, since they attack in the same manner as cow moose.

Sitka Black-Tailed Deer, Mule Deer, and White-Tailed Deer

The Sitka black-tailed deer is native to the wet coastal rain forest of Southeast Alaska and north coastal British Columbia. Transplants have expanded its range and established population now also exist near Yakutat, in Prince William Sound, as well as Kodiak, and Afognak, and Raspberry Islands.

General Description

The Sitka black tailed deer is smaller, stockier, and has a shorter face than other members of the black-tailed group. Fawns are born in early June and weigh six to eight pounds at birth. The average October live weight of adults is about 80 pounds for does and 120 pounds for bucks, although dressed weight bucks of over 200 pounds have been reported. The summer coat of reddish brown is replaced by dark brownish gray in winter. Antlers are dark brown with typical black tailed branching. Normal adult antler development is three points on each side. Average life span is about 10 years, but a few are known to have attained an age of at least 15.

Life History

Fawns are born in late spring. After the winter snow pack recedes, deer disperse; migratory deer move to high elevation alpine/sub-alpine habitats while resident deer remain at lower elevations throughout the forest. Summer and early fall are periods of active foraging as deer accumulate fat reserves, which will help them through the winter and early spring. With the first heavy frost, deer in the higher alpine and sub-alpine areas descend to the upper forest.

The breeding season (or rut) peaks during late November. Breeding bucks spend little time foraging and by late November have used up much of their fat reserve. Does, however, generally enter December in prime condition. Does breed during their second year of life and continue producing fawns annually until they are 10 or 12 years of age. Reproductive success decreases rapidly beyond 10 to 12 years and by age 15, which is probably the maximum life expectancy, reproduction has essentially ceased. Prime age does (5 to 10 years) typically produce two fawns annually.

Throughout the rest of the winter and early spring, deer are generally restricted to uneven-aged old growth forest below 1,500 feet in elevation. The old growth forest provides optimal winter habitat because the high broken canopy intercept much snow but still provides enough light for the growth of forage plants used by deer. During winter, the distribution of deer at various elevations is influenced by changing snow depth. During extreme snow accumulations, many deer congregate in heavily timbered stands at lower elevations, and some may even move into the beach. Spring is a critical period for deer, and if winters are deep and persistent, many deer die of starvation. As snow melts in mid to late spring, deer begin to disperse, and by late spring and early summer they start rebuilding some of the fat reserves lost during winter.

Home Range

Summer and winter home range areas vary from 30 to 1,200 acres and average about 200 acres for radio-collared deer on Admiralty Island. Migratory deer have larger annual home ranges than resident deer. The average distance between summer and winter home ranges is five miles for migratory deer and half a mile for resident deer. Movement of deer between watersheds appears to be minimal during winter.

Food Habits

During summer, deer generally feed on herbaceous vegetation and the green leaves of shrubs. During winter, they are restricted to evergreen forbs and woody browse. When snow is not a problem, evergreen forbs such as bunchberry and trailing bramble are preferred. During periods of deep snow, woody browse such as blueberry, yellow cedar and hemlock, and arboreal lichens are used. Woody browse alone, however, is not an adequate diet and deer rapidly deplete their energy reserves when restricted to such forage.

Populations

Deer populations in Alaska are dynamic and fluctuate considerably with the severity of the winters. When winters are mild, deer numbers generally increase. Periodically, however, a severe winter will cause a major decline in the population. Deer have a high reproductive potential, and depressed populations normally recover rapidly. In some cases, however, predation may speed deer decline, as well as slow recovery to higher levels. The wolf, which occurs on the mainland and islands south of Frederick Sound, is considered the major predator of deer in Southeast Alaska. Both black and brown bears also prey on deer to some degree.

Working Safely Around Deer

The White-tailed deer found thought the eastern and western part of the United States have been known to attack people on many occasions. It is unknown whether Black-tailed deer have made any such attacks, but it is possible for someone to be injured by an irate buck in the breeding season (late fall). Deer are well equipped to injure humans. They are very fast. Bucks have sharp antlers and can clear amazingly high obstacles with graceful, arching leaps. They can run with remarkable speed, even in dense cover, and have excellent camouflage. When working in areas populated with deer, whether it be White-tailed, Black-tailed, or Mule deer, it is just common sense not to approach any large wild animal too closely. It is unlikely that an attack from a deer would be fatal but it is possible and serious injury is likely.

Figure 3

Hazards and Precautions – American Bison and Feral Wild Cattle Safety

American Bison

American Bison (Bison), which shaped the lifestyle of the plains Indians and figured prominently in American history before they were brought to near extinction, were transplanted to Alaska from Montana in 1928. While bison were the most common large land mammal in Alaska thousands of years ago, all of Alaska's wild bison came from 20 animals released near Delta Junction. Natural emigration and transplants have now created additional herds at Copper River, Chitina River, and Farewell. Small domestic herds are located at Healy, Kodiak Island, and on Provo Island. There were approximately 700 wild bison in the state in mid-1985.

General Description

The bison is the largest native land mammal in North America. A full-grown bull stands six feet at the shoulder, is up to 10 feet long, and can weigh more than a ton. Full-grown cows are smaller, but have been known to weigh over 1,200 pounds. A bison's head and forequarters are massive and seem out of proportion to the smaller hind parts. Bison have vertebrae, which begins just ahead of the hips and reaches its maximum height above the front shoulder. From above the shoulder, the hump drops almost straight down to the neck.

The bison's horns curve upward. The horns of the bull are larger and heavier than the horns of the cow. As winter progresses, their coats change color and are much paler by spring. When the weather warms, the hair loosens and hangs in patches until it is completely shed and replaced with new hair by late spring. Hair on the chin resembles a goatee. Older animals tend to have more hair on their heads.

Life History

Most bison young are born in May, but calves are born from April to August or even later. Newly born calves have a reddish coat. They are able to stand when only 30 minutes old; within three hours of birth, they can run and kick their hind legs in the air. At about 6 days of age, calves start grazing. Their reddish-orange coat begins to darken at about 10 weeks, with the molt to dark brown complete about five weeks later.

Cows are sexually mature at two years of age and give birth to single calves twice in three years. The gestation period is approximately 270 days. On rare occasions, a mostly white or even albino calf has been born in the Delta herd, but none has reached maturity.

Bison in Alaska have been known to live to a relatively great age compared to other hoofed animals (ungulates). One tagged bull killed in the Copper River area was over 20 years old.

Bison are migratory animals by nature. Alaska's wild bison do not remain in single herds, but scatter alone or in-groups ranging up to 50 animals or more. In the Delta Junction area, they move far up the Delta River in early spring to secluded meadows where they calve. Around August they travel back downstream, eventually moving on the Delta Junction Bison Range, and finally in late fall, onto farms where they remain throughout the winter. Here they sometimes cause damage to unharvested crops. Alaska's other wild bison herds also have seasonal movement patterns. Bison move slowly while feeding and appear to be quite clumsy. This is pure deception, for when pursued, the bison is fleet of foot and has great endurance. A mature bull eventually captured at Delta Junction jumped a seven-foot log fence from a standing position.

Food Habits

Bison are grazing animals and in Alaska find only limited amounts of food along rivers, in recent burns, and sedge potholes. Their diet is made up mainly of various grasses and forbs like vetch, a favored summer food found on gravel bars. Sedges, silverberry, willow, and ground birch are also eaten.

Working Safely Around Bison

When working in areas where bison are present, follow the same precautions as stated above for other large potentially dangerous wild animal. Generally, where bison are present there also will be moose and Brown (Grizzly) bears sharing the same area. Partially due to the relatively sparse population, bison injure fewer people than Brown Bears or moose.

Never approach bison and use caution when working near bison as they are unpredictable and can cover a lot of ground in a short amount of time. Bison can be found in timbered areas. If approached by a bison and you cannot make it to a vehicle, keep a large tree between you and the bison. You can move around the tree faster than the bison.

If a single bison or heard of bison approach you or your crew, retreat to your vehicle and leave the area. Do not attempt to “drive” the bison from your area while in your vehicle. Bison have no respect for cars and could charge and damage your vehicle and the occupants. The best way to avoid contact is to use your head and give the bison the right of way.

Feral or Wild Cattle

Feral or wild cattle are only found in a few remote locations in Alaska. A population exists on Sitkinak Island on the south end of Kodiak Island, Long Island, Harvester Island, and Chirikof Island. The same caution should be used when working in areas with a population of wild cattle that would be used when working around any of Alaska’s dangerous wildlife. Never approach too closely and if they begin to approach you, clear the area as fast as possible. If you arrive at your work site and there are wild cattle close by, stay in you vehicle and remain there until they leave the area.

If it is necessary to destroy a wild cow, you must notify the Department of Fish & Game. The same Defense of Life and Property (DLP) law that applies to big game species does not apply to wild domestic cattle, but you will be required to salvage the meat and make the report. Cattle reside on leased ground, and the owner of the leases must also be notified. It may also be necessary to compensate the landowner.

Wild Feral Cattle can be dangerous, and there are reports of injuries to people. Although they may look domestic cattle, they are wild and have no fear or respect for humans. Give them the right a way, use common sense, and maintain a safe distance when working where wild Feral Cattle inhabit the area.

ATTACHMENT D

Project-Specific Safe Plans of Action (SPA)

Attachment D1**:** Project-Specific Safe Plans of Action

Attachment D2: Utility Clearance HSEP 7.3.3

Equipment Operator Qualification HSEP 8.3

Cold Stress Control HSEP 11.4

Heat Stress HSEP 11.5

Housekeeping and Material Handling HSEP 16.4

Unexploded Ordnances HSEP 9.5

Attachment D1
Project-Specific Hazard Analysis

JOB/STEP	HAZARDS	SAFE PLAN
All Tasks	Heat Stroke (Symptoms: red, hot, dry skin; no perspiration; dizziness; confusion; rapid breathing and pulse; high body temperature)	This is a **MEDICAL EMERGENCY!** Cool victim rapidly by soaking in cool (not cold) water. Loosen restrictive clothing. **Get medical attention immediately!** For further guidance see HSEP 11.5. See HSEP 11.5 attached at the end of this section for more information.
	Heat Exhaustion (Symptoms: pale, clammy, moist skin; shallow breathing; profuse sweating; weakness; normal temperature; headache; dizziness; vomiting)	Move victim to a cool, air-conditioned area. Loosen clothing, place head in low position. Have victim drink cool (not cold) water.
	Frostbite (Symptoms: blanched, white, waxy skin, but resilient tissue; tissue cold and pale)	Move victim to a warm area. Warm frostbitten area quickly in warm (not hot) water. Have victim drink warm fluids--not coffee or alcohol. Do not break any blisters. Elevate the injured area and **get medical attention**.
	Hypothermia (Symptoms: shivering; apathy; sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration)	Move victim to a warm area. Have victim drink warm fluids–not coffee or alcohol. **Get medical attention.** See HSEP 11.4, attached at the end of this section for more information
	Ladder Use	Fall protection will be required at heights greater than 6 feet.
		Ladders will be inspected to ensure they are in safe condition.
		Extension ladders will be tied off or held for the duration of the job.
	Use of Hand Tools, Hammers, Sledges, Pry bars, etc.	The right tool for the job will be used.
		Before every use, each tool will be inspected for defects.
		Proper PPE such as leather gloves and safety glasses will be used when using tools. Face shields with safety glasses will be worn when grinding.
	Use of Power Tools	Each tool will be inspected before every use for defects.
		When making adjustments, power tools will be unplugged.
		The power source will be GFCI protected.
Using Absorbent Materials for Contaminated Materials		
	Dermal contact with contaminated media	Wear nitrile gloves and tyvek suits and rubber booties.
	Inhalation of vapors	Perform monitoring as prescribed in Attachment C1
	Manual lifting hazards - muscle strain, crushed toes, pinched fingers or hands	Use proper lifting techniques, get assistance and use lifting aids.

Attachment D1
Project-Specific Hazard Analysis

JOB/STEP	HAZARDS	SAFE PLAN
Sampling Environmental Media		
Obtaining and Handling Samples	Heat stress	Comply with SSHP section 12.
	Skin contact with contamination or sample preservatives	Wear nitrile gloves, safety glasses, tyvek suits and provide emergency eyewash.
	Inhalation of gases or vapors	Perform monitoring as shown in Section 7 of the SSHP. Perform monitoring as prescribed in Attachment C1
Drum Handling		
	Manual lifting hazards - muscle strains, crushed toes, pinched fingers or hands	Use proper lifting techniques, get assistance, and use lifting aids
	Inhalation of gases or vapors	Use table C1: in Attachment C, Amaknak Island Air Monitoring Requirements and Action Levels.
	Dermal contact with potential contaminants	Wear nitrile gloves and tyvek suits and rubber booties
	Drums falling on workers	Use mechanical means from a distance where possible. The buddy system will be used during manual removal.
	Hazards working around heavy equipment	Only qualified personnel will be authorized to operate equipment. Use Jacobs equipment operator qualification form found in at the end of this section. Wear orange vest for high visibility. Communicate with operator prior to walking by equipment. Wear hearing protection Equipment will only be operated in accordance with the manufacturer's instruction.
Decontaminating sampling equipment	Skin contact with decontamination solution (e.g., hexane or methanol)	Wear PPE as prescribed in Section 9 and in accordance with air monitoring requirement contained in Section 7 of the SSHP.
	Inhalation of vapors from hexane or methanol	Perform monitoring as shown in Table 2-4.
		Wear PPE as prescribed in Section 9 and Section 7 and in accordance with monitoring plan of the SSHP shall be followed. Perform monitoring as prescribed in Monitoring action plan Attachment C1 Ensure adequate ventilation.
All Tasks	Encountering unexploded ordnance and/or explosive waste	Follow the procedures outlined in CHSP 9.5 attached shall be followed. All operations in affected area will stop until approval from the PSHM and the client are obtained to continue.
Manage Waste Water Minimize all waste	Not using best management practice by creating unnecessary waste	Define waste streams at the beginning of the project to discover safer and more cost effective ways to minimize waste.

Attachment D1
Project-Specific Hazard Analysis

JOB/STEP	HAZARDS	SAFE PLAN
Segregate and control of waste	Mixing waste and storing incompatible waste streams together	Provide segregation of waste etc. solids, liquids combustibles, flammables, hazardous, and highly hazardous, and compatibility of storage and packaging. Placard waste streams as required by State, Federal and best management practices. Provide required container storage and manifests. Store in a segregated area by using barricades.
Spills and fire prevention		Only personnel trained to understand the hazards, safe handling, segregation and packaging shall be responsible for waste handling. Everyone should participate in identifying better methods and controls.
IDW Management	Pinch points	Use caution and watch the placement of your hands, wear nitrile gloves w/ leather gloves over them and tyvek suit to keep potentially contaminated soil or water off clothes and handling drum lids.
	Lifting drums rigging failure or dropping the load	Use proper rigging when moving drums.
	Back injury loading drums	Use lifting aids or get help moving materials.
All Terrain Vehicles	Injury to Operator	Only personnel who are competent in operation of ATV can operate it. Read manufacturers training info and understand operation.
	Unsafe Operations on Slopes and Soft Unstable Ground.	
Loading and Transporting Debris/ Waste Streams	Injury to Co-workers	Ground support personnel will yield right-of-way to all heavy equipment operators.
		Ground support personnel will be familiar with work zones and traffic patterns.
	Tipping Truck, Overturning Machine	Only authorized personnel will operate the unit.
		Seat belts and factory- installed restraining devices will be used during operations.
		Slopes will be negotiated by going straight up and down.
		Severe or sudden turns will be avoided.
		The unit will be operated on level and solid surface when possible. Otherwise caution will be used when proceeding.
	Excess Dust	On unpaved roadways, vehicles will not exceed 10 mph to minimize dust emissions.

Attachment D1
Project-Specific Hazard Analysis

JOB/STEP	HAZARDS	SAFE PLAN
Loading and Transporting Debris/ Waste Streams (continued)	Excess Dust (continued)	Upon approval from the Site Manager, water spray may be used on haul routes to minimize dust emissions.
		Operations will cease until dust is controlled.
Working Around Debris Piles and Staging Areas	Slips, Trips, Falling Debris, Cuts from Sharp Objects	Workers will refrain from walking or climbing on the debris pile.
		Workers will remain a safe distance away from equipment placing debris in the piles or containers.
		Any recognized instability of the piles will be immediately corrected.
		If possible, workers will refrain from handling debris.
		Leather gloves must be worn when handling debris. Use good housekeeping and material handling practices see HSEP 16.4 attached at the end of this section.
	Back Injuries	Personnel will evaluate the size and weight of material and avoid lifting items weighing more than 40 pounds.
		Personnel will use proper lifting techniques (i.e., lift with the legs and not the back).
Drum Handling and Drum Transportation	Manual Lifting Hazards (Muscle Strains, Crushed Toes, Pinched Fingers or Hands)	Use proper lifting techniques.
	Inhalation of Gases or Vapors	Monitor in accordance with Section 7 and follow action plan as prescribed in Attachment C1
	Dermal Contact with Potential Contaminants	Wear nitrile gloves, leather gloves and tyvek coveralls.
	Drums Falling on Workers	Use mechanical means from a distance where possible. The buddy system will be used during manual removal.
	Hazards Working Around Heavy Equipment	Only qualified personnel will be authorized to operate equipment. Wear orange vests.
		Equipment will only be operated in accordance with the manufacturer's instruction.
Heavy Equipment Operation	Equipment Malfunction/Misuse	Only qualified personnel will be authorized to operate equipment (HSEP 8.3).

Attachment D1
Project-Specific Hazard Analysis

JOB/STEP	HAZARDS	SAFE PLAN
Heavy Equipment Operation (continued)	Equipment Malfunction/Misuse (continued)	Equipment will only be operated in accordance with the manufacturer's instructions.
		Use of equipment for specific tasks will be discussed in detail during daily safety meeting.
		The operator will inspect, test, and document equipment daily at the start of each shift. If the loader is found to be unsafe, it will be taken out of service and tagged until the unsafe condition has been corrected.
		Maintenance and repairs will be performed in accordance with the manufacturer's specifications.
	Unsafe Operation	Activities will be determined by the field supervisor and thoroughly discussed with the operator and ground support personnel during the daily safety meeting.
		Ground support personnel assisting the loader operator will remain in sight of operator and will serve as a safety watch.
		All ground support personnel will be familiar with traffic patterns and work areas. Barriers and signs will be used to identify the work area.
	Unsafe Operation on Slopes, and Soft or Unstable Ground	Side slopes will be avoided when possible. Slopes will be negotiated by traveling up or down the slopes with the bucket in low position.
	Injury to Operator and Support Personnel	Operator will access and exit machine by means of ladder or step pads and handholds provided by machine's manufacturer.
		Ladders and step pads will be kept free of any debris or buildup of mud.
		The operator and ground support personnel will wear level D PPE and hearing protection.
		The operator will wear seat belt or other approved restraining devices as required.
		The backhoe will have a proper, working backup alarm, or a dedicated signal person will assist the operator.
		Ground support personnel will yield right-of-way to heavy equipment. The operator will yield to personnel on the grounds that enter the work area.
		Ground support personnel will not stand close to or work under raised loader bucket.
	Fire	The engine will be shut off during fueling operations.

Attachment D1
Project-Specific Hazard Analysis

JOB/STEP	HAZARDS	SAFE PLAN
Heavy Equipment Operation (continued)	Fire (continued)	The fire extinguisher will be mounted on the machine and will be inspected and recharged as necessary.
		Caution will be used to prevent overfilling of machine and to prevent spilling of fuel on ground.
		Machine engine compartment and exhaust system will be kept free of oil, fuel, and debris accumulation.
Using Absorbent Materials for Contaminated Materials	Dermal contact with contaminated media	Wear nitrile gloves, leather gloves and tyvex coveralls.
	Inhalation of vapors	Perform monitoring as prescribed in Section 7 of the SSHP and follow action levels as indicated in Attachment C1
	Manual lifting hazards - muscle strain, crushed toes, pinched fingers or hands	Use proper lifting techniques and use backhoe or other lifting aid.
Sampling of Drums Deheading/Opening of Drums	Sharp Edges from Deheaded Drums	Wear leather gloves
	Inhalation of Gases or Vapors	Monitor in accordance with Section 7 and follow action plan as prescribed in Attachment C1
	Dermal Contact with Potential Contaminants	Wear nitrile gloves, leather gloves and tyvex coveralls.
Obtaining and Handling Samples	Skin Contact with Contaminated or Sample Preservatives	Wear nitrile gloves, and safety glasses
All Tasks	Encountering Unexploded Ordnance and/or Explosive Waste	Follow the procedures outlined in HSEP 9.5. All operations in affected area will stop until approval from the PSHM and the client are obtained to continue.
Use backhoe to excavate and/or remove vaults or dig bollards.	Excavating utilities	Any excavating with backhoe will require utility clearance in accordance with Jacobs Utility Clearance procedure 7.3.3, attached.

ATTACHMENT D2

Utility Clearance, HSEP 7.3.3

Equipment Operator Qualification, HSEP 8.3

Cold Stress Control, HSEP 11.4

Heat Stress, HSEP 11.5

Housekeeping and Material Handling, HSEP 16.4

Unexploded Ordnances, HSEP 9.5

JACOBS

HSE Procedure		Document No: HSEP 7.3.3	Page: 1 of 5
Utility Clearance		Supersedes: CHSP 7.3.3	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 26 Jul 00	Current Revision Date: 26 Aug 02

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
3.0 DEFINITIONS 1
4.0 PROCEDURE 1
4.1. Clearance Step 1 1
4.2. Clearance Step 2 2
4.3. Clearance Step 3 3
4.4. Trenching and Excavations 3
4.5. Other Requirements 4
4.6. Above Ground Power Lines 4
4.7. Approval 4
4.8. Existing Utility Repair 4
5.0 REFERENCES 4
6.0 FIGURES 4
Utility Clearance Permit 5

1.0 PURPOSE AND SCOPE

To establish Health, Safety, and Environment (HSE) requirements to minimize, and to the extent possible, eliminate the risk to personnel and property from contact with buried or aboveground utility service lines.

This Work Instruction applies to all field activities where there could be contact with aboveground utilities or sub-surface utilities or related service lines.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

None

4.0 PROCEDURE

For work involving buried utilities and service lines:

- All three of the following Clearance Steps shall be utilized prior to drilling.
- Follow clearance Steps 1 and 2, in addition to the requirements set forth below for trenching and excavation, before any trenching or excavation work is done.

4.1. Clearance Step 1

Prior to field activities, appropriate property maps, blue lines, and/or as-builts will be examined in an effort to locate underground utility and service lines. Such reviews shall be supplemented by interviews of knowledgeable facility engineering and maintenance personnel.

During the project site walk, any discrepancies or new information regarding utility locations will be added to project maps.

For projects on Federal land, facility-engineering personnel will be asked to provide utility clearance and sign off. The Site Manager shall obtain and submit proper facility utility service clearance request forms.

For projects within local government jurisdiction, the Site Manager shall request the services of the local utility locater service.

If the project occurs in a state or location, which has an agency that conducts utility clearances, they will be notified. The services of State Underground Service Alert (USA), DigAlert, or other appropriate service will be used. The utility locater service will assign a "ticket" number to your site, which shall be recorded. This ticket number is valid for a limited time.

4.2. Clearance Step 2

4.2.1. Sub-surface Survey

Following map reviews, personnel interviews, and use of locater services, one or more of the most appropriate of the following geophysical sub-surface survey methods shall be used to locate underground utility or service lines.

- Electromagnetic (EM) methods,
- Ground penetrating radar (GPR),
- Magnetic survey, and/or
- Pipe locator.

4.2.2. Finding Pipes and Other Objects via Metal Detection

Magnetic detection can be used to find the following:

- Iron, steel, and copper water lines
- Metal gas lines
- Surveying pins (property markers)
- Copper tracer wire
- Copper and aluminum electrical wires
- Steel cables
- Telephone and TV cables
- Aluminum conduit
- Any continuous metal pipe or line

For magnetic detection to work, the target must contain some iron or steel or have an electrical current flowing through it so that a magnetic detector can find it. Nonferrous objects or objects not carrying an electrical current, such as polyvinyl chloride or high-density polyethylene pipe, must be detected by other means.

The strongest signals come from the ends of an object, as this is where the magnetic fields of force tend to concentrate. Therefore, if an object is oriented vertically, it will produce a stronger signal than one oriented horizontally. This can make a relatively small object, such as a steel drum, easier to find than a long, cast-iron water main.

The same object buried horizontally will likely produce two weaker signals, one directly above each end—one signal being positive and one being negative. Cast-iron or steel water pipe laid end-to-end will produce a strong signal at each joint, even if the pipes are welded together. Magnetic detection of metal pipes often results in a series of peak signals designating the locations of welded end joints.

Electric cables must be energized to be detected magnetically.

4.2.3. Ground-Penetrating Radar

Ground-penetrating radar (GPR) uses an electromagnetic (radio wave) antenna tuned to a frequency that can penetrate soils, rock, concrete, ice, and other common natural and manmade materials. Such capabilities make radar a prime technique in obtaining geotechnical information and evaluating hazardous-waste sites. As such, it is more suited for use outside of urban areas where natural conditions predominate. Furthermore, a GPR unit requires considerably more time to process than do simpler magnetic detection techniques.

GPR functions in a manner similar to standard aerial radar. A GPR determines subsurface conditions by sending pulses of high-frequency radio waves into the ground from a transmitter antenna located on the surface. Subsurface structures cause some of the wave energy to be reflected back to the surface, while the rest of the energy continues to penetrate deeper. The result is a series of radio "echoes" that delineate underground interfaces such as bedding, cementation, changes in moisture and clay content, voids, fractures, and intrusions as well as manmade objects.

Resolution of radar reflections can be increased by increasing the frequency of the radar waves transmitted into the ground.

GPR is best suited for determining a region’s hydrogeology, which is its main function. Smaller manmade objects such as individual drums and utilities are harder for a GPR to delineate, though a sensitive unit can reveal their locations as part of a general survey.

4.2.4. Marking Utilities

The following color code is recommended for marking utility locations.

- white work location
- red electrical
- yellow gas or oil
- orange telephone
- blue water
- green sewer

4.3. Clearance Step 3

When earth drilling or borings are to be done, hand augering (not to be done with a power auger) will be done to a minimum of seven feet for all locations where there is a potential to impact buried utilities.

Prior to drilling, the hole shall be reamed by hand to a diameter of 120% of the drill bit to be used.

For soil gas surveys, the survey probe shall be placed as close as possible to the hand auger.

In cases where hand augers meet refusal at depths less than seven feet bgs, the following steps will be taken to ensure the cause of the refusal is not an underground utility.

- A geologist or other individual qualified to classify soil shall examine the substrate to ensure it appears to be native and/or undisturbed material.
- Two additional step-out hand-augered borings shall be drilled approximately two feet laterally from the original boring. The borings shall be located such that a right triangle is formed, with the original boring forming the apex of the 90-degree angle. If these borings also meet refusal at a similar depth to the first boring, and a qualified person determines the soil is native material, hand augering to the total depth of 7 feet will not be required.

4.4. Trenching and Excavations

Prior to groundbreaking, where trenching or excavating will be done, the soil must be probed with a magnetometer. (Magnetometers sense ferrous metallic objects, or iron-rich rock such as basalt, but give no information about objects such as fiberglass or concrete tanks.)

To assist the equipment operator in locating any underground obstructions, a spotter will observe the excavation.

Additional requirements for trenching and excavating activities can be found in the Jacobs HSEPs/CHSPs on this subject.

4.5. Other Requirements

The Project Manager and HSE Manager will determine methods for utility clearance for horizontal and slant boring.

All uncovered utilities must be supported. If support is not required, so indicate under "Deviations From CHSP Approval", Paragraph 8, on the attached Utility Clearance form.

Utility lines shall be locked-out and/or tagged-out prior to repairs or modifications.

4.6. Above Ground Power Lines

Minimum clearances for working in proximity to overhead power lines are

Nominal Voltage	Minimum Clearance
0 -50 KV	20 ft., or one mast length; whichever is greater
50 KV+	20 ft. + 4 in. for every 10 KV over 50 KV or 1.5 mast lengths; whichever is greater

If it is necessary to work without the minimum clearance, the overhead line must be de-energized or re-routed by the utility company or a competent electrician.

4.7. Approval

The attached Utility Clearance Permit must be completed and signed by the Site Manager or the Project Manager's designee prior to commencement of relevant site work.

The Project Manager after collaboration with the site HSE Officer or HSE Manager must approve deviations from this CHSP. Approval via telephone is acceptable in the event the Project Manager is not on site.

4.8. Existing Utility Repair

Prior to field work, locate the utility shut-offs. Obtain keys and/or tools (or arrange a means to promptly summon the contact person) to access the shut-offs.

Plan other appropriate steps necessary to reduce the emergency response time in the event of a damaged underground line incident, to limit property damage from the leak, and to minimize personnel exposure to a potentially hazardous environment.

When repairing existing utilities, refer to the CHSP for Lock-Out and Tag-Out. Repairs should be made only as directed by utility owners.

5.0 REFERENCES

29 CFR 1926.650 –1926.652, Excavations

29 CFR 1910.333, Selection and Use of Work Practices in Sub-part S – Electrical

29 CFR 1926.955, Provisions for Preventing Accidents Due to Proximity to Overhead Lines

6.0 FIGURES

Utility Clearance Permit

Figure 1

Utility Clearance Permit

Project: ______________________________ Completed by: ______________________________

Site Location: ____ Date: __________

Reason for Clearance: ____

DESCRIPTION OF ACTIVITY	YES	NO	N/A	DATE	INITIALS
1. Review of Existing Maps					
2. Interviewed Personnel Familiar With Area?					
3. Above Ground Utilities					
a) marked on site maps					
b) necessary to lockout					
c) document procedures used to lockout or re-route					
4. Underground Utilities					
a) State Agency called: (specify)					
Ticket Number:					
b) State name of additional utility called:					
Ticket Number:					
c) Specify geophysical clearance method used:					
Done By:					
d) Utility locations marked with appropriate color code?					
Done By:					
e) Utilities marked on site map (please attach)					
Done By:					
5. Hand augering to ______ feet done by :					
6. Trench/Excavation probed by:					
a) Hand Clearance required:					
7. Clearance Approval Site Manager: Client Representative:					
8. Procedure Deviations Approval: Project Manager: HSE Manager:					

Describe Deviations: ____

____

Justification: ____

____

JACOBS

HSE Procedure		Document No: HSEP 8.3	Page: 1 of 3
Equipment Operator Qualification		Supersedes: CHSP 8.3	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 14 Aug 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
3.0 DEFINITIONS....1
4.0 PROCEDURE 1
5.0 REFERENCES....2
6.0 FIGURES 2
Operator Qualification 3

1.0 PURPOSE AND SCOPE

This HSEP provides the minimum procedures to be followed for qualification of equipment operators. Further guidelines for "Heavy Equipment" operator qualifications can be found in Section 17.0 in this manual.

This HSEP applies to all employees engaged in operations covered by the Company Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

None

4.0 PROCEDURE

Only persons authorized by a current Qualified Operator's Listing will be permitted to operate the following equipment:

- Hydraulic Cranes (Cherry Pickers, Drotts, etc.)
- Lifting Cranes (Boom/cable types)
- Overhead Gantry Cranes
- Front End Loaders / Back Hoe / Track Hoe
- Bulldozers
- Dumpster Trucks
- Tractor / Trailer Trucks
- Forklifts
- Aerial Lifts
- Buses
- Powder actuated tools

Operators will be assigned by the respective Site Manager and the listings will be updated as necessary.

The listings will be kept in readily available files at the project location.

Use Attachment 1 to assign Qualified Operators for the above required equipment.

5.0 REFERENCES

Various from OSHA standards found in 29 CFR 1910 & 1926

ANSI B30.5 – 1995; Mobile and Locomotive Cranes

6.0 FIGURES

Operator Qualification

Figure 1

Operator Qualification

TO: HSE DEPARTMENT

FROM: ________________________________ (Superintendent)

Through past experience, training, and personal observation, the following person(s) is a Qualified Operator for the equipment indicated.

Name **Equipment**

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____

Date:______________________ ______________________________

Site/Project Manager's Signature

HSE Procedure	Document No: HSEP 11.4	Page: 1 of 5
Cold Stress Control	Supersedes: CHSP 11.4	Rev. 2

Issuing Department:	Approval:	Previous Rev. Date:	Current Revision Date:
Corporate HSE	Mike.Coyle@Jacobs.com	11 Apr 01	18 Sept 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
3.0 DEFINITIONS 1
4.0 PROCEDURE 1
4.1. Hazards of Cold Environments 1
4.2. Evaluation and Control 2
5.0 REFERENCES 3
6.0 FIGURES 3

1.0 PURPOSE AND SCOPE

This Corporate Health, Safety and Environment Procedure (HSEP) describes the procedures for cold stress monitoring of personnel engaged in field work activities.

This HSEP applies to all Company employees who perform field work in cold weather and who are at risk of developing cold stress.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

ECT Refers to equivalent chill temperature.

4.0 PROCEDURE

4.1. Hazards of Cold Environments

Frostbite and hypothermia are two types of cold injury, against which personnel must be protected during the performance of field activities. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 100°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F (see Table entitled Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature). As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident.

Since prolonged exposure to cold air, or to immersion in cold water at temperatures well above freezing, can lead to dangerous hypothermia, whole body protection must be provided.

Adequate insulating clothing to maintain core temperatures above 36°C (96.8°F) will be provided to workers. The equivalent chill temperature (see Table entitled Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature) should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

Core body temperatures of less than 96.8°F will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia.

4.2. Evaluation and Control

Environmental monitoring will be conducted when air temperatures are below 45ºF.

Workers with diseases or taking medication that interferes with normal body temperature regulation will be excluded from work when temperatures are 30ºF or below.

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32°C (-25°F). Superficial or deep local tissue freezing will occur only at temperatures below -1°C (30°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

Limits for properly clothed workers for periods of work at temperatures below freezing are shown in the table entitled Threshold Limit Values Work — Warm-up Schedule for Four-Hour Shift.

If available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7°C (20°F), heated warming shelters (tents, trailers, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure.

The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided.

A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect.

If workers are handling fluids which cool when they evaporate (gasoline, alcohol or cleaning fluids) precautions will be taken to avoid soaking clothing and skin contact.

For work practices at or below -12°C (100°F) ECT the following shall apply:

- The worker shall be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, test periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
- New employees shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
- The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used.

- The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:
  - Proper re-warming procedures and appropriate first aid treatment.
  - Proper clothing practices.
  - Proper eating and drinking habits.
  - Recognition of impending frostbite.
  - Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
  - Safe work practices.

5.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices

U.S. Army Corps of Engineering, Safety and Health Requirements Manual, October 1992

6.0 FIGURES

Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

JACOBS

Figure 1

Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature

(UNDER CALM CONDITIONS)

Estimated Wind Speed (in mph)	Actual Temperature Reading (F°)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (F°)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security	INCREASING DANGER Danger from freezing of exposed flesh within one minute.	GREAT DANGER Flesh may freeze within 30 seconds.

Trenchfoot and immersion foot may occur at any point on this chart.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1987-1988, Cincinnati, Ohio, 1987

Figure 2

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work period	No. of Breaks	Max. Work Period	No. of Breaks
1. -26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min.	2	55 min.	3	40 min.	4
2. -29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
3. -32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
4. -35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
5. -38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
6. -40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
7. -43° & below	-45° & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-1991, Cincinnati, Ohio, 1990.

JACOBS

HSE Procedure		Document No: HSEP 11.5	Page: 1 of 6
Heat Stress Control		Supersedes: CHSP 11.5	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 11 Apr 01	Current Revision Date: 18 Sept 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
3.0 DEFINITIONS 1
4.0 PROCEDURE 1
4.1. Hazards of Hot Environments 1
4.2. Prevention 3
5.0 REFERENCES 4
6.0 FIGURES 4
Work – Rest Regimen[1] 5
Suggested Frequency Of Physiological Monitoring For Fit And Acclimatized Workers[5] 6

1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environmental Procedure (HSEP) describes the procedures for heat stress monitoring of personnel engaged in field work activities.

This procedure applies to all employees who perform field work in hot weather and who are at risk of developing heat stress.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

Heat stress	Refers to heat-induced physiological stress
Wet Bulb Globe Temperature Index (WBGT)	Refers to a measure of environmental factors which most nearly correlate with deep body temperature and other physiological responses to heat.

4.0 PROCEDURE

4.1. Hazards of Hot Environments

Heat-induced physiological stress (heat stress) occurs when the body fails to maintain a normal body temperature. A number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow the ACGIH Threshold Limit Value recommendations for suggested work and rest schedules listed in the table entitled Work-Rest Regimen (Figure 1). This work–rest schedule is determined by the Wet Bulb Globe Temperature Index (WBGT), a measure of environmental factors which most nearly correlate with deep body temperature and other physiological responses to heat. WBGT values are calculated by the following equations:

– Outdoors with solar load

WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

– Indoors or Outdoors with no solar load

WBGT = 0.7 NWB + 0.3 GT

where:

WBGT = Wet Bulb Globe Temperature

NWB = Natural Wet Bulb Temperature

DB = Dry-Bulb Temperature

GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer. Commercially available instruments can be used for convenient measurement of WBGT.

For workers wearing semipermeable or impermeable encapsulating ensembles and/or levels of protection A, B, or C, the recommendations listed in the table entitled Work – Rest Regimen cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 70°F (21°C).

To monitor these workers, measure:

- Heart rate.

  Count the radial pulse during a 30-second period as early as possible in the rest period.

  – If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  – If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

- Oral temperature.

  Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

  – If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.

  – If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

  – Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

- Body water loss.

  Measure weight on a scale accurate to ±0.25 lb. at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work. See the table entitled Suggested Frequency of

Physiological Monitoring For Fit And Acclimatized Worker (Figure 2). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

4.2. Prevention

Proper training and preventative measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. One or more of the following recommendations will help reduce heat stress.

- Adjust work schedules
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
  - Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
  - Add additional personnel to work teams.
  - Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 18 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful.
  - Maintain water temperature at 50° to 60°F (10° to 15.6°C).
  - Provide small disposable cups that hold about 4 ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
  - Weigh workers before and after work to determine if fluid replacement is adequate.
- Encourage workers to maintain an optimal level of physical fitness.
  - Acclimatize workers to site work conditions: temperature, protective clothing, and workload.
  - Urge workers to maintain normal weight levels.
- Wear long cotton underwear under chemical protective clothing. Cotton will aid in absorbing perspiration and will hold it close to the skin, which will provide the maximum amount of cooling from the limited evaporation that takes place underneath the chemical resistant clothing.
- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:

  - Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing.
  - Cooling jackets, vests, or suits.

- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress, which appear below.
  - Heat Rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Symptoms include a decreased ability to tolerate heat as well as being a nuisance.
  - Heat Cramps is caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs are muscle spasm and pain in the extremities and abdomen.
  - Heat Exhaustion is caused by increased stress on various organs to meet increased demands to cool the body. Signs are shallow breathing; pale, cool moist skin; profuse sweating; dizziness and lassitude; nausea; fainting.
  - Heat Stroke is the most severe form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Body must be cooled immediately to prevent severe injury and/or death. Competent medical help must be obtained immediately. Signs and symptoms are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

5.0 REFERENCES

NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices

U. S. Army Corps of Engineers Safety and Health Requirements Manual, EMR 385-1-1, October 1992

6.0 FIGURES

Work – Rest Regimen

Suggested Frequency of Physiological Monitoring For Fit And Acclimatized Worker

Figure 1

Work – Rest Regimen[1]

WBGT Temperature In Which Various Work Loads Are Performed, F°(C°)			
Work-Rest Regimen	Light[2]	Moderate[3]	Heavy[4]
Continuous Work Permitted	86.0 (30.0)	80.1 (26.7)	77.0 (25.0)
75% work 25% rest, each hour	87.1 (30.6)	82.4 (28.0)	78.6 (25.9)
50% work 50% rest, each hour	88.5 (31.4)	84.9 (29.4)	82.2 (27.9)
25% work 75% rest, each hour	90.0 (32.2)	88.0 (31.1)	86.0 (30.0)

Adapted from "Permissible Heat Exposure Threshold Limit Values" in Threshold Limit Values and Biological Exposure Indices for 1990-1991, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1990, p. 69.

2 Light work (up to 200 Kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work, etc.

3 Moderate work (200-300 Kcal/hr or 800-1400 Btu/hr): e.g., walking about with moderate lifting and pushing, etc.

4 Heavy work (350-500 Kcal/hr or 1400-2000 Btu/hr): e.g., sampling work, pick and shovel work, etc.

Figure 2

Suggested Frequency Of Physiological Monitoring For Fit And Acclimatized Workers[5]

NORMAL ADJUSTED TEMPERATURE[6]	IMPERMEABLE WORK ENSEMBLE[7]	ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°.90°F (30.8°-322°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 50 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°.77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Source: *NIOSH/OSHA/USCG/EPA,* Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985, p. 8-22.

5 For work levels of 250 kilocalories/hour.

6 Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F+ (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

7 A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

JACOBS

HSE Procedure		Document No: HSEP 16.4	Page: 1 of 3
Housekeeping and Material Handling		Supersedes: CHSP 16.4	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 20 Jul 01

Table of Contents

1.0 PURPOSE AND SCOPE **1**
2.0 RESPONSIBILITIES **1**
3.0 DEFINITIONS **1**
4.0 PROCEDURE **1**
4.1. General 1
4.2. Housekeeping Procedures 1
4.3. Manual Material Handling and Lifting 2
4.4. Training 2

1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed when maintaining orderliness and material handling in the workplace.

This HSEP applies to all employees and subcontractors on all Jacobs projects.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. General

4.2. Housekeeping Procedures

The procedures listed below, as well as good work practices and cleanliness, can prevent most accidents and are minimum requirements for all work areas.

Keep air hoses, welding leads, and extension cords out of doorways and walkways and off the floor to prevent tripping.

Each person is responsible for keeping his immediate work area free of trash, excess scrap material, and tools not in use.

Immediately clean up all spilled liquids and barricade the area if necessary.

Stack materials and supplies in a safe manner, out of walkways.

Do not pile trash or materials in areas where they block exits or fire doors, fire extinguishers, electrical disconnects, or safety showers.

Stack or pile safely. Always start with a safe base. Uneven surfaces of floor or yard should be leveled. Make sure the pile will not shift. Barrels or other round objects that may roll should be checked.

Pile to a safe predetermined height by floor load limit, by types of materials and strength of containers, or by requirements of fire protection. Cross-tile (interlock) the pile if necessary. There must be a space of at least 18 inches between the top of the pile and any sprinkler heads. More space must be allowed if materials can burn easily. Never store items close to open light bulbs or hot pipes.

Trash containers shall be emptied on a regular basis as not to allow debris to gather next to them.

4.3. Manual Material Handling and Lifting

Inspect the object that is to be lifted to estimate its size and weight and to see if there are nails, splinters, or other items that might cause injury.

Procedure to follow when lifting:

- Crouch as close to the object as practical.
- Get a good grip.
- Keep feet apart and bend knees.
- Lift slowly by straightening legs. (Keep back relatively straight. Leg muscles, not the back, should do the work.)
- Avoid awkward lifting positions. Shift the body until a straight lift can be made.

If the object must be lifted more than waist high, first lift the load waist high and then rest it on a support. Next, bend the knees again to give added leg muscle power for the final lift.

When carrying an object, do not try to change its position or adjust your grip while in motion. Stop and rest the object against a support while making the change.

When changing direction of travel, do not twist. Instead, turn the entire body, including your feet.

To set the load down, bend the legs, not the back. Follow the lifting procedure in reverse order. Always set one corner of the load down first, then slide your hands out so they will not get pinched.

Get help before handling a large or heavy object. When two or more carry a load, it should be decided beforehand how it is to be handled. Routes and clearances should be checked. One man should act as the leader. The leader should position himself so he can watch and coach the others. Persons carrying a long object should be on the same side of the project and remain in step with each other.

If an object appears to be too heavy, get someone to assist you.

4.4. Training

All employees shall be instructed in the housekeeping and lifting requirements outlined in this HSEP.

JACOBS

HSE Procedure		Document No: HSEP 9.5	Page: 1 of 3
Unexploded Ordnance Clearance		Supersedes: CHSP 9.5	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 26 Jul 01	Current Revision Date: 18 Sept 01

Table of Contents

1.0 PURPOSE AND SCOPE 1
2.0 RESPONSIBILITIES 1
2.1. Project Manager (PjM) 1
2.2. UXO Project Leader 1
3.0 DEFINITIONS 1
4.0 PROCEDURE 2
4.1. Drilling Operations Will Require 2
4.2. Other Site Activities 3
5.0 REFERENCES 3
6.0 FIGURES 3

1.0 PURPOSE AND SCOPE

This HSEP applies to all field activities where there is possible contact with ordnance. This unexploded ordnance clearance procedure is a support procedure for well drilling, sampling and remediation and actual ordnance clearance is not to be performed unless specifically directed by the Contracting Officer. If the client facility UXO clearance procedure is at least as stringent as this HSEP, their procedure may take precedence over this HSEP.

The Company and its UXO subcontractor do not clear UXO unless specifically required in the scope of work.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Project Manager (PjM)

It is the responsibility of the Project Manager (PM) to assure full compliance with this HSEP. The PM shall pre-approve the UXO subcontractor capabilities and procedures.

2.2. UXO Project Leader

The UXO Project Leader and Technicians (UPL), and Company subcontractors, must be trained UXO personnel. The training must meet the requirements of a Master EOD Technician and be a graduate of the EOD school at Indian Head, Maryland or equivalent. They will have the responsibility for field implementation of this procedure. They have the authority and responsibility to immediately stop work and take corrective action when an unsafe act or unsafe condition is encountered.

3.0 DEFINITIONS

None

4.0 PROCEDURE

Prior to any site access, a historical record search must be conducted to determine the location, type and extent of unexploded ordnance in the areas to be accessed. If historical or visual information indicates UXO may be on site, complete the following steps.

- The UXO clearance procedures below will be employed in the investigation and handling of ordnance and other hazardous items until it is determined that no explosive hazard exists. The Base Contract Official shall be notified and coordinate activities with Base's input.
- A command post will be established prior to conducting any field operations. All UXO Technicians operating away from the command post will maintain communications (consistent with the base safety plan) with the command post. The command post will maintain communication with the local fire, ambulance and police departments, and the base EOD team.
- A team consisting of two UXO Technicians will conduct a surface visual sweep of the proposed sampling site. They will maintain a line of sight with each other at all times and maintain communication with other field crewmembers and the command post.
- If unexploded ordnance is encountered, they will attempt to find safe routes around the hazardous item. If this cannot be done, an alternate site free and suitable for sampling / drilling and free of excess overgrowth will be located and identified on appropriate maps.
- When unexploded ordnance is encountered, the UXO project leader will mark the item's location and contact the facility EOD to arrange for the item to be blown in place.
- UXO Technicians will mark or delineate access paths, and if required, perform brush removal. Separation will be maintained between the UXO employees and other UXO operations. Separation will be maintained between UXO operations and all non-UXO activities. As a minimum, minimum explosive quantity / distance guidelines are to be maintained for related and nonrelated operations. For DOD projects, reference the DOD Ammunition and Explosives Safety Standards, DOD 6055.9-STD. For Corps of Engineer projects, minimum explosive quantity / distance guidelines are calculated and approved by the Corps of Engineers.
- Two UXO Technicians will then conduct a geophysical survey of this area using a magnetometer locator to locate ferrous and nonferrous metallic objects to a minimum depth of three feet. All metallic contact will be marked with stakes and an alternate clear path will be used.
- If an alternate clear path cannot be found, the installation EOD employees, or if directed by the Contracting Officer, the subcontractor will perform the excavation to comply with approved standard operating procedures.

4.1. Drilling Operations Will Require

Verify that surface brush / overgrowth removal has been performed by UXO Technicians. The clearance of at least 50 feet radius should include access routes and an area for vehicle turn around, as well as an area at least 20 feet from the drill site for the rig and the support vehicle.

The UXO Technicians, using magnetometry, shall clear the subsurface to the depth intervals specified in the Statement of Work. The clearance depth intervals will depend on the local soils, the potential for other hazardous materials and specific facility HSEP directives. During magnetometry, the drill rig and vehicles must be at least 20 feet away to avoid interference.

After the work site has been determined to be free of UXO, using the drill, advance the borehole to the next cleared interval and repeat the downhole magnetometry. Each time a drilling interval is reached, the drill rig and vehicles will be moved to a cleared area a minimum of 20 feet away.

If a positive reading is obtained, abandon the hole according to local regulations, inform the project manager, and notify the client.

4.2. Other Site Activities

UXO clearance procedures for other subsurface investigations or remediation require guidance from the Corporate Health, Safety, and Environment Manager and the client.

When UXO are found during site activities, employees are not to disturb the items and are to inform the PjM or SHSO.

5.0 REFERENCES

U.S. Army Corps of Engineers "Safety and Health Requirements Manual," 385-1-1

Department of Defense, Ammunition and Explosives Safety Standards, July 1999, DOD 6055.9-STD

6.0 FIGURES

None

APPENDIX C

Response to Comments

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			**Page** 1 of 5 **Date:** 8 Jul 04
Commentor: Ellen Godden	**Organization:** 3 CES	**Email:** elizabeth.godden@elmendorf.af.mil	**Phone:** (907) 552-7111

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	1-1	1.0	Last paragraph. For consistency, change “Declaration of Decision” to “Decision Document.”	“Declaration of Decision” will be changed to “Decision Document”.	A
2.	1-2	Fig 1-1	C6.pdf Here is a new base map showing the correct alignment of the railroad. Please use it from now on. If the PDF won’t work, let me know, and I’ll coordinate between you and the Geobase section.	The new base map will be inserted into the final document.	A
3.	1-3	1.2	Last paragraph. Add 2003 Site Investigation Report since that is the source of the “no further action” recommendation for the Landfill Area.	Text will be changed to, “These areas were addressed in the 2000 EE/CA and the 2003 Landfill Site Investigation Report, and the remedy selected for all was no further action.”	A
4.	1-6	1.2.1.3	Next-to-last sentence. Delete “Suspected Landfill Area” since it essentially has been addressed separately in the SI Report.	The text, “Suspected Landfill Area” will be removed from the sentence.	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004	**Page** 2 of 5 **Date:** 8 Jul 04

Commentor:	**Organization:**	**Email:**	**Phone:**
Ellen Godden	3 CES	elizabeth.godden@elmendorf.af.mil	(907) 552-7111

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
5.	1-6	1.2.1.4	The requirements stated in this paragraph are the correct requirements for this project; however, these are not the requirements of the decision document. Please refer to page 7 of the decision document, Proposed Action Descriptions and Estimated Costs, for the description of alternatives evaluated and final selection. Please read the entire decision document prior to beginning fieldwork.	Text will be changed to, "A Decision Document signed by the USAF and ADEC in 2003 requires the removal and transportation of POL-contaminated soil from six areas within SS83 (Drum Bunker Area, Large Foundation Area, Motor Pool Area, Small Foundation Area, Bermed Bunker Area, and the Lookout Pad) to an off-base facility for thermal desorption treatment, as well as confirmatory sampling to ensure removal. In addition, the Decision Document requires that the two USTs located at the Large Foundation Area be removed."	A
6.	1-7, 1-9	1.3.2, 1.3.3	Several references to SS83 Landfill site, landfill, Landfill Area, etc. I think these sections are cut-and-paste from previous documents, which is fine. If the reference applies specifically to the landfill area, leave in the specific reference to the landfill area; otherwise, delete "landfill" if the	Text will be modified as appropriate.	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			Page 3 of 5 Date: 8 Jul 04
Commentor: Ellen Godden	**Organization:** 3 CES	**Email:** elizabeth.godden@elmendorf.af.mil	**Phone:** (907) 552-7111

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
			statement may apply to the entire SS83 site.		
7.	2-2	Fig 2-1	Why are the dates for the Motor Pool Area Excavation shown as 3 May 04?	The entire schedule will be updated with the appropriate dates.	A
8.	3-2 to 3-4	Table 3-1	From the decision document, only DRO, RRO and benzene (for the Motor Pool Area) are contaminants of concern. I think the others in Table 3-1 may have been included because of the sampling we have scheduled at the drainpipe. In some cases, ADEC standards are not the cleanup levels for SS83. We used Table 1-1 from the 2002 EE/CA (Summary of Basewide Background Soil Concentrations for SS83 EE/CA Metallic Target Analytes) when writing the decision document, and these standards will apply for metals at this project, also. Please change Table 3-1, possibly one table listing the contaminants of concern (DRO, RRO, and benzene (BTEX)) and their cleanup levels in section 3.0	Table 3-1 will include only those contaminants of concern included in the Decision Document (DRO, RRO, BTEX). A second table will be added to Appendix A1 (SAP) for the drainpipe standards, using the Elmendorf background levels as presented in the 2000 EE/CA. The following text will be added to the tables as a footnote: "Cleanup levels are those that were determined during the 2000 EE/CA, and are presented in the 2003 Decision Document."	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			**Page** 4 of 5 **Date:** 8 Jul 04
Commentor: Ellen Godden	**Organization:** 3 CES	**Email:** elizabeth.godden@elmendorf.af.mil	**Phone:** (907) 552-7111

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
			and another table of standards just for the drainpipe, in Appendix A1, which includes Elmendorf background levels and a statement that these will remain the cleanup levels for SS83 as they were in the decision document.		
9.	4-1	4.1.1	Please change to, "USAF has provided a UXO safety training disk to be used by all Jacobs Engineering Group Inc. and subcontractor field personnel to assist them with recognition of UXO and chemical warfare materials." I have copies of the chemical warfare recognition pamphlet available in my office.	All subcontractor employees and Jacobs employees who have not attended the Elmendorf EOD training shall attend before commencement of field work. Those Jacobs employees who have attended the training shall view the UXO safety training disk as a refresher.	A
10.	4-4	Table 4-2	Delete GRO/BTEX at the Lookout Pad Area since we already intend to excavate there for DRO and benzene (BTEX) was not a contaminant of concern in the decision document for this site. Also, why run a sample for PAHs when they were not contaminants of concern at any location?	GRO/BTEX will be deleted from the sampling suite at the Lookout Pad Area. PAH comment withdrawn per email dated 15 July 2004.	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			Page 5 of 5 Date: 8 Jul 04
Commentor: Ellen Godden	**Organization:** 3 CES	**Email:** elizabeth.godden@elmendorf.af.mil	**Phone:** (907) 552-7111

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
11.	4.9	Fig 4-3	Please confirm "68.1 mg/kg benzene" at the Motor Pool Area. Decision Document states "0.0681 mg/kg." I think source is 2002 EE/CA, Table 2-6. Units there for BTEX are micrograms/kilogram.	Benzene value on Figure 4-3 will be changed to 0.0681 mg/kg.	A
12.	2-12	2.12.5	Last year we had some trouble with water samples not staying cool enough to meet the lab's specifications. Please be sure coolers and cooling materials maintain integrity, especially if outside temperatures remain high.	All efforts will be made to keep samples within an acceptable temperature range.	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			**Page** 1 of 2 **Date:** 8 Jul 04
Commentor: Louis Howard	**Organization:** ADEC	**Email:** Louis_Howard@dec.state.ak.us]	**Phone:** (907) 269-7552

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	4-5	4.2.2	The document states that the two underground storage tanks (USTs) containing diesel heating fuel as not being regulated by the Department. This is not entirely true. If the USTs had a release from overfills, spills, or leaks, they would be regulated by 18 AAC 75 Contaminated Sites regulations for investigation and cleanup. Additionally, 18 AAC 75 adopts the UST Procedure Manual by reference in regulation. For example: 18 AAC 75.355(d) Analysis for petroleum contamination **must** follow the applicable Alaska methods for petroleum hydrocarbons referred to in Table 1 of Chapter 2 of the *UST Procedures Manual*, dated November 7, 2002 and adopted by reference. Therefore the UST Procedure Manual is not "guidance" as stated in the document, but it is in fact, regulation that must be followed by the Air Force. Please provide clarification where the USTs are stated as not being	The sentence, "It is assumed that the USTs are not regulated by ADEC because they contained diesel heating fuel." will be removed from the text. Also, the sentence, "However, 18 Alaska Administrative Code 78 will be used as guidance for the UST removals" will be deleted. Following the text, "UST confirmation sample procedures will follow ADEC's *Underground Storage Tanks Procedures Manual* (ADEC 2002)" will be followed with, "as referenced in 18 AAC 75.355 (d)."	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			**Page** 2 of 2 **Date:** 8 Jul 04
Commentor: Louis Howard	**Organization:** ADEC	**Email:** Louis_Howard@dec.state.ak.us]	**Phone:** (907) 269-7552

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
			"regulated" by the Department simply because they contained heating fuel.		
2.		General	With these corrections [above comment] and EPA's comments being incorporated, the plan is approved.	Comment noted.	A

REVIEW COMMENTS

Document Reviewed: SS83 Removal Action Work Plan, Draft, June 2004			**Page** 1 of 1 **Date:** 8 Jul 04
Commentor: Terri Beach	**Organization:** AFCEE	**Email:** terri.beach@elmendorf.af.mil	**Phone:** (907) 552-1822

ITEM	PAGE	SECTION	COMMENT	JACOBS RESPONSE	RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	[SAP] 2-9	2.10	Please include the following information in the final report concerning use of concrete foundations as backfill material: survey where foundations are buried onsite, burial depth, and approximate quantity.	The final report will include the requested information.	A
2.	SAP 2-1	2.1	Last ¶, 1st sentence. Contaminated soils will go to DRMO, not TSD. TDS personnel will assist in filling in required paperwork.	The referenced sentence will be modified to reference Alaska Soil Recycling instead of the TSD facility.	A
3.	IDW 4-1	4.2	1st Bullet, last sentence. According to ASR, depending upon their workload, soils may be sitting onsite for months before they are treated. It is okay to return soils to SS83 and to have open pits for a short time. If ASR is backlogged, the plan will need to be revised; pits can't remain open for months.	Treated soil from ASR will not be returned to the SS83 site. Following receipt of confirmation sampling results, excavations will be backfilled with the soil from the gravel pit shown on Figure 1-1.	A