N83447.AR.000622
NAS FORT WORTH
5090.3a

FINAL WORK PLAN FOR INTERIM REMEDIAL ACTIONS AT SOLID WASTE MANAGEMENT UNITS 17, 28, 29, 30 AND 62 NAS FORT WORTH TX

10/1/2001

HYDROGEOLOGIC

706 0 File: 17G D.E.

NAVAL AIR STATION FORT WORTH JRB CARSWELL FIELD TEXAS

ADMINISTRATIVE RECORD COVER SHEET

AR File Number 706

FINAL

Work Plan

Interim Remedial Actions

at

Solid Waste Management Units 17, 28, 29, 30, & 62
NAS Fort Worth JRB, Texas

Prepared for
U.S. Air Force Center for Environmental Excellence
Brooks AFB, Texas

Contract Number F41624-00-D-8032

October 2001

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

30 November 2001

MEMORANDUM FOR RAFAEL CASANOVA (EPA REGION 6)

FROM: Mr. Don Ficklen
HQ AFCEE/ERD
3207 North Road
Brooks AFB, TX 78235

SUBJECT: Former Carswell AFB
Final Baseline Ecological Risk Assessment

Dear Mr. Casanova,

One copy of the Final Baseline Risk Assessment is attached for your approval. Cheryl Overstreet and Gary Miller from EPA Region 6 have provided comments, and they have been addressed under a prior correspondence. Once this risk assessment is approved, the Feasibility Study for the Former Carswell AFB can be finalized.

Should you have any questions regarding this report, please contact me at (210) 536-5290.

Sincerely,

Mr. Don Ficklen

cc:

RESPONSES TO TECHNICAL REVIEW COMMENTS
October 23, 2001

Document Reviewed: **Draft Work Plan Interim Remedial Actions at Solid Waste Management Units 17, 28, 29, 30 & 62 NAS Fort Worth JRB, Texas**

Date of Review: **16 October 2001**

Date Comments Received: 17 October 2001

General Comments

While the remedial actions to be accomplished are relatively simple "dig and haul" operations, it is recommended that at least one copy of the Work Plan, preferably that used by the field project manager, have copies of essential referenced materials (e.g. applicable OSHA safety regulations, hazardous waste handling/transport requirements, etc.).

Response: The Work Plan and other necessary documents will be available on-site or will be readily accessible for use by the EEG Project Team

Also, the Health and Safety Plan seems to be very generic. Consider tailoring it to the sites to be addressed in this project.

Response: The Health and Safety Plan is typically generic in order to cover situations that may not be anticipated, but could potentially be encountered. No revisions to the Work Plan are proposed at the time. Refer to the "Note on Specific Comments" below.

Specific Comments:

It is recommended that the following specific comments be addressed in the next version of the document:

Response: Specific Comments are addressed on the following pages.

Note on Specific Comments: **AFCEE has accepted the rationale for the IRA approach for each site as detailed in this Work Plan. The specific comments addressed below are pertinent to document quality, but many do not have a direct impact on the execution of field work at these sites. Where practical, the revision detailed in each comment response will be added to the Final Work Plan. Due to extremely short schedule for production of the Final Work Plan prior to execution of the field work described within the Work Plan, it may not be possible to incorporate detailed responses in the final document. All applicable comments will be addressed and in the Interim Remedial Action Report that will be generated at the conclusion of the field effort.**

Item	Page	Section	Comment	Response
			Work Plan	
1	1-1	1.0	The second paragraph refers to "RFI activities" to be performed under this Work Plan It is recommended that this sentence be revised to indicate that remedial actions will be performed as well as investigative activities.	The text will be revised to read. " ... (AFCEE) to perform RFI and Interim Remedial Action (IRA) activities at the five SWMUs listed above. This Work Plan (WP) summarizes RFI and IRA activities ... "
2	2-1	2 0	1st paragraph, 3rd bullet. Please insert the acronyms for Organochlorine Pesticides and Polychlorinated Biphenyls here rather than in the 6th bullet of the third paragraph.	The edit will be made as requested. The acronyms for Volatile Organic Compounds and Semivolatile Organic Compounds will also be defined in this set of bullets
3	2-1	2.0	2nd paragraph, 2nd sentence. Please add organophosphorous pesticides and chlorinated herbicides to the list of Analytical Methods in this sentence.	This edit will be made as requested
4	2-2	2 1	2nd paragraph, 2nd sentence. The text refers to "RRS-2 and RRS-3 COCs" here and in other places in the Work Plan. Please consider rewording this as "RRS-2 and RRS-3 level COCs".	Please refer to "Note on Specific Comments" preceding this table.
5	2-2	2.1 1	1st paragraph, last sentence Please list the PAHs referred to in the text As a general rule, always list all chemicals by name in instances such as this.	The last sentence will be revised to read: " . and other PAHs including benzo(g,h,i)perylene, chrysene, fluoranthene, phenanthrene, and pyrene."
6	2-2	2 1.1	2nd paragraph, 5th sentence Please insert a comma after the word "Foxtrot".	The text will be revised as requested
7	2-2	2 1.1	2nd paragraph, last sentence Please delete the term "to the environment" after the word "ubiquitous" This comment applies to all places in the text where this phrase occurs.	The text will be revised as requested.
8	2-2	2 1 1	3rd paragraph. Throughout the text, please reference boreholes as they appear in the figures, rather than using the abbreviated version (e.g. use BHGLTA701 rather than B701).	Please refer to "Note on Specific Comments" preceding this table

Item	Page	Section	Comment	Response
9	2-2	2 1.1	3rd paragraph, 2nd sentence. When referring to regulatory concentrations, please give the concentration (in this case, the TNRCC MSC). This comment applies to the entire document.	No changes are proposed in response to this comment. All applicable regulatory concentrations will be incorporated into the subsequent RFI Report. Please refer to "Notes on Specific Comments" preceding this table.
10	2-3	2.1 1	Paragraph at the top of the page, last two sentences. Please state whether SPLP was run on these samples (for lead) to obtain site specific lead MSCs, and if not, explain why.	The following text will be added before the last sentence of the paragraph: "Because a detection of lower concentration (from boring B701/718) had already been found to be unsuitable for establishing a site-specific MSC, SPLP was not performed on this sample "
11	2-3	2.1 1	Paragraph at the top of the page, last sentence Please delete the terms "have to", "so that RRS 2 closure of soil", and "may be requested".	The text will be revised as requested.
12	2-3	2 1 2	1st paragraph. Please define or delete the term "with low MSCs".	The term "with low MSCs" will be deleted from the text.
13	2-3	2.1 2	1st paragraph Please list the other volatile organic compounds (VOCs) and PAHs.	The following text will be added to the end of the paragraph: "The other VOCs detected in subsurface soil include chloromethane, ethylbenzene, xylenes, methyl ethyl ketone, and propane nitrile. The PAHs detected in subsurface soil include acenaphthene, anthracene, benzo(g,h,i)perylene, fluoranthene, phenanthrene, and pyrene "
14	2-3	2 1 2	2nd paragraph, 1st sentence. Please state whether the borings referred to were confirmation or delineation borings.	The sentence will be revised to read. "... detected in subsurface soils during the characterization and delineation phases of the RFI were either not confirmed ..."
15	2-3	2.1 2	2nd paragraph, 2nd sentence. Please replace "are delineated to RRS-1" with "have been delineated".	The text will be revised as requested
16	2-3	2 1.3	1st paragraph, 1st sentence. Please list the "chlorinated solvents".	The text will be revised to read: "... chlorinated solvents such as TCE, *cis*-1,2-dicholoroethene, *trans*-1,2-dichloroethene, tetrachloroethene, and vinyl chloride ... "

Item	Page	Section	Comment	Response
17	2-3	2 1.3	1st paragraph, 2nd sentence. Please explain in the text how it was determined that arsenic, benzene, and chlorobenzene were "potentially related to landfill activities".	The sentence will be rewritten to read. "Arsenic, benzene, and chlorobenzene were detected at Standard 2 concentrations or greater As the presence of these analytes are not be related to the basewide TCE plume, it was determined that they were potentially related to landfill activities."
18	2-3	2 1 3	2nd paragraph, 1st sentence If no Arsenic was detected in the first and second rounds of sampling, please indicate that this is the case in the text. Please give the dates of the sampling rounds. Please insert the term "these three" between "delineate" and "sporadic".	No changes are proposed in response to this comment as no further groundwater sampling is to be performed. A full discussion of groundwater sampling activities and result will be provided in the RFI Report. Please refer to "Note on Specific Comments" preceding this table.
19	2-3	2.1.3	2nd paragraph, 2nd sentence Please explain in the text how the arsenic was delineated and indicate which direction(s) the delineation occurred.	See response to comment 18
20	2-3	2.1.3	2nd paragraph, 3rd sentence. It appears that boring B761 was not sampled from "ground surface to the water table". If this is the case, please revise this sentence.	Boring B761 was sampled at four intervals, 0, 5, 10, and 15 feet No changes are proposed.
21	2-3	2.1 3	2nd paragraph, 5th sentence. Please explain how it was determined that "No source areas for arsenic were established", especially considering that there was an arsenic hit in boring B761.	The arsenic detection in the surface sample at B761 (5 9 mg/kg) is only slightly above the RRS 2 value of 5.85 mg/kg. This detection is considered to be within the natural fluctuation of background at the site and is not considered to be indicative of a release. No changes to the text are proposed.
22	2-3	2.1.3	3rd paragraph, 1st sentence Please include the RRS-3 values for benzene in the text Also, please give details on the sampling rounds mentioned, including dates of sampling Please check to ensure that 7 rounds of groundwater sampling were conducted at well W704	See response to comment 18.

Item	Page	Section	Comment	Response
23	2-3	2.1.3	3rd paragraph, 6th sentence. Please delete the term "round of" and change "samples" to "sample". Also, please insert "confirm delineation and" between the words "to" and "verify". Please delete the term "and to confirm delineation" from the end of the sentence	The text will be revised as requested
24	2-4	2.1.3	1st paragraph on page, last sentence. Please delete the word "and" following the phrase "no further groundwater monitoring".	The text will be revised as requested.
25	2-4	2.1.3	Last paragraph. If appropriate, please include a discussion of seasonal variances and their effect on groundwater contamination levels. Also, please explain why there were 7 rounds of groundwater sampling for benzene (see comment number 22 above) and only 5 rounds of sampling for chlorobenzene	See response to comment 18.
26	2-5	2.2	2nd paragraph, 2nd sentence. Please replace the word "established" with the word "completed". Please define the time period in which Radian Corporation performed its work- give actual years rather than "in the mid to late 1980s"	The text will be revised to read: "... were completed by Radian Corporation during site activities conducted from 1984 to 1988."
27	2-5	2.2.1	Last sentence. Please replace the "," following "SWMU 28" with a ";".	The sentence will be revised to read: "Although delineation sampling is necessary for some COCs, no surface soil excavations are planned for SWMU 28."
28	2-5	2 2.2	4th sentence. The text makes reference to SPLP analyses which were being conducted on samples Please update the paragraph in the next version of the Work Plan to reflect the results of these analyses.	The paragraph will be updated to indicate that the SPLP result was below the RRS 2 value and the associated soil sample result can be used as a site-specific MSC.
29	2-5	2 2 3	Section header. Please rename this section "Groundwater/ Surface Water" since surface water samples are discussed here.	The text will be revised as requested.

Item	Page	Section	Comment	Response
30	2-6	2.3	1st paragraph, 4th sentence Please give an exact range (e.g. 18-20 feet) for the depth of the water table rather than "approximately 18 feet".	Please refer to "Note on Specific Comments" preceding this table.
31	2-6	2.3	1st paragraph, third to last sentence. Please provide an explanation of why it is not necessary to remove or delineate stained soils at SWMU 29.	The sentence will be rewritten to read "No Standard 3 concentrations of analytes were detected associated with stained soils; consequently an IRA excavation of stained soils is not necessary for closure under Standard 2."
32	2-6	2.3.1	2nd paragraph, 1st sentence. Please indicate the color of the cell on the figure that pertains to RRS-3 compounds above MSCs. This comment pertains to all other similar sentences in the Work Plan.	Please refer to "Note on Specific Comments" preceding this table
33	2-7	2.3.1	Top two lines on the page. Please state whether the TNRCC accepted this rationale for explaining away the PAH detections. This comment applies to all similar text in the Work Plan.	The following text will be added at the end of the paragraph: "This rationale has successfully been used at other surface soil sampling locations affected by environmental PAH sources not related to SWMU activities (HydroGeoLogic, 2001)."
34	2-7	2.3.3	1st paragraph, next to last sentence. Please list the four wells in which there were RRS 2 detections of metals. Please give more details on the "three rounds" of sampling mentioned Also, please use the form "RRS #" or "RRS-#" consistently throughout the work plan.	As groundwater investigations are not the subject of this Work Plan, additional information regarding previous sampling results is not necessary. No changes will be made The use of "RRS #" will be standardized in subsequent documents Please refer to "Note on Specific Comments" preceding this table
35	2-7	2.3.3	1st paragraph, last sentence. Please quantify "significant concentrations". Also, please indicate whether TNRCC approval was obtained concerning ending the groundwater monitoring program.	The sentence will be revised to indicate that "significant concentrations" are Standard 2 and Standard 3. Only three rounds of groundwater samples are required by the RCRA permit and no approval was required.
36	2-8	2.4	4th paragraph, 1st sentence Please indicate the depth to groundwater for these monitoring wells.	Please refer to "Note on Specific Comments" preceding this table
37	2-10	2.5	Last paragraph, 1st sentence. Please indicate the depth to groundwater for these monitoring wells	Please refer to "Note on Specific Comments" preceding this table

Item	Page	Section	Comment	Response
38	2-11	2.5.2	2nd paragraph, last sentence Here and in other portions of the text, high PAH levels are dismissed as being from sources not related to the SWMU in question. If possible, please give more supporting evidence as to why the PAHs are not related to the SWMUs	The rationale for no further investigation of PAHs is provided in the text No document changes are proposed. See response to comment 33.
39	4-1	4.1	1st paragraph, 3rd sentence. In a number of places throughout the document, the excavations are referred to as an interim remedy for obtaining site closure If no further remedial actions are expected to be required, please revise the text	The use of "interim" is appropriate in this context No changes to the document are proposed.
40	4-1	4.1	1st paragraph, last sentence. Please indicate how the site-specific MSC for lead at SWMU 17 was calculated	The sentence will be revised to read. "... 73.1 mg/kg (see section 2.1.1)."
41	4-1	4.1 1	1st paragraph, 3rd sentence. Please show how the volume of the excavation was calculated. This comment pertains to all other similar sections of text throughout the Work Plan.	The size of each proposed excavation was determined based on concentrations in surrounding borings Each excavation may be larger than presented in the work plan if initial confirmation sample results determine that the excavations need to be larger. No changes to the text are proposed.
42	4-1	4 1 1	1st paragraph, next to last sentence Please explain how the depth of the sample (0 to 0.5 ft) was obtained Typically, surface sample depths have been 0 to 2 feet This comment applies to similar text throughout the Work Plan.	Surface soil sample intervals at NASFW have consistently been collected from 0 to 0 5 feet. No changes to the text are proposed
43	4-2	4.2	1st sentence. Please explain which COCs had alternative MSCs established	The following sentence will be added after the first sentence in Section 4.2. "The alternative MSCs are presented on Figure 2 2 "
44	4-2	4.2	2nd sentence. Please list those compounds which were encountered at RRS-3 concentrations	The compounds encountered at RRS-3 concentrations were listed in Section 2.2 No changes to the document are proposed.
45	4-2	4 2 1	2nd paragraph, 1st sentence If site conditions allow, please consider moving soil boring B130 closer to the location of boring B126.	Boring B130 was placed as close to the location of B126 as possible without puncturing the liner of the DRMO hazmat containment area. No changes are proposed.

Item	Page	Section	Comment	Response
46	4-2	4.2 1	3rd paragraph, 1st sentence. According to the text, soil borings B133 and B134 are expected to delineate surface detections of silver to the south and west of the location of boring B111 However, on Figure 2 2, the proposed boring locations appear to be located southeast and southwest of boring B111 Please address this discrepancy.	The text will be modified to read ".. to delineate the surface detection of silver in B111 Sample B133 will be collected along the bank of the Trinity River to the southeast of B111, and sample B134 will be collected away from the bank to the west-southwest of B111 "
47	4-3	4.2 2	2nd sentence on the page. Please replace "SPLP analysis should be performed" with "SPLP analysis will be performed" and delete the word "potentially".	The text will be revised as requested.
48	4-3	4 3	1st paragraph, last sentence. Please explain how the site-specific MSC of 44 4 mg/l was established for this location (by what SPLP location).	The sentence will be revised to read as follows: ".. 44.4 mg/kg for lead from soil boring B229 (Figure 2-3) "
49	4-4	4 4	1st paragraph, last sentence. Please give more detail as to why an alternate MSC could not be established. Also, please give an explanation of the "industrial groundwater protection limit".	The text will be revised to read. "... however, the SPLP extract of a soil sample with a lower lead concentration (68.4 J mg/kg at B910/927) was found to contain lead above the RRS 2 value for industrial groundwater. Consequently, no soil value greater than 68 4 mg/kg can be considered to be below Standard 3 unless confirmed by an analysis of an SPLP extract " The next paragraph was closed up with the first paragraph and now reads: "The highest lead result that can be used to establish as site-specific MSC is the detection of 30 mg/kg at the 15-foot interval of B942. The SPLP extract will be analyzed for any confirmation sample from a SWMU 30 IRA excavation that exceeds 30 mg/kg."
50	5-1	5.0	For ease in reviewing the proposed work, please provide a table, similar to Table 3-2 of the FSP, which identifies the tasks to be performed at each of the five sites; such as type of sampling and/or excavation or boring, COC's, approximate size and quantity of excavation, etc.	A reference to Table 3-2 of the FSP will be added to the text.

Item	Page	Section	Comment	Response
51	5-1	5.1	Please reword the text to indicate that EEG will obtain utility clearances through a local Utility Locating Service. In addition, since SWMU 62 (Landfill 6), is located outside of the boundaries of NAS Ft. Worth JRB, it will be necessary to notify and secure the approval of the Westworth Redevelopment Authority prior to mobilizing onto this site	The text was revised to read. "Prior to commencement of drilling activities, utility clearances will be obtained through the services of an established Utility Locating Service subcontractor, and dig permits will be secured from the Navy Public Works Office These permits, once obtained, will be maintained in clear view at each work site Since SWMU 62 (Landfill 6), is located outside of the boundaries of NAS Fort Worth JRB, EEG will notify and secure the approval of the Westworth Redevelopment Authority prior to mobilizing onto this site. EEG will also obtain "
52	5-2	5.2	2nd paragraph, 1st sentence. This sentence is somewhat cumbersome. It is recommended that this sentence be revised for clarity.	The text will be revised to read: "Before any excavation equipment is moved onto each project site, a decontamination area for that site will be established Where practical, a decontamination area may be shared between sites that are in close proximity to each other."
53	5-2	5 2	2nd paragraph, 4th sentence. Please give the name and title of the Base representative who will give the authorization for waste storage.	The text will indicate that Mr. Mike Dodyk is the authorized base representative.
54	5-2	5.2	2nd Paragraph, 8th sentence Please update the text to reflect that there will be four excavation areas, rather than three.	The sentence will be revised to read "Containers of IDW from each excavation area will be brought to this storage lot."
55	5-3	5.3	2nd sentence on the page. If appropriate, please add the phrase "or more" after the term ". .depth of the excavation will be 7 feet. .".	The term "or more" is appropriate and will be added.
56	5-3	5 3	First paragraph on the page, 6th sentence Please insert "and also notify the Navy Occupational Safety and Health Office." after "...(OSHA) rules for excavation and confined space entry".	The requested text will be added.

Item	Page	Section	Comment	Response
57	5-4	5.4	Last paragraph should start with "All Investigation-Derived Wastes will be stored in the AFCEE storage yard, in compliance with TNRCC regulations " Also, the bottom line on the page should be revised to indicate that there are four excavation sites.	The requested sentence will be added to the beginning of the paragraph The final sentence will be edited to read "...excavation work at the four SWMUs, composite ..."
58	5-5	5.4	1st full paragraph. Please state that the disposal of containerized water will be accomplished only after approval is secured from the Navy Environmental Office	The requested text will be added between "... to the landfill." and "Water that is .. "
59	5.7	5.7	Last paragraph. Add text to the paragraph indicating that provisions will be made for the establishment and protection of the germination of the grass seeds.	A final sentence will be added that reads: "Where areas are reseeded, provisions will be made to protect the area to allow for undisturbed germination."
60	NA	NA	Figures. Please consider using a wider range of colors in the Figures to prevent using the same color for different purposes For example, yellow is used to indicate "Analyte detected at Standard 3 concentration" and "Proposed sampling locations (except Data Screen Table)". Also, it is recommended that "Standard 3 concentration" be written in the form "RRS 3 concentration" for consistency.	Please refer to "Note on Specific Comments" preceding this table.
61	NA	NA	Figures. For all figures, please give the range of the sample depth for all samples For example, a column header should read "05-07 ft" rather than "05 ft".	The "05 ft" notation for soil interval is consistent with other project documents and has not been altered
62	NA	NA	Figure 2.1 It appears that Arsenic was only sampled at the surface for boring BHGLTA761. If this is not the case, please revise the table Also, it does not appear that Arsenic has been delineated for this boring. Please consider additional delineation sampling.	Arsenic samples were collected at the surface and the 5-, 10-, and 15-foot intervals at this boring. The table associated with this boring will be corrected.
63	NA	NA	Figure 1.1. The TCE Concentration contour lines are not necessary on this figure.	The contour lines show the relationship of the plume to the subject SWMUs and will be retained on the figure.

Item	Page	Section	Comment	Response
FIELD SAMPLING PLAN (APPENDIX A)				
64	3-2	3.2	Bullets These analytical methods do not seem to be the same as mentioned in the body of the Work Plan. Please address this discrepancy	The analytical methods listed in the FSP match those currently in use for the COCs The numeral "6" that appears before the hyphen in three of the methods is extraneous and will be removed.
65	3-3	3 3.1	2nd paragraph, 1st sentence. Please explain or delete the "***" located before the term "DPT methods".	The *** symbols will be removed.
66	3-3	3 3.1 1	2nd paragraph, end of the second sentence Please insert the missing boring number.	The boring will be identified as B725/768
67	3-4	3.3 2 2	2nd paragraph, 1st sentence. Please correct the spacing between "5-foot" and "interval".	The text will be revised as requested.
68	5-2	5.2	Top of page. Please indicate that, prior to commencement of drilling activities, utility clearances must be obtained through the services of an established Utility Locating Service subcontractor and dig permits must be secured from the Navy Public Works Office.	The text will be modified as requested (see response to comment 51)
69	5-2	5 2	3rd paragraph on the page, 1st sentence. Please change the location of the field office and the primary staging area to the Contractor trailer at 1346A Range Road and the IDW yard south of Bldg. 1337	The text will be modified as requested
70	5-4	5.3	2nd paragraph, 2nd sentence. The text mentions that a stainless steel hand trowel will be used to obtain metals samples Please give an explanation as to why this is the best tool to use to sample metals. This comment also applies to other portions of the work plan	Hand trowels are a cost-effective means for collecting surface soil samples Stainless steel materials should not contribute detectable amounts of COCs to the analytical results. No changes are proposed
71	5-4	5 4 1	5th paragraph. Delete the phrase "base civil engineer or" from the last sentence.	The text will be modified as requested
72	NA	Table 3-2	Expand Table 3-2 to include the excavations.	The table will be revised to include information pertaining to the excavations.

Item	Page	Section	Comment	Response
73	NA	Table 4-1	Please remove "Joseph Dunkle" from the table and replace his name with "Don Ficklen"	The text will be revised as requested
74	NA	Figure 4-1	Top of Figure. Please convert Mr Dodyk from a "PG" to a "PE" and convert Mr. Ficklen from a "PE" to a "PG".	The text will be revised as requested.
HEALTH AND SAFETY PLAN (APPENDIX B)				
75	NA	NA	2nd cover page The "Site Safety and Health Officer" is listed as "TBD" It is recommended that the Site Safety and Health Officer be determined and his name included in the next version of the Work Plan/Health and Safety Plan.	The name of the SSHO will be added to the document cover page.
76	1-1	1.0	1st paragraph, 1st sentence. Please change the word "an" to "a".	The text will be revised as requested.
77	NA	Table 13-1	Please replace "Joseph Dunkle" with "Don Ficklen". Please add Mr. Michael Dodyk to the table	The text will be revised as requested.

FINAL

Work Plan

for

Interim Remedial Actions

at

Solid Waste Management Units 17, 28, 29, 30, and 62
NAS Fort Worth JRB, Texas

Contract No. F41624-01-D-8057

Prepared for
U.S. Air Force Center For Environmental Excellence
Brooks AFB, Texas

Prepared by
Ellis Environmental Group, LC
414 SW 140th Terrace
Newberry, FL 32669
(352) 332-3888
&
HydroGeoLogic, Inc.
1155 Herndon Parkway, Suite 900
Herndon, VA 20170

October 2001

REPORT DOCUMENTATION PAGE

Form Approved
QMB No 0704-0188

1 AGENCY USE ONLY *(Leave blank)*	2 REPORT DATE	3 REPORT TYPE AND DATES COVERED
	October 2001	Final

4 TITLE AND SUBTITLE

Final Work Plan Interim Remedial Actions
At Solid Waste Management
Units 17, 28, 29, 30, and 62
NAS Fort Worth JRB, Texas

5 FUNDING NUMBERS

F41624-00-D-8032
Delivery Order No 0009

6 AUTHOR(S)

Ellis Environmental Group
HydroGeoLogic, Inc

7 PERFORMANCE ORGANIZATION NAMES(S) AND ADDRESS(S)

Ellis Environmental Group
414 SW 140th Terrace
Newberry, FL 32669

8 PERFORMANCE ORGANIZATION REPORT NUMBER

9 SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(S)

AFCEE/ERD
Brooks AFB,
Texas 78235-5363

10 SPONSORING/MONITORING AGENCY REPORT NUMBER

11 SUPPLEMENTARY NOTES

12a DISTRIBUTION/AVAILABILITY STATEMENT

Unlimited

12b DISTRIBUTION CODE

13 ABSTRACT (Maximum 200 words)

This Work Plan provides a summary of Interim Remedial Action (IRA) and sampling activities at SWMUs 17, 28, 29, 30, and 62. This work plan presents the soil analytical results produced during the multi-phased RFI for these sites and provides rationale for the selection of IRAs required for obtaining closure

14 SUBJECT TERMS	15 NUMBER OF PAGES
	16 PRICE CODE

17 SECURITY CLASSIFICATION OF REPORT	18 SECURITY CLASSIFICATION OF THIS PAGE	19 SECURITY CLASSIFICATION OF ABSTRACT	20 LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

Preface

This document contains the Final Work Plan (WP) for the Interim Remedial Action (IRA) at Solid Waste Management Units (SWMUs) 17, 28, 29, 30, and 62 at the Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas.

Ellis Environmental Group, LC (EEG) prepared this report under contract to the U S Air Force Center for Environmental Excellence (AFCEE), Contract No. F41624-00-D-8032, Delivery Order No. 0009, in support of the Air Force Installation Restoration Program (IRP)

Responsible key EEG personnel are as follows:

Rich Wheeler, PE – Assistant Program Manager
Rick Levin, PG – Project Manager

This contract will be administered by the Defense Contract Management Command, 10500 Battleview Pkwy., Suite 200, Manassas, Virginia, 22110 The contracting officer will be Mr. Cliff Trimble. The contracting officer's representative will be Mr. Don Ficklen (210-536-5290), located at the AFCEE/Environmental Restoration Division, 3207 North Road, Brooks Air Force Base (AFB), Texas 78235-5363.

Contents

Figures

Appendices

Abbreviations & Acronyms

ft-bgs	feet below ground surface
mg	milligram
kg	kilogram
AFCEE	U.S. Air Force Center for Environmental Excellence
AFB	Air Force Base
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
B2EHP	bis(2ethylhexyl)phthalate
CFR	Code of Federal Regulations
COC	contaminant of concern
DDD	4,4-dichlorodiphenyldichloroethane
DDE	4,4-dichlorodiphenyldichloroethene
DDT	4,4-dichlorodiphenyltrichloroethane
DOT	Department of Transportation
DPT	direct-push technology
EEG	Ellis Environmental Group, LC
EPA	Environmental Protection Agency
HSA	hollow stem auger
HW	hazardous waste
IDW	investigation-derived waste
IRA	Interim Remedial Action
JRB	Joint Reserve Base
MEK	methyl ethyl ketone
MSC	medium-specific concentration
MTBE	methyl tertiary butyl ether
NAS	Naval Air Station
NDTG	nuclear density test gauge
NGVD	National Geodetic Vertical Datum
OC	organochlorine
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PID	photoionization detector
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RRS	Risk Reduction Standard
SPLP	synthetic precipitation leaching procedure
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAC	Texas Administrative Code

TCE	trichloroethene
TNRCC	Texas Natural Resource Conservation Commission
TPH	total petroleum hydrocarbons
UXO	unexploded ordnance
VOC	volatile organic compound
WP	Work Plan

1.0 Introduction

On February 7, 1991, the Resource Conservation and Recovery Act (RCRA) hazardous waste (HW) permit HW-50289 was issued by the Texas Natural Resource Conservation Commission (TNRCC) to the former Carswell Air Force Base (AFB), which is currently known as Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas. In accordance with the RCRA HW permit and a subsequent TNRCC letter to the U.S. Air Force, dated March 2, 1995, a multi-phased RCRA Facility Investigation (RFI) was conducted at five solid waste management units (SWMUs) located at NAS Fort Worth JRB. The five SWMUs and their common names are as follows.

- SWMU 17 (Landfill 7)
- SWMU 28 (Landfill 1)
- SWMU 29 (Landfill 2)
- SWMU 30 (Landfill 9)
- SWMU 62 (Landfill 6)

The location of the subject SWMUs at NAS Fort Worth JRB are presented in Figure 1-1.

Ellis Environmental Group, LC (EEG), under Contract Number F41624-00-D-8032, Delivery Order Number 0009, was contracted by the U S. Air Force Center for Environmental Excellence (AFCEE) to perform RFI activities and Interim Remedial Action (IRA) activities at the five SWMUs listed above This Work Plan (WP) summarizes RFI and IRA activities to be conducted pursuant to application for closure under TNRCC Risk Reduction Standards (RRS) program. Accordingly, a summary of results and description of current data gaps is provided. This WP also presents descriptions and the rationale for interim remedial actions to be conducted at the five SWMUs listed above in order to obtain closure under the TNRCC RRS program.

2.0 RCRA Facility Investigation Summary

The following sections summarize the analytical results from the RFI field activities and the rationale for the IRAs at SWMUs 17, 28, 29, 30, and 62. Initial soil characterization samples were collected in 5-foot intervals from the ground surface to the top of the water table. RFI characterization samples collected in 1998 were analyzed for the full suite of 40 Code of Federal Regulations (CFR) Appendix IX constituents. In accordance with the AFCEE Basewide Quality Assurance Project Plan (QAPP) (HydroGeoLogic, 1998), the following U.S. Environmental Protection Agency (EPA) methods were used to cover the full Appendix IX list:

- SW8260A – Volatile Organic Compounds (VOCs)
- SW8270B – Semivolatile Organic Compounds (SVOCs)
- SW8080A – Organochlorine (OC) Pesticides and Polychlorinated Biphenyls (PCBs)
- SW8140 – Organophosphorus Pesticides
- SW8151 – Chlorinated Herbicides
- SW8290 – Dioxins and Furans
- SW9010A/SW9012 – Cyanide
- SW9030 – Sulfide
- SW6010A-standard – Trace Elements (Metals)
- SW7470A/7471A – Mercury

A shorter list of Appendix IX analytical methods was used for additional characterization sampling performed between 1999 and July 2001 based on the results from the initial characterization sampling Analytical methods for cyanide, sulfide, dioxins, furans, organophosphorous pesticides, and chlorinated herbicides were eliminated as none of these analytes were detected in the initial sampling round. In addition, analysis of metals was performed using the more sensitive SW6010-trace and the SW7000 series EPA Methods to achieve greater accuracy and lower detection limits.

The following EPA Methods were used during the delineation (1999 – 2001) sampling:

- SW8260B – Volatile Organics
- SW8270C – Semivolatile Organics
- SW6010B-trace – Trace Elements (Metals)
- SW7000-series – Trace Elements (Metals)
- SW7470A/SW7471A – Mercury
- SW8080A –OC Pesticides and PCBs
- SW8310 – Polynuclear Aromatic Hydrocarbons (PAHs)

It should be noted that detections of thallium in 1998 were shown to be statistically less than background (HydroGeoLogic, 1998a). In addition, detections of selenium using SW6010-standard were shown to be false positives during subsequent delineation/confirmation sampling performed in 1999.

2.1 Solid Waste Management Unit 17 (Landfill 7)

During Phase I of the SWMU 17 RFI, four characterization soil borings—BHGLTA701 (B701), B702, B703, and B704—were advanced within SWMU 17 using a direct-push technology (DPT) system. An additional 10 borings were advanced to visually and lithologically characterize the

landfill and to define the landfill boundaries. The water table was encountered at approximately 17 feet below ground surface (ft-bgs) in the main landfill area and 7 to 10 ft-bgs east of the main landfill Various construction debris consisting primarily of concrete, rebar, asphalt, metal, bottle caps, crushed drums, pieces of chain link fencing, creosote-stained wood, brick, plastic, glass, and aircraft aluminum were found throughout the landfill. Analytical results above TNRCC Risk Reduction Standard 1 (RRS-1) from the characterization soil boring locations are presented in Figure 2-1.

Metals and PAHs were the primary contaminants of concern (COCs) identified in surface and subsurface soils during the initial characterization activities. Consequently, several rounds of soil borings were advanced to delineate these RRS-2 and RRS-3 COCs between 1999 and 2001. In addition, several borings were advanced to confirm RRS-3 COCs If those RRS-3 COCs were confirmed, then synthetic precipitation leaching procedure (SPLP) was performed in order to obtain site-specific Medium Specific Concentrations (MSCs) A total of 37 soil boring/surface sample locations were advanced during this period Analytical results from confirmation and delineation borings as well as site-specific MSCs are presented in Figure 2-1.

A total of nine monitoring wells were installed at SWMU 17 to delineate COCs detected in SWMU 17 groundwater. In 1998, monitoring well WHGLTA701 (W701) was installed upgradient of the landfill, and monitoring wells W702, W703, and W704 were installed downgradient of the landfill Monitoring wells W705 through W709 were installed in 2000-2001 to delineate benzene-impacted groundwater detected at SWMU 17.

2.1.1 Surface Soil

RRS-2 and RRS-3 COCs were identified in surface soils at SWMU 17 during the characterization and delineation phases of the RFI (Figure 2-1) RRS-3 COCs detected in surface soils include arsenic, lead, mercury, PCB-1254, and the PAHs with low MSCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, dibenzo(*a,h*)anthracene, and indeno(1,2,3-*c,d*)pyrene] RRS-2 COCs detected in surface soils include zinc and other PAHs including benzo*(g,h,i)*perylene, chrysene, fluoranthene, phenanthrene, and pyrene.

As depicted on Figure 2-1, lead is the only RRS-3 compound remaining above site-specific MSCs in SWMU 17 surface soils. All other RRS-3 compounds detected in the surface were either not confirmed at RRS-3 concentrations (green colored cells) or they were detected below site-specific MSCs (blue colored cells) With the exception of PAHs, all RRS-2 and RRS-3 compounds at SWMU 17 are delineated to RRS-1. A series of soil samples with decreasing concentrations at or near the reporting limit for PAHs delineates PAHs in surface soils. It should be noted that SWMU 17 is located directly adjacent to an engine testing facility north of the landfill, as well as Taxiway Foxtrot, west of the landfill. PAHs are associated with engine exhaust. Therefore, low concentrations of PAHs are considered to be ubiquitous in surface soils located in the vicinity of an airport.

Lead detections in SWMU 17 surface soil are delineated to the north, east, south, and west by samples collected at SWMUs 17, 23, and 25 The site-specific MSC (73.1 mg/kg) for lead was obtained from the delineation boring B723B; however, when SPLP analysis was performed on the detection of lead at B701/B718 (169 mg/kg), lead was detected in the SPLP extract at a

concentration that exceeded the TNRCC MSC for industrial groundwater. Therefore, the concentration of 169 mg/kg detected at B701/B718 remains at a RRS-3 concentration and cannot be used as a site-specific MSC for SWMU 17. Because a detection of lower concentration (from boring BHGLTA701/718) had already been found to be unsuitable for establishing a site-specific MSC, SPLP was not performed on this sample. Lead was also detected at a RRS-3 concentration of 467 F mg/kg at B725/B768 The RRS-3 detections of lead at B701/B718 and B725/B768 will be removed as part of an IRA at SWM17.

2.1.2 Subsurface Soil

RRS-2 and RRS-3 COCs were identified in SWMU 17 subsurface soils during the characterization and delineation phases of the RFI (Figure 2-1). RRS-3 COCs detected in subsurface soil include arsenic, cadmium, chromium, lead, chlordane, acrylonitrile, and PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, dibenzo(*a,h*)anthracene, and indeno(1,2,3-*c,d*)pyrene]. RRS-2 COCs detected in subsurface soils include barium, cobalt, copper, mercury, silver, zinc, p,p'- 4, 4-dichlorodiphenyldichloroethylene (DDE), acetone, 2-hexanone, other volatile organic compounds (VOCs), and PAHs. The other VOCs detected in subsurface soils include chloromethane, ethylbenzene, xylenes, methyl ethyl ketone, and propane nitrile. The PAHs detected in subsurface soil include acenaphthene, anthracene, benzo*(g,h,i)*perylene, fluoranthene, phenanthrene, and pyrene.

All RRS-3 compounds detected in subsurface soils during the characterization and delineation phases of the RFI were either not confirmed at RRS-3 concentrations or they are below site-specific MSCs. All RRS-2 and RRS-3 subsurface detections at SWMU 17 have been delineated.

2.1.3 Groundwater

Chlorinated solvents, such as TCE, cis-1,2-dicholoroethene, trans-1,2-dichloroethene, tetrachloroethene, and vinyl chloride, associated with the regional trichloroethene (TCE) plume were the primary COCs detected in SWMU 17 groundwater at monitoring wells W701, W702, W703, and W704. Arsenic, benzene, and chlorobenzene were detected at Standard 2 concentrations or greater. As the presence of these analytes are not related to the basewide TCE plume, it was determined that they were potentially related to landfill activities.

Arsenic was detected in all three downgradient wells during the third round of sampling. Three groundwater samples were collected in 2001 to confirm and delineate these three sporadic arsenic detections. Results indicated that arsenic was delineated in groundwater. In an effort to locate a potential source area for arsenic at SWMU 17, three additional soil borings (B761, B762, and B763) were advanced to collect soil samples from the ground surface to the water table for analysis of arsenic. These soil borings were used to augment characterization borings B701-B704 with greater coverage of the SWMU 17 landfill area. No source areas for arsenic were established Therefore, the sporadic arsenic detections in groundwater are most likely natural variations of background or they may be related to changes in water chemistry due to the presence of TCE and benzene plumes in groundwater at SWMU 17 Based on these results, no further groundwater monitoring for arsenic is recommended for SWMU 17.

Benzene was detected at RRS-3 concentrations in monitoring well W704 in sampling rounds 3, 4, 5, and 7. An expedited site characterization was performed in May 2000, which included the installation of several piezometers and the collection of soil samples to confirm and delineate the benzene plume. Monitoring wells W705 and W706 were installed in 2000 to delineate benzene in the downgradient direction east of the landfill. Monitoring wells W707, W708, and W709 were installed in 2001 to further delineate benzene in the upgradient direction and to locate potential source areas in soil. No VOCs were detected in soil during the installation of monitoring wells W707, W708, or W709. An additional groundwater sample was collected at well W704 and perimeter wells to confirm delineation and to verify decreasing benzene concentrations. Results indicated that benzene concentrations were decreasing at monitoring well W704 and that benzene is delineated in groundwater Based on these results, no further groundwater monitoring and is recommended for benzene at SWMU 17.

Chlorobenzene was detected at RRS-2 concentrations during sampling rounds 1 and 3 at monitoring well W703;however, there were no detections in sampling rounds 2, 4, and 5. Based on these results, no further groundwater monitoring is recommended for chlorobenzene

2.2 Solid Waste Management Unit 28 (Landfill 1)

SWMU 28 was a construction debris landfill for Carswell AFB in the 1940s and 1950s. It was located on the west bank of the West Fork Trinity River. In 1968, the U.S Army Corps of Engineers excavated most of the landfill as part of a major flood control construction project. The exact whereabouts of the landfill materials was not documented, however, it appears that excavated landfill materials were used as riprap along the west bank of the West Fork Trinity River Landfill materials not excavated during construction activities appear to have been left in place and form part of the west bank of the West Fork Trinity River

In 1998 and 1999, during the initial phase of the SWMU 28 RFI, four characterization soil borings—W101/B101, W102/B102, W103/B103, and W104—were advanced within SWMU 28 using a hollow stem auger (HSA) and a DPT system (Figure 2-2). The water table was encountered at approximately 10 ft-bgs in the northwest portion of the landfill area and 30 ft-bgs in the southeast portion of landfill. Various construction debris waste materials were encountered in the landfill. The debris and materials consisted primarily of concrete, rebar, asphalt, metal wire, glass bottles, wood, porcelain, and floor tiles.

Metals, pesticides, PCBs, and PAHs were the primary COCs identified in surface and subsurface soils during the initial characterization activities Consequently, borings B105-B109 were advanced to delineate these RRS-2 and RRS-3 COCs in 2000. Analytical results above RRS-1 from the characterization soil boring locations are presented in Figure 2-2.

In January 2001, further delineation locations (B110-B114) were advanced on the west bank of the West Fork Trinity River, and an additional characterization boring (B115) was advanced on the east bank of the West Fork Trinity River. Two lithology-only borings—B116 and B117—were also advanced on the east bank to obtain groundwater elevation data and to visually identify potential landfill material. Soil borings B118-B122 were advanced to confirm RRS-3 COCs and SPLP was performed on confirmed RRS-3 COCs to obtain site-specific MSCs In addition, four sediment samples were collected along the landfill near the west bank of the West Fork Trinity

River. These samples did not reveal any detections of metals, mercury, pesticides, PCBs, or VOCs. However, several PAHs were detected at low concentrations just above the detection limit.

In June 2001, three additional soil borings (B123, B124, and B126) were advanced at the request of the TNRCC to further characterize COCs at the landfill. Boring B125 was advanced in order to confirm and perform SPLP analysis on RRS-3 detections of lead at W102/B102.

A total of 24 soil boring/surface sample locations were advanced between 1998 and 2001. Analytical results from confirmation and delineation borings as well as site-specific MSCs are presented in Figure 2-2.

Four monitoring wells (W101-W104) were installed in 1998 and 1999 at SWMU 28 to characterize potential COCs in SWMU 28 groundwater. Monitoring wells (LF01-1A, -1B, -1C, -1D, -1E, and -1F) were completed by Radian Corporation during site activities conducted from 1984 to 1988. Additionally, four surface water samples were collected from the West Fork Trinity River along the west bank of the river near the landfill in February 2001

2.2.1 Surface Soil

RRS-2 and RRS-3 COCs identified in surface soils at SWMU 28 during the initial characterization and delineation phases (borings B101-B122) of the RFI were either not confirmed or detected below site-specific MSCs (Figure 2-2) These detections were also delineated. RRS-3 COCs detected in surface soils during the Phase IV characterization sampling (B123-B126) include cadmium and lead. RRS-2 COCs detected in surface soils during the Phase IV characterization sampling include silver, zinc and p,p'-DDE. Although delineation sampling is necessary for some COCs, no surface soil excavations are planned for SWMU 28.

2.2.2 Subsurface Soil

RRS-2 and RRS-3 COCs identified in subsurface soils at SWMU 28 during the initial characterization and delineation phases (borings B101-B122) of the RFI were either not confirmed or detected below site-specific MSCs. The subsurface detections were also delineated (Figure 2-2). RRS-3 COCs detected in subsurface soils during the Phase IV characterization sampling (B123-B126) include arsenic, cadmium, chromium, copper, lead, mercury, and bis(2-ethylhexyl)phthalate (B2EHP). With the exception of copper, mercury, and B2EHP all RRS-3 COCs are below site-specific MSCs. An SPLP analysis of the copper detection at B126-15' was performed and was found to be below the RRS-2 value The associated soil sample result can be used as a site-specific MSC for copper at SWMU 28. RRS-2 COCs detected in surface soils during further characterization sampling include cobalt, copper, mercury, nickel, silver, tin, zinc, p,p'- 4,4-dichlorodiphenyldichloroethane (DDD), p,p'-DDE, acetone, methyl ethyl ketone (MEK), toluene, fluoranthene, naphthalene, phenanthrene, and pyrene. As with surface soil, no subsurface soil excavations are planned for SWMU 28 at this time; however, delineation and confirmation/SPLP sampling is necessary for some COCs.

2.2.3 Groundwater / Surface Water

No significant detections of SWMU 28 soil COCs were encountered in groundwater samples collected from monitoring wells W101 through W104 in three rounds of sampling. Similarly, surface water samples revealed no detections of metals, mercury, pesticides, PCBs, or semi-volatile organic compounds (SVOCs) Methyl tertiary butyl ether (MTBE) was detected at low concentrations in surface water; however, MTBE was not found in SWMU 28 soils. In addition, no significant detections of SWMU 28 soil COCs were found in historic data from Radian wells LF01-1A, -1B, -1C, -1D, -1E, and -1F. No further monitoring of SWMU 28 groundwater is planned.

2.3 Solid Waste Management Unit 29 (Landfill 2)

During the initial investigation of the SWMU 29 RFI in 1998, four Appendix IX characterization soil borings (B201, B202, B204, B206) were advanced using a DPT system An additional 19 borings were advanced to visually and lithologically characterize the landfill and to define the landfill boundaries. Four of the 19 borings (B203, B205, B210, and B215) also had piezometers installed to determine groundwater flow direction. The water table was encountered at approximately 18 ft-bgs in the landfill. Landfill debris encountered at SWMU 29 consisted mostly of stained soils, along with some concrete, asphalt, and metal wire. In 1999, a fifth Appendix IX characterization boring (B231) was advanced at the request of the TNRCC in the western portion of SWMU 29 using an HSA rig. A total of 16 borings (B232 to B247) were advanced to investigate and characterize stained soils encountered in the central area of the landfill. No Standard 3 concentrations of analytes were detected associated with stained soils; consequently, an IRA excavation of stained soil is not necessary for closure under Standard 2. A discussion of the results will be presented in the RFI report for SWMU 29. Soil boring locations are presented in Figure 2-3. Note that characterization borings present only analytical results above RRS-1.

Metals and PAHs were the primary COCs identified in surface and subsurface soils during the initial characterization activities. Consequently, several rounds of soil borings were advanced to delineate these RRS-2 and 3 COCs between 1999 and 2001. In addition, several borings were advanced to confirm RRS-3 COCs and SPLP analysis was performed on confirmed RRS-3 COCs to obtain site-specific MSCs. A total of 21 soil boring sample locations were advanced during this period. Analytical results from confirmation and delineation borings as well as site-specific MSCs are presented in Figure 2-3.

A total of four monitoring wells were installed in 1998 at SWMU 29 to delineate potential COCs in SWMU 29 groundwater Monitoring wells W201, W202, and W203 were installed as downgradient groundwater characterization wells, and monitoring well W204 was installed as the upgradient characterization well.

2.3.1 Surface Soil

RRS-2 and RRS-3 COCs were identified in surface soils at SWMU 29 during the characterization and delineation phases of the RFI (Figure 2-3). RRS-3 COCs detected in surface soils include antimony, barium, cadmium, chromium, lead, nickel, aldrin heptachlor epoxide, B2EHP, and the

PAHs with low MSCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, dibenzo(*a,h*)anthracene and indeno(1,2,3-*c,d*]pyrene). RRS-2 COCs detected in surface soils include nickel, zinc, endrin aldehyde, endrin ketone, p,p'-DDD, p,p'-DDE, p,p'- 4,4-dichlorodiphenyltrichlorethane (DDT), acetone, methylene chloride, PAHs, and sulfide.

As depicted on Figure 2.3, lead and B2EHP were the only RRS-3 compounds remaining above site-specific MSCs in SWMU 29 surface soils. All other RRS-3 compounds detected in the surface were either not confirmed at RRS-3 concentrations (green colored cells) or they are below site-specific MSCs (blue colored cells). All RRS-2 and RRS-3 PAH compounds at SWMU 29 are delineated to RRS-1, or are below the site-specific MSC. It should be noted that SWMU 29 is located directly adjacent to roads and a former runway. PAHs are found in asphalt and engine exhausts. Therefore, low concentrations of PAHs in low concentrations are considered to be ubiquitous in surface soils located in the vicinity of roads and runways. This rationale has successfully been used at other surface soil sampling locations affected by environmental PAH sources not related to SWMU activities (HydroGeoLogic, 2001).

Lead detections in SWMU 29 surface soil are delineated to the north, east, south, and west by samples collected at borings B248, B206, B239, and B237. The site-specific MSC (44.4 mg/kg) for lead was obtained from the delineation boring B229, however, lead failed SPLP at B251 with a concentration of 1470 mg/kg. Lead was also detected at a concentration of 1530 J mg/kg at B231. An IRA is planned to remove RRS-3 detections of lead at this location so that RRS-2 closure of SWMU 29 may be requested.

B2EHP detections in SWMU 29 surface soil are delineated to the east and south by samples collected at borings B204 and B201. Delineation of B2EHP to the north and west of B231 will be accomplished as part of the excavation confirmation sampling. B2EHP was detected at a concentration of 1 2 J mg/kg at B231, and was confirmed with a concentration of 1.2 mg/kg at B251. This detection of B2EHP failed SPLP. Consequently, an IRA is planned to remove RRS-3 detections of B2EHP at this location so that RRS-2 closure of SWMU 29 may be requested

2.3.2 Subsurface Soil

RRS-2 and RRS-3 COCs were identified in SWMU 29 subsurface soils during the characterization and delineation phases of the RFI (Figure 2-3) RRS-3 COCs detected in subsurface soils include cadmium, chromium, lead, selenium, thallium, heptachlor epoxide, and PAHs with low MSCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, B2EHP, chrysene, dibenzo(*a,h*)anthracene and indeno(1,2,3-*c,d*)pyrene] RRS-2 COCs detected in subsurface soils include cobalt, selenium, silver, zinc, p,p'-DDD, acetone, MEK, ethylbenzene, m-xylene, o-xylene, PAHs, and petroleum hydrocarbons.

All RRS-3 compounds detected in subsurface soils were either not confirmed at RRS-3 concentrations or they are below site-specific MSCs. All RRS-2 and RRS-3 subsurface detections at SWMU 29 are delineated to RRS-1.

2.3.3 Groundwater

No significant detections of SWMU 29 soil COCs were encountered in groundwater samples collected from monitoring wells W201-W204 in three rounds of sampling conducted in 1998. The only compound detected at RRS-3 concentrations was TCE, which was not detected at RRS-2 or RRS-3 concentrations in the soil at SWMU 29. The RRS-3 TCE concentrations and the RRS 2 concentrations of associated chlorinated solvents are considered to be part of the regional TCE plume and not related to landfill activities. There were RRS 2 detections of metals in all four wells, but they were not detected consistently across all three rounds. As significant (Standard 2 and Standard 3) concentrations of SWMU 29 COCs were not detected during the three rounds of sampling in 1998, groundwater monitoring was discontinued in 1999.

2.4 Solid Waste Management Unit 30 (Landfill 9)

SWMU 30 was operated as a landfill between 1978 and 1983. The unit reportedly managed clean construction rubble and trees. No hazardous materials were reportedly buried at this site, although materials with hazardous constituents may have been disposed of in the landfill (A.T. Kearney, 1989).

During the characterization phase of the SWMU 30 RFI, a total of 25 soil borings were advanced between April 1998 and March 1998, five of which were converted into piezometers to facilitate monitoring well placement Soil samples were collected from three borings (B910, B911, and B921) every 5 feet from the ground surface to the top of the water table and analyzed for the Appendix IX suite of analytes in accordance with the RCRA HW permit. The additional 22 borings were advanced to visually and lithologically characterize the landfill and to define the landfill boundaries. Debris encountered at SWMU 30 consisted primarily of asphalt, concrete, plastic, wood, wire, fence mesh, paint chips, tile, and bricks. Analytical results above RRS-1 from the characterization soil boring locations are presented in Figure 2-4.

Low concentrations of metals, PAHs, OC pesticides, and laboratory artifacts were detected in the surface soil and 5-foot interval during the initial characterization activities. Consequently, several rounds of soil borings were advanced to delineate or confirm RRS-2 and RRS-3 COCs between 1999 and 2001. A total of 21 soil boring/surface sample locations were advanced during this period. Analytical results from confirmation/SPLP analysis and delineation borings as well as site-specific MSCs are presented in Figure 2-4.

A total of eight monitoring wells were installed at SWMU 30 between June 1998 and January 1999 to characterize potential COCs in SWMU 30 groundwater. Three rounds of groundwater samples were collected from these monitoring wells between June and November 1999.

2.4.1 Surface Soil

RRS-2 and RRS-3 COCs were identified in surface soils at SWMU 30 during the characterization and delineation phases of the RFI (Figure 2-4). RRS-3 COCs detected in surface soils include barium, cadmium, lead, and various PAHs with low MSCs. RRS-2 COCs detected in surface soils include zinc and other PAHs.

As depicted on Figure 2-4, no compounds in the surface soil remain above site-specific MSCs at SWMU 30 All RRS-3 compounds detected in the surface were either not confirmed at RRS-3 concentrations or they were detected below site-specific MSCs. With the exception of PAHs in the northern portion of the landfill, all RRS-2 and RRS-3 compounds detected in surface soil at SWMU 30 are delineated to RRS-1 A series of soil samples with decreasing concentrations at or near the reporting limit for PAHs delineates PAHs in surface soils north of the landfill. It should be noted that SWMU 30 is located approximately 1/2 mile east of the fightline area of NAS Fort Worth JRB where PAHs have been exhausted from jet engines for the last 50 years. Therefore, low concentrations of PAHS are considered to be ubiquitous in surface soils located in the vicinity of an operational airport.

2.4.2 Subsurface Soil

RRS-2 and RRS-3 COCs were identified in SWMU 30 subsurface soils during the characterization and delineation phases of the RFI (Figure 2-4). RRS-3 COCs detected in subsurface soils include lead, chlordane, and PAHs with low MSCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, dibenzo(*a,h*)anthracene and indeno(1,2,3-*c,d*)pyrene]. RRS-2 COCs detected in subsurface soils include copper, mercury, zinc, alpha-chlordane, chlordane, gamma-chlordane, p,p'-DDE, MEK, and PAHs.

With the exception of lead in the north central and southwestern portions of the landfill at B921/B929 and B910/B927, all RRS-3 compounds detected in subsurface soils were either not confirmed at RRS-3 concentrations or they are below site-specific MSCs. Similarly, RRS-2 and RRS-3 subsurface detections at SWMU 30 are delineated to RRS-1.

Lead detections in SWMU 30 subsurface soil are delineated to the north, east, south, and west by samples collected at borings B928, B930, B932, B933, B934, B935, B944, B945 and B946. The site-specific MSC (101 mg/kg) for lead was obtained from the 10-foot interval of soil characterization boring B942; however, when SPLP analysis was performed on the detections of lead at B921/929 (154 mg/kg) and B910/B927 (68.4 J mg/kg), lead was detected in the SPLP extract at concentrations that exceeded the TNRCC MSC for industrial groundwater. Therefore, the concentrations of 169 mg/kg (B921/B929) and 68 4 J mg/kg (910/B927) and remain at a RRS-3 concentration cannot be used as a site-specific MSC for SWMU 30. The RRS-3 detections of lead at B910/B927 and B921/B929 will have to be removed as part of an IRA so that RRS-2 closure of soil at SWMU 30 may be requested.

2.4.3 Groundwater

During the three rounds of groundwater sampling conducted at SWMU 30, several inorganic analytes, including antimony, arsenic, cadmium, copper, nickel, and silver, were detected above their respective RRS-1 values in groundwater monitoring wells. Antimony, cadmium, copper, and nickel were only detected in W901. As W901 is the upgradient monitoring well for SWMU 30, no further sampling for these analytes in the groundwater is necessary. With the exception of arsenic (discussed below), the remaining detections of inorganic analytes are sporadic and not indicative of a release from the unit. B2EHP was also detected in groundwater samples collected from downgradient SWMU 30 monitoring wells. The detections are sporadic and do not

demonstrate a pattern of detection that is considered indicative of a release. Therefore, no additional sampling for these analytes in the groundwater at SWMU 30 is necessary.

Arsenic was detected above background in groundwater samples collected from monitoring wells W904 and W905 in two consecutive sampling events; however, arsenic was not detected in any SWMU 30 soil samples and arsenic is not considered to be a SWMU 30 COC. No further monitoring of arsenic is recommended for SWMU 30 monitoring wells.

2.5 Solid Waste Management Unit 62 (Landfill 6)

SWMU 62 was operated as a landfill between 1975 and 1978. The unit reportedly received construction rubble, trees, and miscellaneous trash as well as several drums of "hydraulic fluid." The landfill was covered in 1978 (A.T. Kearney, 1989). Observations and lithologic logs from the 1998 field effort indicate that SWMU 62 was covered with sand, gravel, and broken chunks of concrete.

In 1998, during the characterization phase of the SWMU 62 RFI, three Appendix IX soil borings (B604, B605, and B615) were advanced within the landfill using a DPT system. An additional 16 borings were advanced to visually and lithologically characterize the landfill and to define the landfill boundaries. At the request of the TNRCC, an additional Appendix IX soil boring (B626) was advanced in 1999 to chemically characterize the southern portion of the landfill The water table was encountered at approximately 18 ft-bgs throughout the landfill area. Various construction debris consisting primarily of concrete, rebar, asphalt, metal, roofing tiles, construction lumber, plywood, and glass was found throughout the landfill Analytical results above RRS-1 from the characterization soil boring locations are presented in Figure 2-5.

Metals, pesticides, and PAHs were the primary COCs identified in surface and subsurface soils during the initial characterization activities. Consequently, several rounds of soil borings were advanced to delineate RRS-2 and RRS-3 COCs between 1999 and 2001. In addition, several borings were advanced to confirm RRS-3 COCs and SPLP was performed on confirmed RRS-3 COCs to obtain site-specific MSCs. A total of 25 soil boring/surface sample locations were advanced during this period. Analytical results from confirmation and delineation borings as well as site-specific MSCs are presented in Figure 2-5

A total of four monitoring wells (one upgradient and three downgradient) were installed at SWMU 62 to characterize potential COCs in SWMU 62 groundwater. In 1998, monitoring wells W601, W602, and W603 were installed downgradient of the unit, and monitoring well W604 was installed upgradient of the unit.

2.5.1 Surface Soil

RRS-2 and RRS-3 COCs were identified in surface soils at SWMU 62 during the characterization and delineation phases of the RFI (Figure 2-5). RRS-3 COCs detected in surface soils include antimony, beryllium, and lead RRS-2 COCs detected in surface soils include nickel, vanadium, zinc, p,p'-DDE, and fluoranthene.

As depicted on Figure 2-5, lead is the only RRS-3 compound remaining above site-specific MSCs in SWMU 62 surface soils. All other RRS-3 compounds detected in the surface were either not confirmed at RRS-3 concentrations or they were detected below site-specific MSCs. With the exception of lead, all RRS-2 and RRS-3 compounds detected in surface soil at SWMU 62 are delineated to RRS-1.

Lead detections in the main body of SWMU 62 surface soil are delineated to the north, south, and east. The site-specific MSC (27.5 mg/kg) for lead was obtained from the delineation boring B628B; however, lead was detected in the western portion of the landfill at a concentration of 110 mg/kg at B640. It was subsequently confirmed in a duplicate sample at a concentration of 116 mg/kg. When SPLP analysis was performed on the detection of lead at B640, lead was detected in the SPLP extract at a concentration that exceeded the TNRCC MSC for industrial groundwater. Therefore, the concentration of 116 mg/kg detected at B640 remains at a RRS-3 concentration and cannot be used as a site-specific MSC for SWMU 62. Lead was also detected at RRS-3 concentrations in the B640 delineation locations B646 (61 mg/kg) and B647 (53 mg/kg). Since the soil samples for lead at B646 and B647 are still within holding times, confirmation and SPLP of these two detections has been requested to increase the site-specific MSC for lead at SWMU 62 The remaining RRS-3 detections of lead at B640, B646, and B647 will have to be removed and delineated as part of an IRA so that RRS-2 closure of soil at SWM62 may be requested.

2.5.2 Subsurface Soil

RRS-2 and RRS-3 COCs were identified in SWMU 62 subsurface soils during the characterization and delineation phases of the RFI (Figure 2-5). RRS-3 COCs detected in subsurface soils include chromium, lead, chlordane, dieldrin, and PAHs with low MSCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, dibenzo(*a,h*)anthracene, and indeno(1,2,3-*c,d*)pyrene]. RRS-2 COCs detected in subsurface soils include vanadium, zinc, chlordane, p,p'-DDE, acetone, MEK, sulfide, and PAHs.

With the exception of lead in the western portion of the landfill at B640, all RRS-3 compounds detected in subsurface soils were either not confirmed at RRS-3 concentrations or they are below site-specific MSCs. Similarly, RRS-2 and RRS-3 subsurface detections at SWMU 62 are delineated to RRS-1 Lead must be delineated before RRS-2 closure may be requested for SWMU 62. It should be noted that boring B641 provides eastern delineation of PAHs detected in the 5-foot interval of B615. Soil borings B628B, B635, and B636 are considered to be out of the lithologic and photo-identified boundaries of SWMU 62. PAHs east of the unit may be associated with a vehicle parking area used between 1978 and 1980 and/or surficial debris in the area east of SWMU 62

2.5.3 Groundwater

Three rounds of groundwater samples were collected upgradient and downgradient of SWMU 62 in 1998. The initial round of groundwater samples was analyzed for the full suite of Appendix IX compounds The second and third rounds were analyzed for metals, VOCs, SVOCs, and pesticides. The predominant detections were of chlorinated solvents associated with the regional TCE plume. No COCs associated with SWMU 62 soils were detected downgradient of the unit Groundwater monitoring was discontinued at SWMU 62 in 1999.

3.0 Interim Remedial Action Objectives

The overall objective is to conduct IRAs necessary to obtain closure of the five subject SWMUs under the TNRCC RRS program. An overview of the RRS program is presented in Section 2.0 of the *Draft Technical Memorandum* (HydroGeoLogic, 1998a) and Section 1.2 of the Final RFI of SWMUs 22, 23, 24, and 25 (HydroGeoLogic, 2001). In addition, the SWMUs at NAS Fort Worth JRB are subject to the specific requirements of the TNRCC RCRA permit (HW-50289). Specific permit requirements are discussed in greater detail in Section 3 2 of the RFI WPs (HydroGeoLogic, 1998b).

In summary, this IRA was designed and conducted to achieve the following objectives:

- Delineate RRS-2 and RRS-3 COCs and confirm RRS-3 detections.
- Conduct pre-removal confirmation sampling.
- Excavate a pre-determined volume of contaminated soil.
- Remove, properly contain and dispose of the excavated and contaminated soil.
- Backfill with appropriate material.
- Re-grade and restore site to present configuration

4.0 Description of Remedial Actions

4.1 Solid Waste Management Unit 17 (Landfill 7)

As noted previously, alternative MSCs for COCs detected at several SWMU 17 boring locations could not be established using SPLP and the COCs currently remain at RRS-3 concentrations. An IRA consisting of two excavations is to be conducted in order to remove RRS-3 contaminant concentrations.[1] The proposed excavations appear to be the best interim remedy for attaining RRS-2 closure for the site soils (Figure 2-1). With the goal being to attain RRS-2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COCs are below site-specific RRS-2 concentrations This is determined by comparing the confirmation sampling result to the TNRCC established RRS-2 value, or the site-specific MSC, if it exists (Figure 2-1). The primary COC at SWMU 17 is lead and the current site-specific MSC value for lead at SWMU 17 is 73.1 mg/kg (See Section 2.1.1).

Pre-excavation confirmation sampling using DPT methods is recommended to ensure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities. If RRS-3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and/or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that RRS-2 concentrations of COCs have been established on all faces of the excavation area. The excavation intervals and COCs driving the excavations are also noted with pink colored cells on Figure 2-1 analytical tables. Specific details about each excavation are outlined below.

4.1.1 Excavation Description

Excavation SWMU 17A is for the removal of lead-contaminated soils at the surface interval of boring B701/B718. Excavation SWMU 17A will be centered on the location of boring B701/B718. The dimensions of the excavation will extend to 5 feet wide by 5 feet long, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B701/B718 at a depth of 2 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 0-to-0.5-foot interval, with locations centered on each the north, south, east, and west sidewalls of the excavation. The proposed SWMU 17A excavation location and dimensions are presented in Figure 2-1.

Excavation SWMU 17B is for the remediation and removal of surface soils contaminated with RRS-3 concentrations of lead. Excavation SWMU 17B is to be centered on the location of boring B725/B768. The initial excavation will extend to 5 feet long by 5 feet wide, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B725/B768 at a depth of 2 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 0-to-0.5-foot interval, with locations centered on each the north, south, east, and west sidewalls of the excavation. The proposed SWMU 17B excavation location and dimensions are presented in Figure 2-1.

[1]IRA excavation boundaries may be altered and/or additional IRA sites may be added to the area of all SWMUs in this IRA WP and are subject to confirmation sampling of the excavated area

4.2 Solid Waste Management Unit 28 (Landfill 1)

As discussed in Section 2.2, alternative MSCs for COCs at most SWMU 28 boring locations were established using SPLP, and most of the COCs are at or below site-specific RRS-2 concentrations. The alternative MSCs are presented on Figure 2-2. However, RRS-3 concentrations for several compounds encountered at one of the 2001 characterization borings still exist. Confirmation/SPLP sampling is proposed for these compounds. In addition, delineation is required for some of the COCs detected at RRS-2 and RRS-3 concentrations at all three of the characterization borings advanced in June 2001. Rationale for additional sampling is presented below. Proposed sample locations are presented in Figure 2-2

4.2.1 Proposed Surface Soil Sampling

Soil sample locations B127 and B128 are proposed to delineate surface detections of cadmium and silver at B123 to the west and north of B123. The detection of zinc in the surface interval of B123 at a concentration of 40.4 mg/kg is considered to be a natural variation of the background value of 38.8 mg/kg.

Soil boring B130 is proposed to delineate cadmium, lead, silver, zinc, and p,p'-DDE detections at B126 to the west of B126. Soil boring B132 is proposed to delineate surface detections of zinc and p,p'-DDE south of B126. Note that cadmium, lead, and silver are already delineated in surface soil south of B126 by B108

Soil sample locations B133 and B134 are proposed to delineate the surface detection of silver in B111. Sample B133 will be collected along the bank of the Trinity River to the southeast of B111, and Sample B134 will be collected away from the bank to the west-southwest of B111

4.2.2 Proposed Subsurface Soil Sampling

Soil boring B129 is proposed to delineate subsurface detections at B124 of metals, mercury, pesticides, VOCs, and PAHs to the west of B124. Lead, zinc, p,p'-DDE, and toluene will be delineated in the 5-foot interval of B129 and toluene will be delineated in the 10-foot interval of B129. Note that lead is delineated to the west of B124 in the 10-foot interval of B106/B120. Appendix IX metals, mercury, p,p'-DDD, p,p'-DDE, toluene, and PAHs will be delineated in the 15-foot interval of B129 and toluene will be delineated in the 20-foot interval of B129. Detections of chromium (18.2 mg/kg) and zinc (34 5 mg/kg) in the 20-foot interval of B126 are considered to be natural variations of the background concentrations of 16.31 mg/kg and 31.3 mg/kg respectively. If bedrock is encountered before deeper samples can be collected, then all analyses and analytes proposed for the deeper sample intervals should be consolidated into a soil sample collected just above bedrock to provide delineation of these compounds

Soil boring B130 is proposed to delineate subsurface detections detected in the 5-foot interval of B126 of toluene and B2EHP to the west of B126. Depth to bedrock is approximately 6 ft-bgs next to B130. The sample interval just above bedrock should be sampled for Appendix IX metals, mercury, p,p'-DDD, p,p'DDE, toluene, B2EHP, and naphthalene. If bedrock is encountered at 6 ft-bgs, then these samples should be consolidated into the 5-foot interval of B130.

Soil boring B131 is proposed to confirm RRS-3 detections of mercury and B2EHP detected in the 5-, 10-foot intervals of B126. SPLP analysis will be performed on each of these analytes to obtain site-specific MSCs for these compounds. If alternative MSCs cannot be established for any of these compounds then excavation of the remaining RRS-3 COCs may be necessary to obtain closure of SWMU 28 under RRS-2. Note that confirmation/SPLP is currently being performed for RRS-3 copper detected in the 15-foot interval of B126. Potential excavation dimensions could range in size and volume if the groundwater MSC is exceeded in the SPLP extract of confirmed RRS-3 COCs in the various sample intervals.

Soil boring B132 is proposed to delineate subsurface detections to the south of B126. The 5-foot interval of B132 will be sampled for cadmium, copper, lead, zinc, mercury, toluene, and B2EHP. Silver is delineated in the 5-foot interval by B108. The 10-foot interval of B132 will be sampled for cadmium, copper, lead, tin, zinc, p,p'DDD, p,p'-DDE, toluene, B2EHP, and naphthalene. Note that arsenic, mercury, and silver are delineated in the 10-foot interval south of B126 by B108. The 15-foot interval of B132 will be sampled for Appendix IX metals (less mercury) and toluene. The 20-foot interval of B132 will be sampled for toluene only. The detection of acetone in the 20-foot interval of B126 is considered to be a laboratory artifact If bedrock is encountered before all subsurface samples can be collected, then the deeper proposed subsurface samples should be consolidated into the interval just above bedrock to obtain delineation of these compounds.

4.3 Solid Waste Management Unit 29 (Landfill 2)

As mentioned in Section 2.3, only two of the COCs at SWMU 29 currently remain at RRS-3 concentrations. An IRA consisting of one excavation is to be conducted in order to remove RRS-3 contaminant concentrations. The proposed excavation appears to be the best interim remedy for attaining RRS-2 closure for the site soils (Figure 2-3) With the goal being to attain RRS-2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COCs are below site-specific RRS-2 concentrations. This is determined by comparing the confirmation sampling result to the TNRCC established RRS-2 value for B2EHP and the site-specific MSC of 44.4 mg/kg for lead from soil boring BHGLTA229 (Figure 2-3).

Pre-excavation confirmation sampling using DPT methods is recommended to ensure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities. If RRS-3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and/or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that RRS-2 concentrations of COCs have been established on all faces of the excavation area. The excavation intervals and COCs driving the excavations are also noted with pink colored cells on the Figure 2-3 analytical tables. Specific details about the excavation are outlined below.

4.3.1 Excavation Description

Excavation SWMU 29A is for the removal of lead and B2EHP-contaminated soils at the surface interval of borings B231 and B251. The dimensions of the excavation will extend to 10 feet wide by 10 feet long, with an excavation depth of 2 feet (7.4 cubic yards). A confirmation sample will be collected and analyzed for lead and B2EHP directly below B231/B251 at depth of 2 ft-bgs.

Four additional samples, analyzed for lead and B2EHP (68, 4J mg/kg at B910/B927) only, will be collected at the 0-0.5' foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 29A excavation location and dimensions are presented in Figure 2-3. Note that proposed excavations SWMU 31A and SWMU 31B will be completed under a separate work plan as part of the IRAs for Waste Accumulation Areas

4.4 Solid Waste Management Unit 30 (Landfill 9)

As mentioned in Section 2.4, only one of the COCs at SWMU 30 remains at RRS-3 concentrations. An IRA consisting of two excavations is to be conducted in order to remove RRS-3 contaminant concentrations. The proposed excavation appears to be the best interim remedy for attaining RRS-2 closure for the site soils (Figure 2-4) With the goal being to attain an RRS-2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COCs are below site-specific RRS-2 concentrations. This is normally determined by comparing the confirmation sampling result to the site-specific MSC of 101 mg/kg for lead at SWMU 30 (Figure 2-4), however, the SPLP extract of a soil sample with a lower lead concentration (68.4 J mg/kg at B910/B927) was found to contain lead above the RRS-2 value for industrial groundwater. Consequently, no soil value greater than 68.4 mg/kg can be considered below Standard 3 unless confirmed by an analysis of an SPLP extract. The highest lead result that can be used to establish as site-specific MSC is the detection of 30 mg/kg at the 15-foot interval of B942. The SPLP extract will be analyzed for any confirmation sample from a SWMU 30 IRA excavation that exceeds 30 mg/kg

Pre-excavation confirmation sampling using DPT methods is recommended to ensure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities. If RRS-3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and/or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that RRS-2 concentrations of COCs have been established on all faces of the excavation area The excavation intervals and COCs driving the excavations are also noted with pink colored cells on Figure 2-4 analytical tables. Specific details about the excavation are outlined below.

4.4.1 Excavation Description

Excavation SWMU 30A is for the removal of lead contaminated soils at the 5-foot interval of borings B921/B929. The dimensions of the excavation will extend to 7 feet wide by 7 feet long, with an excavation depth of 7 feet (12.7 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B921/B929 at a depth of 7 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. Since the site-specific MSC of 101 mg/kg is less than the concentration of 154 J mg/kg (B921/B927-5-foot) that exceeded the industrial groundwater MSC in the SPLP analysis, the site-specific MSC of 101 mg/kg should be used at as a comparison value at excavation SWMU 30A. The proposed SWMU 30A excavation location and dimensions are presented in Figure 2-4

Excavation SWMU 30B is for the removal of lead contaminated soils at the 5' interval of borings B910/B927. The dimensions of the excavation will extend to 7 feet wide by 7 feet long, with an

excavation depth of 7 feet (12 7 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B910/B927 at a depth of 7 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. SPLP should be run on each RRS-3 confirmation sample that exceeds 30 mg/kg to determine if the lead concentrations are protective of the environment at this excavation location. Note that lead was not detected above RRS-1 in the 10-foot interval of B910/B927 If the confirmation sample collected in the 7-foot interval exceeds the industrial groundwater MSC in the SPLP extract, the excavation should be completed to a depth of 10 ft-bgs where lead is known to be below background concentrations. The proposed SWMU 30B excavation location and dimensions are presented in Figure 2-4

4.5 Solid Waste Management Unit 62 (Landfill 6)

As noted in Section 2.5, an altemative MSC for COCs detected at several SWMU 62 boring locations could not be established using SPLP. These COCs currently remain at RRS-3 concentrations. An IRA consisting of three excavations is to be conducted in order to remove RRS-3 contaminant concentrations.[2] The proposed excavations appear to be the best interim remedy for attaining RRS-2 closure for the site soils (Figure 2-5). With the goal being to attain RRS-2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COCs are below site-specific RRS-2 concentrations. This is determined by comparing the confirmation sampling result to the TNRCC established RRS-2 value, or the site-specific MSC, if it exists (Figure 2-5) The primary COC at SWMU 62 is lead and the current RRS-2 value for lead at SWMU 62 is 27.5 mg/kg.

Pre-excavation confirmation sampling using DPT methods is recommended to ensure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities If RRS-3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and/or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that RRS-2 concentrations of COCs have been established on all faces of the excavation area. The excavation intervals and COCs driving the excavations are also noted with pink colored cells on the Figure 2-5 analytical tables. Specific details about each excavation are outlined below.

4.5.1 Excavation Description

Excavation SWMU 62A is for the removal of lead contaminated soils at the surface and 5-foot interval of boring B640. Excavation SWMU 62A will be centered on the location of boring B640. The dimensions of the excavation will extend to 7 feet wide by 7 feet long, with an excavation depth of 7 feet (12.7 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B640 at a depth of 7 ft-bgs. Four soil samples, analyzed for lead only, will be collected at the surface interval, with locations centered on the north, south, east, and west sidewalls of the excavation. An additional four soil samples, also analyzed for lead only, will be collected at the 5-foot interval, with locations centered on the north, south, east, and west

[2]IRA excavation boundaries may be altered and/or additional IRA sites may be added to the area of all SWMUs in this IRA WP and are subject to confirmation sampling of the excavated area

sidewalls of the excavation. The proposed SWMU 62A excavation location and dimensions are presented in Figure 2-5.

Excavation SWMU 62B is for the remediation and removal of surface soils contaminated with RRS-3 concentrations of lead. Excavation SWMU 62B is to be centered on the location of boring B646. The initial excavation will extend to 5 feet long by 5 feet wide, with an excavation depth of 5 feet (4 6 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B646 at a depth of 5 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 0-to-0.5-foot interval, with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 62B excavation location and dimensions are presented in Figure 2-5. Note that the 5-foot interval will provide westem delineation of the lead detection at the 5-foot interval of B640 as well as vertical delineation at B646. The surface samples will delineate lead detected at B646 to the north, west, and south.

Excavation SWMU 62C is for the remediation and removal of surface soils contaminated with RRS-3 concentrations of lead. Excavation SWMU 62C is to be centered on the location of boring B647. The initial excavation will extend to 5 feet long by 5 feet wide, with an excavation depth of 5 feet (4.6 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B647 at a depth of 5 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 0-to-0 5-foot interval, with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 62C excavation location and dimensions are presented in Figure 2 5 Note that the 5-foot interval will provide southern delineation of the lead detection at the 5-foot interval of B640 as well as vertical delineation at B647. The surface samples will delineate lead detected at B646 to the west, south, and east.

5.0 Description of Work

Figure 1-1 shows the location of each SWMU. The areas to be excavated are shown on Figures 2-1 through 2-5. Refer to Table 3-2 of the Field Sampling Plan for an identification of the tasks to be performed at each of the sites.

In the event that hazardous materials are discovered during excavation at any site, the excavation will be temporarily halted and the potential threat to human health and/or the environment will be evaluated along with consultation with the AFCEE and TNRCC field inspector. Potentially hazardous soils, liquids, or similar materials that do not pose an immediate or short-term threat to human health or the environment will be appropriately contained and transported to the investigation-derived waste (IDW) storage area. Potentially hazardous soils, liquids, or similar materials that do pose an immediate or short-term threat to human health or the environment will be handled as an emergency response.

If unexploded ordnance (UXO) is encountered, work will be halted and control of the site given over to the appropriate Air Force and Navy personnel. The excavation effort will resume only if clearance is given in writing by an authorized Air Force or other Department of Defense representative.

The IRA herein described is anticipated to begin in October 2001 and is expected to last from two to four weeks. This IRA WP is divided into nine tasks:

- Task 1 – Mobilization/demobilization
- Task 2 – Site preparation and clearance
- Task 3 – Excavation
- Task 4 – Temporary storage and disposal of excavated materials
- Task 5 – Transport and disposal of COC soils
- Task 6 – Acquisition and transport clean fill
- Task 7 – Backfill and site restoration
- Task 8 – Equipment decontamination
- Task 9 – Reporting

5.1 Task 1 – Mobilization / Demobilization

This task includes all necessary planning, site clearances, preparation of any permit applications, and efforts needed to obtain necessary permits. It also includes site preparation and mobilizing personnel and equipment to the site. EEG will act as the initial point of contact with the base for all activities and will obtain utility clearances from NAS Fort Worth JRB. Prior to commencement of drilling activities, utility clearances will be obtained through the services of an established utility locating service subcontractor, and dig permits will be secured from the Navy Public Works office. These permits, once obtained, will be maintained in clear view at each work site. Since SWMU 62 (Landfill 6) is located outside of the boundaries of NAS Ft. Worth JRB, EEG will notify and secure the approval of the Westworth Redevelopment Authority prior to mobilizing onto this site. EEG will also obtain all other permits, applications, certificates, and other documents required by federal, state, and local authorities to perform and complete each remedial action.

If necessary, traffic will be routed around each work site with minimal interference to normal traffic patterns. EEG's subcontractor will maintain access to the work site at all times and furnish all signs, barricades, and flagmen required to control traffic. All signs and barricades shall be in accordance with the American National Standards Institute (ANSI) D6.1, Manual of Uniform Traffic Control Devices. If needed, temporary fencing or other barricades will be installed to restrict access to the work sites or to control vehicle or pedestrian traffic. Traffic patterns will minimize the chance of accidents and protect the public and worker safety. The use of traffic patterns will be initiated in areas where base personnel must travel in proximity to the IRA site.

Prior to commencement of work, all excavation equipment shall be cleaned and decontaminated according to the guidelines described in Subsection 5.8. The equipment shall not leak any fluids that may enter the excavation or contaminate equipment that is placed in the pits If hazardous material is encountered, any necessary permits for excavation, transport, and/or disposal of hazardous debris will be obtained in a timely manner.

5.2 Task 2 – Site Preparation and Clearance

No excavation shall be performed until a NAS Fort Worth JRB digging permit is acquired, underground utility clearances have been obtained, and site utilities have been field located. The subcontractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Although EEG will acquire the necessary utility clearances before work begins, the subcontractor is required to verify the safe vertical limit of excavating equipment for working in the vicinity of active electrical components.

Before any excavation equipment is moved onto each project site, a decontamination area for that site will be established. Where practical, a decontamination area may be shared between sites that are in close proximity to each other. The decontamination areas shall be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. The decontamination area shall be lined with a heavy-gauge plastic sheeting and designed with a collection system to capture decontamination waters. Solid wastes shall be accumulated in 55-gallon drums and subsequently transported to the waste storage area designated by Mike Dodyk, PE, the authorized base point of contact Smaller decontamination areas for personnel and portable equipment shall be provided as necessary. These locations shall include basins or tubs to capture decontamination fluids, which shall be transferred to a large accumulation tank as necessary. The IDW storage area is located in the Civil Engineering Storage Yard south of Building 1337. Containers of IDW from each excavation area will be brought to this storage lot. IDW shall be properly containerized and temporarily stored at each site prior to transportation into the storage lot. General waste-handling procedures are discussed in Section 5 5.

For the completion of IRAs at various SWMUs, it may be necessary to remove chain link fencing that presently runs along at least one side of the SWMUs. If it becomes necessary to remove, or by the act of excavation the structural integrity of the fencing is compromised, the subcontractor shall provide for the reinstallation of said fencing In the event that existing fencing must be removed or temporarily relocated, the subcontractor shall take steps to ensure the security of the site and the safety of workers or base personnel that may be in the area, especially after normal

working hours. This will be accomplished by use of various types of barriers or temporary fencing as the site manager shall deem appropriate.

5.3 Task 3 – Excavation

Figures 2-1 through 2-5 show the areas to be excavated for each site. The site-specific dimensions are listed above in Sections 4.0. The location of each excavation site will be clearly marked in the field by EEG before the excavation activities commence. At each site, the subcontractor will maintain an excavation of sufficient size to allow workers to complete all necessary tasks related to this IRA in a safe and timely manner. In the case of where the depth of the excavation will be 7 feet or more, coordinated efforts by the subcontractor and soil sampling personnel will be initiated to facilitate the safe collection of confirmation samples from the excavated area. Where possible, confirmation sampling will be accomplished by sampling directly from the excavator bucket. If this proves problematic, confirmation sampling will be facilitated with a sampling hand auger or similar device. Both of these methods will afford sampling personnel the ability to conduct sampling operations without physically entering the excavation pit. All contractors and subcontractors shall follow Occupational Safety and Health Administration (OSHA) rules for excavation and confined space entry and also notify the Navy Occupational Safety and Health office. Sheeting, bracing, or shoring shall be installed in the absence of adequate side slopes if there is a need for workers to enter the excavated area. The subcontractor will submit specifications to EEG for sheeting, bracing, or shoring that shall be installed in the absence of adequate side slopes if there is a need for workers to enter any excavation areas that are greater than 4 feet deep

Excavation and sampling activities will be monitored with an organic vapor monitor such as a photo-ionization detector (PID) or an organic vapor analyzer (OVA). Additional monitoring devices may be deemed advisable such as Draeger tubes and a LEL/02 for benzene monitoring at depth.

Surface water shall be diverted to prevent entry into the excavation. The subcontractor will protect the site from puddling or running water, or accumulation of standing water in excavations Excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. All excavated soils will be temporarily stored in such a way as to prevent movement of COC soils from the containment area. This would include protection from precipitation events or displacement of material by wind. This could involve utilization of a water-impermeable tarp between the ground and the bottom of the pile that is protected from surface water by a berm structure around its perimeter and under the tarp. The berm structure can be achieved by clean fill, or dimensional lumber laid end-to-end, or uncontaminated soil. The whole pile would also be covered by a secured water impermeable tarp to protect the deposited COC soil from precipitation and wind.

It is not expected that excavation activity will come into contact with the water table at any of the SWMUs addressed by this IRA. Nevertheless, the subcontractor shall be prepared to deal with any dewatering of the excavation pit necessary for the adequate completion of the proposed work. If large volumes of water are to be pumped, the subcontractor will station a portable water storage tank for collection of removed water. Any dewatering that might be needed shall be limited to

that necessary to ensure adequate access and safe excavation, and to ensure that compaction requirements can be met.

No blasting will be permitted. No open burning of trash, brush, or refuse will be permitted In addition, the subcontractor will take steps to ensure that no accumulation of litter or debris shall accumulate or be deposited at the IRA site herein described The subcontractor, where necessary, shall provide appropriate waste containers.

The subcontractor will treat areas subject to dust-producing activities with liquid palliatives that will not harm re-growth of vegetation, or with another such method of dust control that complies with base regulations. Likewise, excavated materials stored for subsequent use as backfill will be treated or protected to control the production of dust in accordance with base regulations

EEG will conduct all soil and water sampling in accordance with TNRCC regulations during excavation activities. EEG will provide all bottleware, sampling supplies, and sample analyses. Sampling intervals for each SWMU excavation is as stated above in Section 4.0 Stockpiled soils will also be tested after removal so as to determine suitability for backfill or appropriate containment and disposal Each sample shall be homogenized and quartered before being containerized. Samples collected for VOC analysis shall be containerized prior to sample homogenization. Stainless steel scoops or trowels, glass jars with Teflon™ lids, or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples. Any above ground vegetative matter or debris will be excluded from the sample.

Specific suites of laboratory analyses are prescribed for each individual SWMU addressed by this IRA WP Analytical methods and COCs to be tested are listed in Figures 2-1 through 2-5.

Appropriate methods for the collection of samples will be dependent upon the method of analysis chosen Samples will be collected from the exposed soil surface using a stainless steel hand trowel for metals, total petroleum hydrocarbon (TPH), or SVOCs. VOC samples will be collected using the EnCore™ soil sampler. The QAPP (HydroGeoLogic, 2000) will be used to ensure that the data collected is accurate and representative.

The sampling crew will record any unusual surface conditions that may affect the chemical analyses such as (1) asphalt pieces that may have been shattered by mowers, thus spreading small fragments of asphalt over the sampling area, (2) distance to roadways, aircraft runways, or taxiways, (3) obvious deposition of contaminated or clean soil at the site, (4) evidence of dumping or spillage of chemicals, (5) soil discoloration, and/or (6) unusual condition of growing plants, etc.

5.4 Task 4 – Temporary Storage and Disposal of Excavated Materials

The State of Texas requires the generator to determine if the waste is hazardous within 90 days from the date it was produced. In AFCEE's agreement with the Navy, hazardous or non-hazardous waste will not be stored on base for more than 90 days. In the event that hazardous materials are discovered during this investigation, the subcontractor will stop work and notify the EEG field supervisor for further direction. Potentially hazardous soils, liquids, or similar

materials that do not pose an immediate or short-term threat to human health or the environment will be secured in the manner described in Section 5.2 and Appendix A.

All IDWs will be stored in the AFCEE storage yard, in compliance with TNRCC regulations. Hazardous material shall be stored in 55-gallon drums or other sealed containers suitable for prevention of contaminant release. Storage shall comply with RCRA regulations and relevant TNRCC requirements for temporary storage of hazardous materials. Field personnel will use proper drum labeling techniques in order to identify the origin of the waste. All drums will be placed on wood palettes. Field personnel will complete the IDW Inventory Sheet to log all waste produced. At the completion of all excavation work at the four SWMUs, composite samples of the waste will be collected by the field sampling team and submitted to an approved laboratory for analysis. Analytical testing will be performed to characterize any potentially hazardous debris found during the excavation. Following receipt of analytical results, EEG will request approval for disposal of the waste from the receiving disposal facility.

Upon approval, solids will be disposed of at a permitted landfill. Depending on the analytical results for containerized water, the water may be discharged into the base sanitary sewer at the Civil Engineering Storage Yard via Manway #4, or shipped off-site for disposal. Depending on the volume of IDW produced, the drums containing solids are either emptied into a roll-off container by field sampling personnel or the drums themselves are removed by a licensed transporter to the landfill. Disposal of containerized water will be accomplished only after approval is secured from the Navy Environmental office. Water that is transferred into the sanitary sewer system will be documented on the IDW Inventory Sheet by field personnel for submittal to the Navy. Waste that is transported off base will be accompanied by a waste manifest that is completed by EEG and signed by an AFCEE representative.

Potentially hazardous soils, liquids or similar materials that do pose an immediate or short-term threat to human health or the environment will be handled by the Subcontractor as an emergency response

For any spill of hazardous material that could threaten or harm human health or the environment, or that exceeds the reportable quantity limits under 40 CFR 302.4, EEG will immediately notify the following entities:

- Base fire department
- AFCEE
- TNRCC
- National Response Center at 1-800-424-8802

The spill will be immediately cleaned up and the material will be re-collected and stored for proper disposal. Written reports in accordance with relevant TNRCC guidance will be submitted within 15 calendar days.

5.5 Task 5 – Transport and Disposal of COC Soils

All soil and debris that is to be removed should be treated as potentially hazardous, though it is not anticipated to be. Field screening and definitive analytical laboratory analysis is to be utilized

to verify that material is non-hazardous. EEG will maintain a log of the materials and any visible signs of contamination encountered during excavation.

The subcontractor shall segregate and contain any and all excavated material in the manner described in Section 5.3, 5.4, and Appendix A. All materials will be handled, transported, stored, and disposed of in accordance with applicable federal, state, and local laws, ordinances, or other rulings having the effect of law, including but not limited to the items listed below:

- Resource Conservation and Recovery Act (42 USC 6901)
- Clean Water Act (33 USC 1251)
- Clean Air Act (42 USC 7401-7642)
- Toxic Substances Control Act (15 USC 260)
- National Environmental Policy Act (42 USC 4321-4347)
- Hazard Communication (OSHA Std 29 CFR 1910.1200)

Disposal of COC soils shall be performed by the subcontractor in accordance with all local, state, and federal solid and hazardous waste laws and regulations, and conditions specified herein. This work shall include all necessary personnel, labor, transportation, packaging, documentation (if required for disposal, manifesting or completing waste profile sheets), equipment, and reports EEG will perform all sampling and analyses needed to support the determination of the disposal method. Personal protective equipment and other associated miscellaneous wastes are expected to be non-hazardous and will be packed in appropriate IDW containers

Transportation shall be provided in accordance with Department of Transportation (DOT) Hazardous Material Regulations and state and local requirements, including obtaining all necessary permits, licenses, and approvals. Evidence that a state licensed hazardous waste transporter is being used shall be submitted to EEG. Transport vehicles shall not be overloaded and will have the ability to totally enclose the waste soils so as to prevent loss or wetting during transport. Transportation, treatment, disposal methods and dates, the quantities of waste, the names and addresses of each transporter, and the disposal or reclamation facility, shall also be made available for inspection, as well as copies of manifests and certifications of final treatment/disposal signed by the responsible disposal facility official.

The wastes shall be taken to a treatment, storage, or disposal facility which has EPA or appropriate state permits and hazardous waste identification numbers and complies with the provisions of all applicable federal, state and local regulations The original return copy of the hazardous waste manifest, signed by the owner or operator of a facility legally permitted to treat or dispose of those materials shall be furnished to EEG not later than 10 working days following the delivery of those materials to the facility A statement of agreement and sampling requirements from the proposed treatment, storage or disposal facility and certified transporters to accept hazardous wastes shall be furnished to EEG not less than 14 days before transporting any wastes If the Subcontractor selects a different facility than is identified in the proposal, documentation shall be provided for approval to certify that the facility is authorized and meets the standards specified in 40 CFR 264

5.6 Task 6 – Acquisition and Transport of Clean Fill

Depending upon the results of stockpile characterization and confirmation sampling, the excavated material may be used as backfill when the excavation has been completed. No borrow material from other unrelated sites on NAS Fort Worth JRB will be used for fill material. If needed, satisfactory off-site fill will be brought in, and will consist of clean, sound, durable particles and be free of hazardous materials, roots, grass, or other biodegradable materials. All backfill materials delivered into the base shall be transported in accordance with 49 CFR 172, 173, 178, and 179, and all other applicable local, state, and federal transportation regulations.

5.7 Task 7 – Backfill and Site Restoration

Satisfactory excavated materials may be used as backfill. Non-hazardous excavated material shall be backfilled immediately after the required information has been recorded The first soils that were excavated shall be the last replaced when filling each pit, so that native soils will be restored at the ground surface. No excavation pit shall be left open overnight unless adequate safety precautions are employed. No borrow material from other unrelated sites on NAS Fort Worth JRB will be used for fill material. Soils will be backfilled until compaction requirements are met and the original grade is restored.

At each excavation location, the subcontractor must compact soils when backfilling, using 6-inch lifts, to obtain a 95 percent density for materials returned to excavation pits. At least three compaction density tests shall be performed, in accordance with ANSI/ASTM D1556, ANSO/ASTM D1557, or ANSI/ASTM D698. The degree of compaction required is expressed as a percentage of the maximum density obtained by the compaction test procedure using a Nuclear Density Test Gauge (NDTG) Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

The fill material shall be mixed and blended to the proper moisture content before beginning compaction The mixed material shall be placed on the prepared sub-grade in layers of uniform thickness. The surface shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections of existing surfaces at each site. The lines and grades including cross and crown slope indicated for the select fill shall be maintained by means of line and grade stakes.

Segregated soil stockpiles that appear or are suspected to be contaminated with hazardous substances are to be contained and disposed of in accordance with provisions outlined in Sections 5.4 and 5.5 Stockpiled soils subjected to chemical confirmation testing may be used as backfill if they are found to conform to the requirements of clean fill per TNRCC regulation, 30 Texas Administrative Code (TAC) 334.503 (c)(3)(E) or as otherwise approved by the TNRCC field inspector. Clean replacement fill that is brought from off-site must also conform to the above regulatory requirement, and must be similar in composition to native soils at the site Boring logs from nearby monitoring wells indicate that site soils are made up of mostly silty clay from the ground surface to an approximate depth of 7 or 8 feet, grading to sand and gravel below that depth.

Each excavation location shall be returned as closely as possible to its original condition when work is complete. Following the completion of backfilling at each of the three sites, all drums, trash, and other waste shall be removed. Each site will then be graded, contoured, and leveled to its original elevation. Parcels that were excavated in vegetated areas will be reseeded with native grasses, and those that were excavated in paved areas, such as the picnic area at SWMU 31, shall be repaired to a condition equal to or exceeding that found before the excavation work. Where areas are reseeded, provisions will be made to protect the area to allow for undisturbed germination.

5.8 Task 8 – Equipment Decontamination

All equipment that may directly or indirectly contact samples or contaminated materials shall be decontaminated in a designated decontamination area. This includes excavators, loaders, dozers, sampling devices, and miscellaneous small tools and other implements. In addition, the contractor shall take care to prevent post-excavation samples from coming into contact with potentially contaminating substances, such as oil, engine exhaust, corroded surfaces, and dirt.

The following procedure shall be used to decontaminate large pieces of equipment, such as excavators and loaders: the external surfaces of equipment shall be washed with high-pressure hot water and Alconox™, or equivalent laboratory-grade detergent, and if necessary, scrubbed until all visible dirt, grime, grease, oil, loose paint, rust flakes, etc., have been removed. The equipment shall then be rinsed with potable water. The inside surfaces of equipment buckets and blades shall also be washed as described.

The following procedure shall be used to decontaminate sampling devices that are used in conjunction with heavy equipment for collection of samples along pit sidewalls:

- Scrub the equipment with a solution of potable water and Alconox, or equivalent laboratory-grade detergent.
- Rinse the equipment with copious quantities of potable water followed by ASTM Type II Reagent Water (high-performance liquid chromatography-grade water and distilled water purchased in stores are not acceptable substitutes for ASTM Type II Reagent-Grade Water)
- Air dry the equipment on a clean surface or rack, such as Teflon®, stainless steel, or oil-free aluminum elevated at least 2 feet above ground.
- If the sampling device shall not be used immediately after being decontaminated, it shall be wrapped in oil-free aluminum foil, or placed it in a closed stainless steel, glass, or Teflon® container

ASTM Reagent-Grade Type II Water, methanol, and hexane shall be purchased, stored, and dispensed only in glass, stainless steel, or Teflon® containers. These containers shall have Teflon® caps or cap liners. EEG will ensure these materials remain free of contaminants. If any question of purity exists, new materials shall be used.

5.9 Task 9 – Reporting

Following the completion of all tasks, EEG, in coordination with the subcontractor, will prepare a set of drawn "as built" field diagrams that illustrate the exact location and dimensions of each

excavation. A professional surveyor at each SWMU will then record the limits of the excavation work. All surveying locations of field activities shall be measured by a State of Texas certified land surveyor The surveys shall be third order (cf. Urquhar, L.C , 1962 Civil Engineering Handbook, 4th Edition, p 96 and 97) and references will be tied to the Texas State Plane Coordinate System, North Central Zone. The horizontal datum will be the North American Datum of 1983 and the units will be in U.S survey feet The vertical datum will be the National Geodetic Vertical Datum (NGVD) of 1988 and the units will be in U.S. survey feet. The surveyed control information for all data collection points shall be recorded and displayed in a table The table shall give the X (easting) and Y (northing) coordinates, the ground elevation, and the measuring point elevation of any specific features at each site The reference location is the origin. The accuracy of the X-Y coordinates for each sample location will be within 0.1 feet.

All excavation information will be documented in the RFI report for these units. The RFI report will be prepared after all IRA work has been completed.

6.0 References

A. T. Kearney, 1989, RCRA Facility Assessment, Preliminary Review/Visual Site Inspection

HydroGeoLogic, Inc , 1998, Final Basewide Quality Assurance Project Plan, NAS Fort Worth JRB, Texas.

HydroGeoLogic, Inc., 1998a, Draft Technical Memorandum Initial Soil Sampling Results SWMUs 17, 26, 27, 29, 30 and 62 RCRA Facility Investigation NAS Fort Worth JRB, Texas.

HydroGeoLogic, Inc , 1998b, Revised Final Work Plans, RCRA Facility Investigation of Landfills, NAS Fort Worth JRB, Texas.

HydroGeoLogic, Inc., 2000, Final 2000 Basewide Quality Assurance Project Plan, NAS Fort Worth JRB, Texas.

HydroGeoLogic, Inc., 2001, Final RCRA Facility Investigation SWMUs 22, 23, 24, and 25, NAS Fort Worth JRB, Texas.

TAB

FIGURES

Figures

HydroGeoLogic, Inc —Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB, Texas

Figure 1.1
SWMU Locations and Regional TCE Plume Terrace Alluvium Groundwater April 2001

U.S. Air Force Center For Environmental Excellence

Legend

- NAS Fort Worth JRB (Carswell Field)
- Former Carswell Air Force Base
- Landfill Boundaries
- 500 — TCE Concentration Contour (µg/L)
- MW-53 ◆ — NAS Fort Worth JRB Basewide Sampling Well
- 50 — TCE Concentration (µg/L)
- WHGLTA036 ◆ — Monitoring well data collected as part of other investigations during April 2001
- ND — TCE Concentration (µg/L)
- HM-119 ◆ — AFP 4 Semi-Annual Monitoring Well
- 17 — TCE Concentration (µg/L)
- SD13-07 ◆ — Monitoring well data collected as part of other investigations during July 2001
- ND — TCE Concentration (µg/L)

ND = Not Detected at Laboratory Method Detection Limit of 0 5µg/L

F = The analyte was positively identified, but the associated value is below the PQL

J = The analyte was positively identified, but the quantitation is an estimation

N

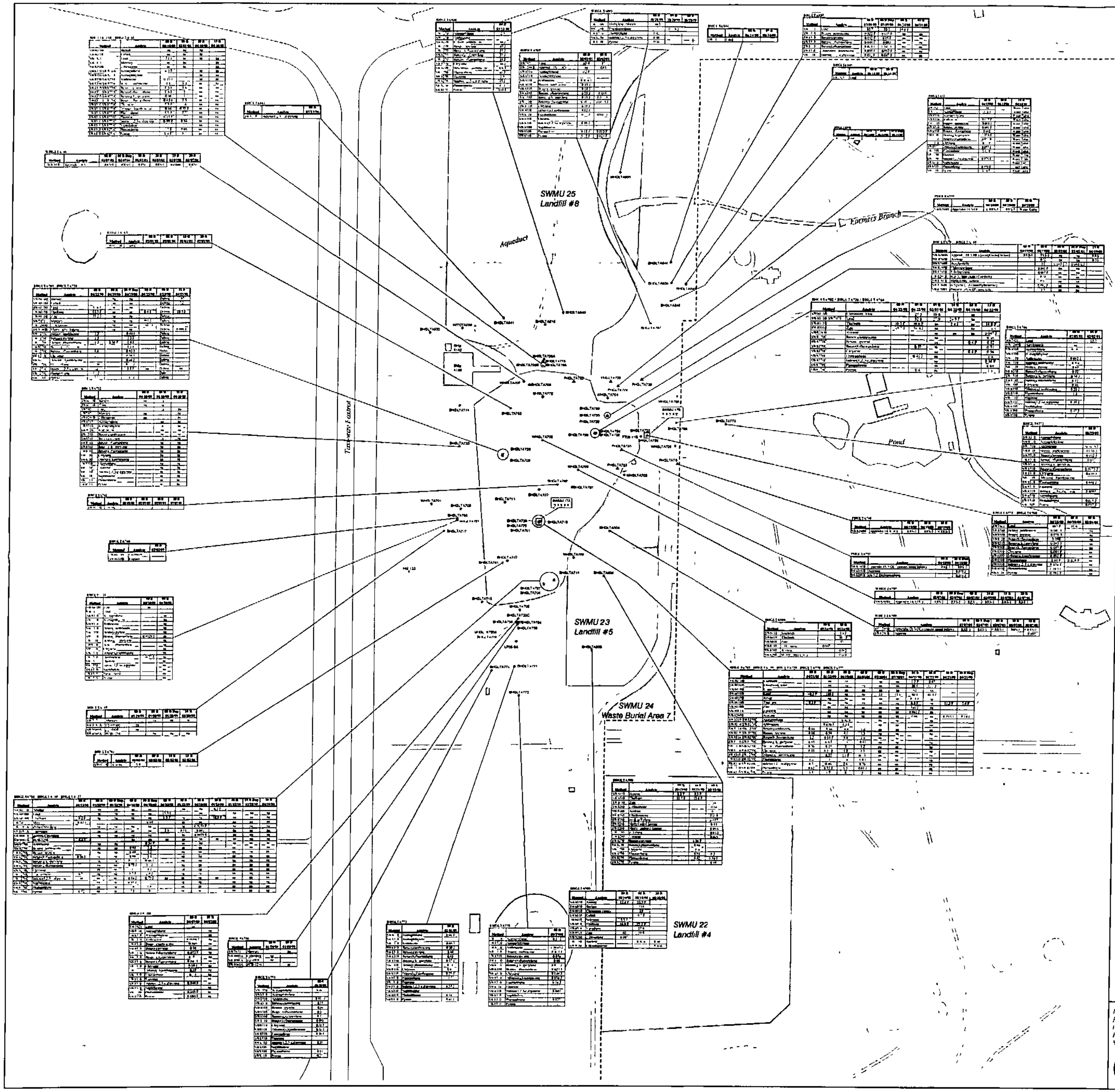
650 0 650 1300
SCALE IN FEET

Filename EEG001\01C010\Report\tce_apr2001 apr
Created 09/20/99 jbelcher
Revised 09/18/01 asp
Project EEG001-01C010
Map Source HydroGeoLogic, Inc GIS Database, Jacobs Engineering

File: 17A-89
D.E.

EL LIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.



HydroGeoLogic Inc. Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB Texas

Figure 2.1

SWMU 17/ Landfill 7 Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center for Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Landfill 7/SWMU 17 Boundary
- Other SWMU/Landfill Boundaries
- Existing Borehole Location (Chemical Analysis)
- Existing Borehole Location (Lithology)
- Piezometer Location
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg
Grey: Headers indicate SWMU 17 Soil Samples
Blue: Headers indicate Soil Samples collected under separate RFI
Pink: Headers indicate Sample interval to be removed in IRA
Yellow: Header indicates SWMU 17 Site Screening Values
Appx IX: Appendix IX analytical suite
GWP: Groundwater Protection
MSC: Medium-Specific Concentration GWP Industrial
na: Not Analyzed
RRS 1: Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3
- Analyte detected at Standard 3 concentration.
- Analyte detected at Standard 3 concentration, but below site specific MSC
- Initial analyte detection at Standard 2 or 3, but not confirmed during subsequent sampling
- Statistically less than background.
- Analyte not detected or detected at Standard 1 concentration
- < RRS-1: Analytical Suite not detected or detected at Standard 1 concentration.

Data Screening Values

Method		Analyte	Surface RRS 2	Surface RRS 1	Sub-Surface RRS 1	Sub-Surface RRS-2	GWP MSC	Site Specific MSC
SW6010B		Arsenic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW6010B		Barium	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW6010B		Cadmium	[illegible]	0.556	[illegible]	[illegible]	[illegible]	0.67
SW6010B		Chromium, total	5.86	5.86	10.21	10.21	10	16.8
SW6010B		Cobalt	11.05	[illegible]	[illegible]	410	410	
SW6010B		Copper	17.3	130	[illegible]	130	130	
SW6010B	SW7421	Lead	20.6	20.97	[illegible]	[illegible]	[illegible]	[illegible]
SW6010B		Selenium	[illegible]	[illegible]	[illegible]	5	5	
SW6010B		Silver	[illegible]	[illegible]	[illegible]	51	51	
SW6010B		Thallium	[illegible]	[illegible]	1.5	1.5	[illegible]	
SW6010B		Vanadium	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW6010B		Zinc	[illegible]	3100	[illegible]	3100	3100	
SW7471A		Mercury	0.14	[illegible]	[illegible]	[illegible]	[illegible]	
SW8081A		p,p'-DDE	0.0017	[illegible]	[illegible]	[illegible]	[illegible]	
SW8081A		alpha-Chlordane	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8081A		Chlordane	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8081A		gamma-Chlordane	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8081A	SW8082A	PCB-1254 (Aroclor 1254)	1	1	1	1	[illegible]	
SW8082			[illegible]	0.05	[illegible]	[illegible]	[illegible]	
SW8260B		Acetone	[illegible]	[illegible]	[illegible]	[illegible]	1000	
SW8260B		Acrylonitrile	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8260B		Chloromethane	0.005	[illegible]	[illegible]	[illegible]	[illegible]	
SW8260B		cis-1,2-Dichloroethene	[illegible]		[illegible]			
SW8260B		Ethylbenzene	[illegible]	70	0.003	70	70	
SW8260B		m,p-Xylene	[illegible]	1000	[illegible]	1000	1000	
SW8260B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8260B		Methyl ethyl ketone	0.005	6100	0.005	6100	6100	
SW8260B		[illegible]	0.005	1000	0.005	1000	1000	
SW8260B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8270C		Acenaphthene	[illegible]	610	[illegible]	610	610	
SW8310			[illegible]	610	[illegible]	610	610	
SW8270C		Acenaphthylene	[illegible]	[illegible]	[illegible]	610	610	
SW8310			[illegible]	610	[illegible]	610	610	
SW8270C		Anthracene	[illegible]	3100	[illegible]	3100	3100	
SW8310			[illegible]	3100	[illegible]	3100	3100	
SW8270C		Benzo(a)anthracene	[illegible]	0.33	[illegible]	[illegible]	[illegible]	13
SW8310			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8270C		Benzo(a)pyrene	0.33	[illegible]	[illegible]	0.33	[illegible]	1.6
SW8310			[illegible]	[illegible]	[illegible]	0.02	[illegible]	
SW8270C		Benzo(b)fluoranthene	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2
SW8310			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8270C		Benzo(g,h,i)perylene	[illegible]	[illegible]	[illegible]	310	310	
SW8310			[illegible]	310	[illegible]	310	310	
SW8270C		Benzo(k)fluoranthene	[illegible]	[illegible]	[illegible]	0.39	0.39	13
SW8310			[illegible]	[illegible]	[illegible]	0.39	0.39	
SW8270C		Chrysene	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8310			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8270C		Dibenz(a,h)anthracene	0.33	[illegible]	[illegible]	[illegible]	0.02	0.37
SW8310			[illegible]	[illegible]	[illegible]	0.02	[illegible]	
SW8270C		Fluoranthene	0.33	410	[illegible]	410	410	
SW8310			[illegible]	410	[illegible]	410	410	
SW8270C		Fluorene	[illegible]	410	0.33	410	410	
SW8310			[illegible]	410	[illegible]	410	410	
SW8270C		Indeno(1,2,3-cd)pyrene	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.84
SW8310			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SW8270C		Naphthalene	[illegible]	200	0.33	200	200	
SW8310			[illegible]	[illegible]	[illegible]	200	200	
SW8270C		Phenanthrene	[illegible]	310	0.33	310	310	
SW8310			0.0035	310	[illegible]	310	310	
SW8270C		Pyrene	0.33	310	[illegible]	310	310	
SW8310			[illegible]	310	[illegible]	310	310	

100 0 100 200 300
SCALE IN FEET

N

Filename: [illegible] Report landfill7 soil samps.apr
Project: HG001-01C.010
Created: [illegible] 27/01 jbelcher
Revised: [illegible]/19/01 jb
Map Source: HydroGeoLogic Inc
ArcView GIS Database, 2001

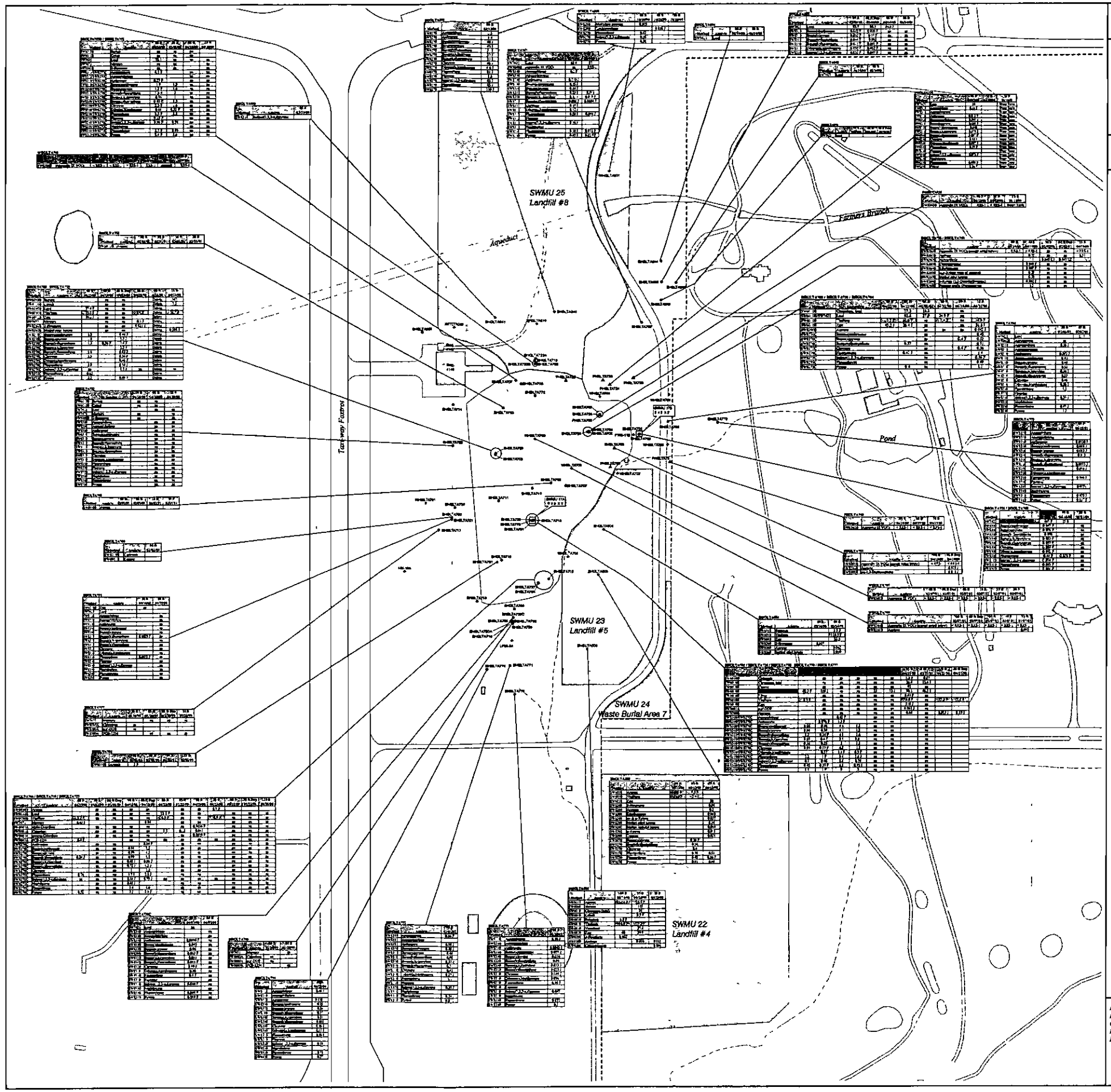
ELLIS ENVIRONMENTAL GROUP LC

HYDROGEOLOGIC

Figure 2.1

SWMU 17/ Landfill 7 Analytical Results in Soil and Proposed Excavation Locations

US Air Force Center For Environmental Excellence



Legend

- NAS Fort Worth JRB Boundary
- Landfill 7/SWMU 17 Boundary
- Other SWMU/Landfill Boundaries
- Existing Borehole Location (Chemical Analysis)
- Existing Borehole Location (Lithology)
- Piezometer Location
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg.

SWMU 17 Soil Samples

Samples collected under separate RFI.

Samples collect Sample interval in to removed in IRA.

Tarrant County Texas Background Value

Appendix IX analytical suite

Groundwater Protection.

Municipal Solid Waste Criteria

Not Analyzed.

RRS-1 Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3
- Analyte detected at Standard 3 concentration.
- Analyte detected at Standard 3 concentration, but below site-specific MSC.
- Initial analyte detection at Standard 2 or 3, but not confirmed during subsequent sampling.
- Statistically less than background.
- Analyte not detected or detected at Standard 1 concentration.
- < RRS-1 Analytical Suite not detected or detected at Standard 1 concentration.

Method	Analyte	Background Value	Residential Soil Ingestion	Residential Soil Ingestion	Residential Soil Ingestion	GWPT	Site Specific MSC
SW6010B	Arsenic	7.32	1.85	7.32	0.26	5	
SW6010B	Barium	371	511	1.0E+3	260	600	
SW6010B	Cadmium	0.556	0.556	0.56	0.56	0.5	0.27
SW6010B	Chromium, total	21.56	27.84	18.51	14.71	10	18.5
SW6010B	Lead	11.05	400	400	150	0.15	
SW6010B	Silver	1.71	1.85	1.72	1.85	1.5	
SW6010B/SW7421	Lead	20.87	20.97	12.66	12.66	7.5	7.5
SW6010B	Selenium	0.392	5	0.313	5	5	
SW6010B	Silver	0.213	51	0.178	51	51	
SW6010B	Thallium	2.45	2.52	2.3	1.2	1.2	
SW6010B	Vanadium	46.2	51	17.6	51	51	
SW6010B	Zinc	54	1.0E+3	51.3	3.1E+3	3.1E+3	
SW7471A	Mercury	0.24	0.2	0.053	0.2	0.2	
SW8081A	4,4'-DDD	0.00151	0.2	0.0027	0.2	0.2	
SW8081A	4,4'-DDE	0.000951	0.2	0.00283	0.2	0.2	
SW8081A	4,4'-DDT	0.00387	0.2	0.00253	0.2	0.2	
SW8081A	Aldrin	0.00067	0.2	0.00067	0.2	0.2	
SW8081A/SW8082A	Aroclor-1254 (Arochlor 1254)	0.0062	0.2	0.0245	0.2	0.2	
SW8082	PCB-1254 (Arochlor 1254)					0.33	
SW8082	Aroclor-1260	0.0145	0.66	0.0483	0.33	0.33	
SW8260B	Acetone	0.868	1000	0.805	1000	1000	
SW8260B	Acetonitrile	0.56	0.971	0.56	0.971	0.971	
SW8260B	Chloroethane	0.004	1.9	0.005	1.9	1.9	
SW8260B	cis-1,2-Dichloroethene	0.001	1	0.001	1	1	
SW8260B	Dibromomethane	0.001	70	0.001	70	70	
SW8260B	Methylene Chloride	0.005	1000	0.005	1000	1000	
SW8260B	n-Propylbenzene	0.005	99	0.005	99	99	
SW8260B	Styrene	0.005	1000	0.005	1000	1000	
SW8260B	Tetrachloroethene	0.005	0.05	0.005	0.05	0.05	
SW8260B	Toluene	0.005	1000	0.005	1000	1000	
SW8260B	trans-1,2-Dichloroethene	0.001	100	0.001	100	100	
SW8260B	Trichloroethene	0.005	0.5	0.005	0.5	0.5	
SW8260B	Trichlorofluoromethane	0.005	1300	0.005	1300	1300	
SW8260B	Vinyl chloride	0.001	0.2	0.001	0.2	0.2	
SW8260B	Xylenes	0.005	1000	0.005	1000	1000	
SW8270C	1,2,4-Trichlorobenzene	0.33	0.9	0.33	0.9	0.9	
SW8270C	1,2-Dichlorobenzene	0.33	0.9	0.33	0.9	0.9	
SW8270C	1,3-Dichlorobenzene	0.33	0.9	0.33	0.9	0.9	
SW8270C	1,4-Dichlorobenzene	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,4,5-Trichlorophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,4,6-Trichlorophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,4-Dichlorophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,4-Dimethylphenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,4-Dinitrophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,4-Dinitrotoluene	0.33	0.9	0.33	0.9	0.9	
SW8270C	2,6-Dinitrotoluene	0.33	0.9	0.33	0.9	0.9	
SW8270C	2-Chloronaphthalene	0.33	0.9	0.33	0.9	0.9	
SW8270C	2-Chlorophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2-Methylnaphthalene	0.33	0.9	0.33	0.9	0.9	
SW8270C	2-Methylphenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	2-Nitroaniline	0.33	0.9	0.33	0.9	0.9	
SW8270C	2-Nitrophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	3,3'-Dichlorobenzidine	0.33	0.9	0.33	0.9	0.9	
SW8270C	3-Nitroaniline	0.33	0.9	0.33	0.9	0.9	
SW8270C	4,6-Dinitro-2-methylphenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Bromophenyl-phenylether	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Chloro-3-methylphenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Chloroaniline	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Chlorophenyl-phenylether	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Methylphenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Nitroaniline	0.33	0.9	0.33	0.9	0.9	
SW8270C	4-Nitrophenol	0.33	0.9	0.33	0.9	0.9	
SW8270C	Acenaphthene	0.33	0.9	0.33	0.9	0.9	
SW8270C	Acenaphthylene	0.33	0.9	0.33	0.9	0.9	
SW8270C	Anthracene	0.33	0.9	0.33	0.9	0.9	
SW8270C	Benzo(a)anthracene	0.33	0.9	0.33	0.9	0.9	1.3
SW8270C	Benzo(a)pyrene	0.0742	0.278	0.0742	0.278	0.933	
SW8270C	Benzo(b)fluoranthene	0.33	0.73	0.33	0.73	0.92	3.6
SW8270C	Benzo(g,h,i)perylene	0.0742	0.83	0.0742	0.83	0.83	
SW8270C	Benzo(k)fluoranthene	0.33	0.9	0.33	0.9	0.9	1
SW8270C	Bis(2-ethylhexyl)phthalate	0.0557	0.839	0.0557	0.839	0.839	
SW8270C	Carbazole	0.33	3.9	0.33	3.9	3.9	
SW8270C	Chrysene	0.0742	1.6	0.0742	1.6	1.6	
SW8270C	Dibenz(a,h)anthracene	0.33	0.29	0.33	0.29	0.29	
SW8270C	Dibenzofuran	0.0557	0.39	0.0557	0.39	0.39	2.3
SW8270C	Fluoranthene	0.33	2.2	0.33	2.2	2.2	
SW8270C	Fluorene	0.0742	1.3	0.0742	1.3	1.3	
SW8270C	Hexachlorobenzene	0.33	0.33	0.33	0.33	0.33	
SW8270C	Hexachlorobutadiene	0.557	0.83	0.557	0.83	0.83	0.27
SW8270C	Hexachlorocyclopentadiene	0.33	0.9	0.33	0.9	0.9	
SW8270C	Hexachloroethane	0.33	0.9	0.33	0.9	0.9	
SW8270C	Indeno(1,2,3-cd)pyrene	0.0742	0.278	0.0742	0.278	0.933	0.39
SW8270C	Naphthalene	0.33	200	0.33	200	200	
SW8270C	Nitrobenzene	0.363	200	0.363	200	200	
SW8270C	Phenanthrene	0.33	1.8	0.33	1.8	1.8	
SW8270C	Phenol	0.0933	2.7	0.0933	2.7	2.7	
SW8270C	Pyrene	0.33	1.6	0.33	1.6	1.6	
SW8270C	Pyridine	0.0557	1.6	0.0557	1.6	1.6	

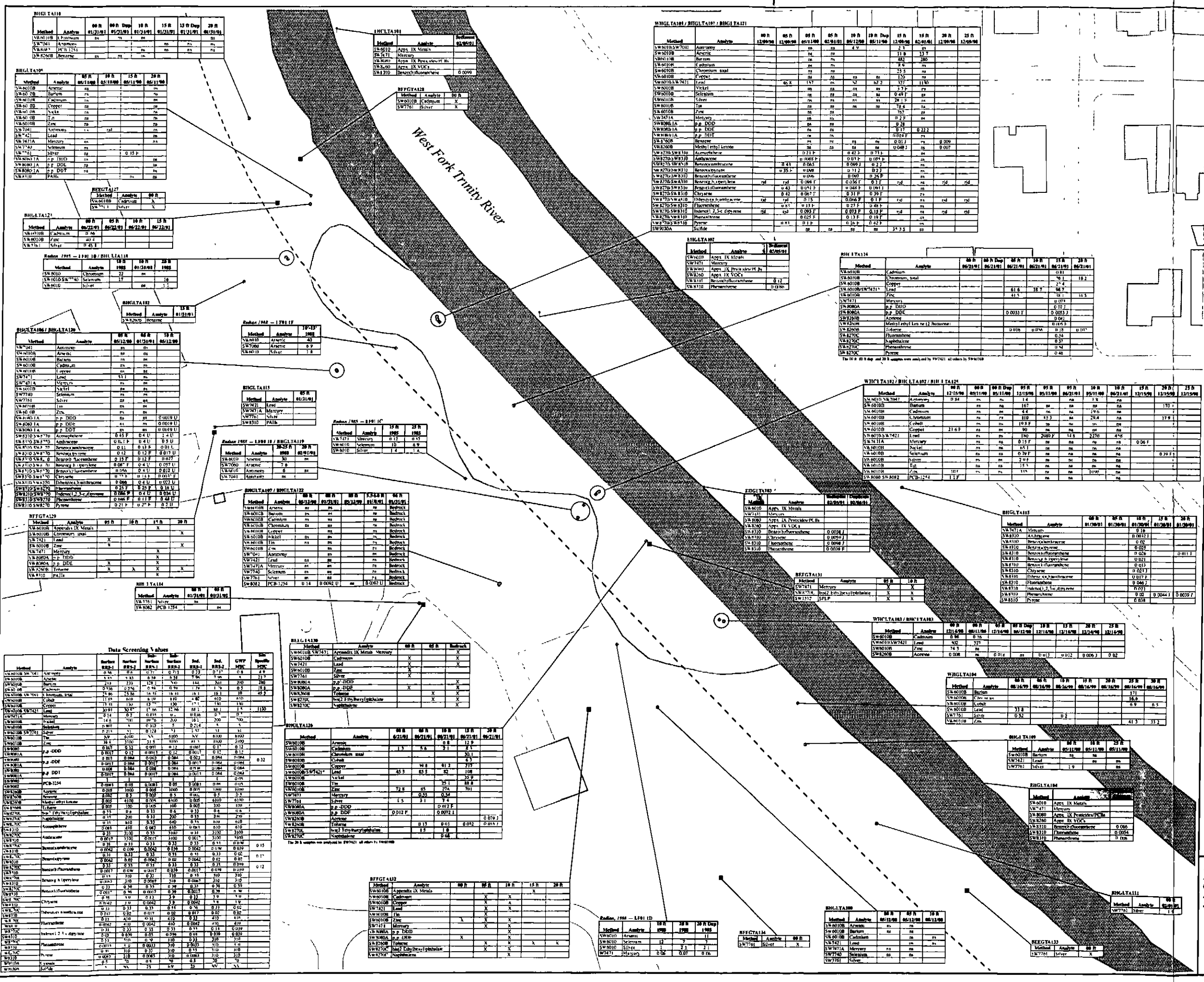
100 0 100 200 300
SCALE IN FEET

N

Filename: X:\EEG001\01C010\Report-landfill7_soil samps.apr
Project: EEG001-01C010
Created: 08/27/01 jbelcher
Revised: 10/19/01 jb
Map Source: HydroGeoLogic, Inc
ArcView GIS Database, 2001

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic Inc



HydroGeologic Inc —Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB Texas

Figure 2.2

File D.F. 17A-89

SWMU 28/Landfill 1 Analytical Results in Soil and Sediment with Proposed Sampling Locations

U S. Air Force Center
For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Landfill Boundaries
- Rip-rap
- Existing Borehole Location (Chemical Analysis)
- Proposed Sampling Location
- Existing Monitoring Well Location
- Surface Water/Sediment Sampling Location

All results in mg/kg

Orange Headers indicate Sediment Samples
Yellow Headers indicate Proposed Sampling Locations (except Data Screen Table)
Grey Headers indicate Soil Samples
Appx IX Appendix IX analytical suite
GWP Groundwater Protection
MSC Medium-Specific Concentration GWP Industrial
NV No Value
na - Not Analyzed
ns Not Sampled
RRS-1 - Risk Reduction Standard 1
RRS 2 Risk Reduction Standard 2
rjd Rejected
Sed - Sediment

Color Codes

- Analyte detected at Standard 1 concentration
- Analyte detected at Standard 1 concentration but below site specific MSC
- Initial analyte detection at Standard 2 or 3 but not confirmed during subsequent sampling
- Analyte not detected or detected at Standard 1 concentration

N

50 0 50 100
SCALE IN FEET

Filename X:\FTG001\01C010\Report landfill1_soil_analy_Dsize.apr
Project LTG001-01C010
Created 09/25/00 jbeilcher
Revised 10/19/01 jb
Source HydroGeoLogic, Inc. GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

West Fork Trinity River

HydroGeoLogic,Inc —Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB, Texas

Figure 2.2

File: D.E. 170-89

SWMU 28/Landfill 1
Analytical Results in Soil and Sediment with Proposed Sampling Locations

U.S. Air Force Center
For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Landfill Boundaries
- Rip-rap
- Existing Borehole Location (Chemical Analysis)
- Proposed Sampling Location
- Existing Monitoring Well Location
- Surface Water/Sediment Sampling Location

All results in mg/kg
Yellow Headers indicate Sediment Samples
Yellow Headers indicate Proposed Sampling Locations (except Data Screen Table)
Green Headers indicate Soil Samples
Appx. IX - Appendix IX analytical suite
GWP - Groundwater Protection
MSC - Medium-Specific Concentration GWP-Industrial
NV No Value
ns - Not Analyzed
ns Not Sampled
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2
rjd - Rejected
Sed. - Sediment

Color Codes
- Analyte detected at Standard 3 concentration.
- Analyte detected at Standard 3 concentration, but below site-specific MSC
- Initial analyte detection at Standard 2 or 3, but not confirmed during subsequent sampling.
- Analyte not detected or detected at Standard 1 concentration.

N

50 0 50 100
SCALE IN FEET

Filename X:\EEG001\01C010\Report\landfill1_soil_analy_Dsze.apr
Project. EEG001-01C010
Created. 09/25/00 jbelcher
Revised 10/19/01 jb
Source HydroGeoLogic, Inc—GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.

Data Screening Values

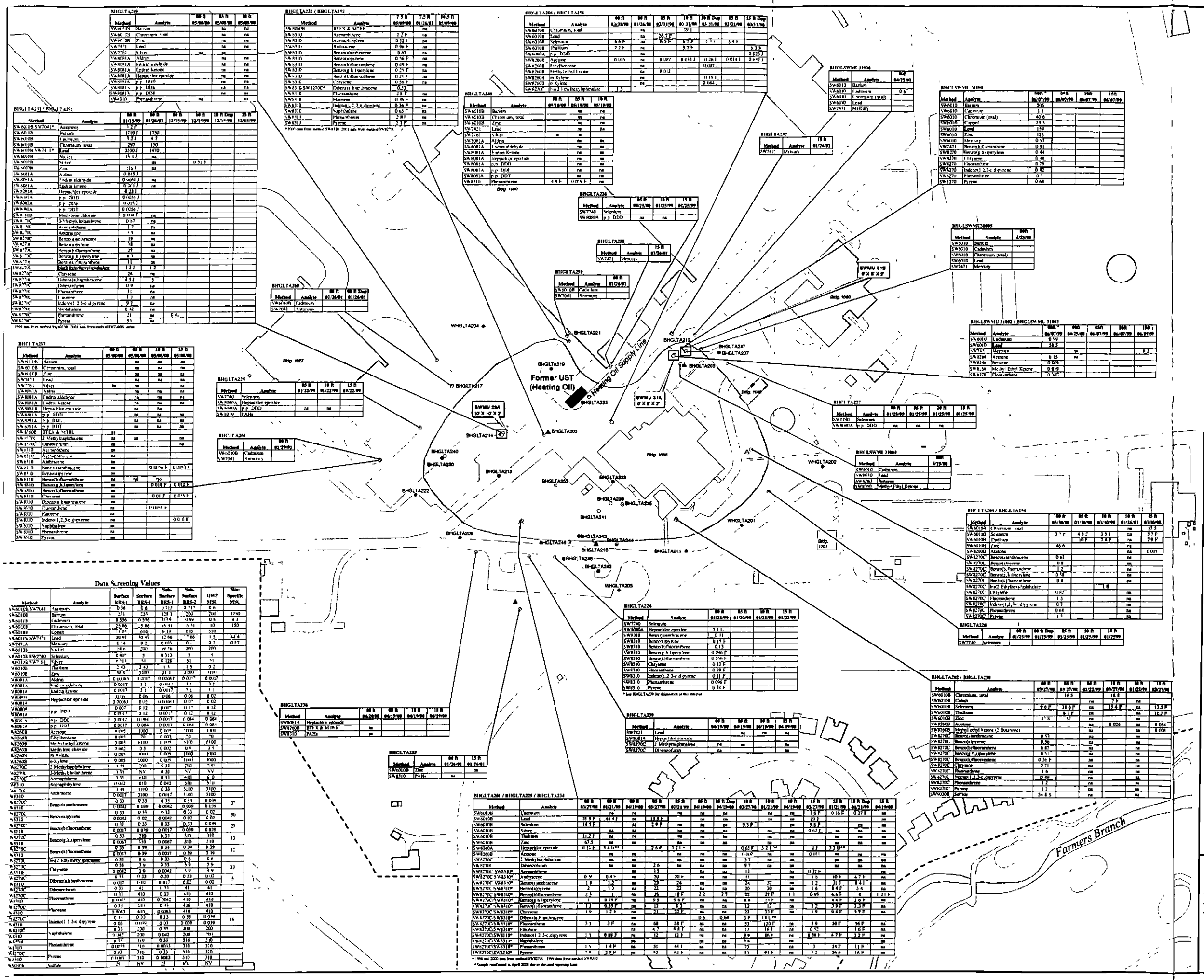
Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	Soil RRS-1	Soil RRS-2	GWP MSC	GWP Site-Specific MSC
SW6010B/SW7041	Antimony	0.56	0.6	0.712	0.712	9.23	0.712	0.6	6.9
SW6010B	Arsenic	5.87	5.83	6.38	6.38	7.98	7.98	5	23.3
SW6010B	Barium	233	233	128.1	300	166	200	200	280
SW6010B	Cadmium	0.344	0.334	0.39	0.39	1.79	1.79	0.5	19.6
SW6010B/SW7420	Chromium, total	25.86	25.86	34.31	34.31	14.1	14.1	10	67.5
SW6010B	Cobalt	11.68	610	6.19	610	4.82	610	610	
SW6010B	Copper	17.37	190	13.72	190	17.1	190	130	
SW6010B/SW7421	Lead	30.91	30.97	12.66	12.66	83.1	83.1	1.5	1129
SW7471A	Mercury	0.34	0.2	0.693	0.3	0.0396	0.2	0.2	
SW6010B	Nickel	14.6	200	19.76	200	14.1	200	200	
SW6010B	Selenium	0.903	5	0.313	5	0.214	5	5	
SW6010B/SW7761	Silver	0.213	51	0.128	51	1.27	51	51	
SW6010B	Tin	NV	6100	NV	6100	NV	1100	6100	
SW6010B	Zinc	38.8	3100	31.3	2900	81.3	3100	3100	
SW8080	a,a'-DDD	0.007	0.12	0.007	0.12	0.007	0.12	0.12	
SW8080A	a,a'-DDD	0.0017	0.12	0.0017	0.12	0.0017	0.12	0.12	
SW8080	a,a'-DDE	0.003	0.084	0.003	0.084	0.003	0.084	0.084	0.32
SW8081A	a,a'-DDE	0.0019	0.084	0.0017	0.084	0.0017	0.084	0.084	
SW8080	a,a'-DDT	0.008	0.084	0.008	0.084	0.008	0.084	0.084	
SW8080A	a,a'-DDT	0.0017	0.084	0.0017	0.084	0.0017	0.084	0.084	
SW8080	PCB-1254							0.05	
SW8081	Aroclor-1254	0.098	0.05	0.089	0.05	0.098	0.05	0.05	
SW8260B	Acetone	0.005	1000	0.005	1000	0.005	1000	1000	
SW8260B	Benzene	0.002	0.3	0.002	0.3	0.002	0.3	0.5	
SW8260B	Sec-butyl ethyl ketone	0.025	4100	0.025	3900	0.025	3900	4100	
SW8260B	Toluene	0.005	160	0.005	160	0.005	160	700	
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	0.35	0.6	0.33	0.6	0.6	
SW8270C	Naphthalene	0.33	200	0.33	260	0.33	300	200	
SW8270C	Acenaphthene	0.33	610	0.33	610	0.33	610	610	
SW8310	Acenaphthene	0.083	610	0.083	610	0.083	610	610	
SW8270C	Anthracene	0.33	3100	0.33	3100	0.33	3100	3100	
SW8310	Anthracene	0.0017	3100	0.0017	3100	0.0017	3100	3100	
SW8270C	Benzo(a)anthracene	0.33	0.33	0.33	0.33	0.33	0.33	0.039	0.15
SW8310	Benzo(a)anthracene	0.0043	0.039	0.0043	0.039	0.0043	0.039	0.039	
SW8270C	Benzo(a)pyrene	0.33	0.33	0.33	0.33	0.33	0.33	0.039	0.12
SW8310	Benzo(a)pyrene	0.0043	0.039	0.0043	0.039	0.0043	0.039	0.039	
SW8270C	Benzo(b)fluoranthene	0.33	0.33	0.33	0.33	0.33	0.33	0.039	0.12
SW8310	Benzo(b)fluoranthene	0.0017	0.039	0.0017	0.039	0.0017	0.039	0.039	
SW8270C	Benzo(g,h,i)perylene	0.33	310	0.33	310	0.33	310	310	
SW8310	Benzo(g,h,i)perylene	0.0067	310	0.0067	310	0.0067	310	310	
SW8270C	Benzo(k)fluoranthene	0.33	0.39	0.33	0.39	0.33	0.39	0.39	
SW8310	Benzo(k)fluoranthene	0.0017	0.39	0.0017	0.39	0.0017	0.39	0.39	
SW8270C	Chrysene	0.33	3.9	0.33	3.9	0.33	3.9	3.9	
SW8310	Chrysene	0.0042	3.9	0.0042	3.9	0.0042	3.9	3.9	
SW8270C	Dibenz(a,h)anthracene	0.33	0.33	0.33	0.33	0.33	0.33	0.02	
SW8310	Dibenz(a,h)anthracene	0.017	0.02	0.017	0.02	0.017	0.02	0.02	
SW8270C	Fluoranthene	0.33	410	0.33	410	0.33	410	410	
SW8310	Fluoranthene	0.0042	410	0.0042	410	0.0042	410	410	
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	0.33	0.33	0.33	0.33	0.039	
SW8310	Indeno(1,2,3-c,d)pyrene	0.05	0.039	0.05	0.039	0.05	0.039	0.039	
SW8270C	Phenanthrene	0.33	310	0.33	310	0.33	310	310	
SW8310	Phenanthrene	0.0033	310	0.0033	310	0.0033	310	310	
SW8270C	Pyrene	0.33	310	0.33	310	0.33	310	310	
SW8310	Pyrene	0.0042	310	0.0042	310	0.0042	310	310	
SW6010A	Cyanide	0.5	20	0.5	20	0.5	20	20	
SW6020A	Dioxin	25	NV	25	NV	25	NV	NV	

Figure 2.3

File D.E. 17-87

SWMU 29 / Landfill 2
Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center
For Environmental Excellence



Legend

- NAS Fort Worth JRB Boundary
- Landfill Boundaries
- Existing Borehole Location (Lithology)
- Existing Borehole Location (Chemical Analysis)
- Existing Borehole/Piezometer Location (Lithology)
- Existing Borehole/Piezometer Location (Chemical Analysis)
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg

Grey	Headers indicate SWMU 17 Soil Samples
Pink	Headers indicate Sample interval to be removed in IRA
Yellow	Header indicates SWMU 17 Site Screening Values
Appx IX	Appendix IX analytical suite
GWP	Groundwater Protection
MSC	Medium Specific Concentration GWP Industrial
na	Not Analyzed
RRS 1	Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3
- Analyte detected at Standard 3 concentration
- Analyte detected at Standard 3 concentration but below site specific MSC
- Initial analyte detection at Standard 2 or 3 but not confirmed during subsequent sampling
- Statistically less than background
- Analyte not detected or detected at Standard 1 concentration
- ✓ RRS-1 Analytical Suite not detected or detected at Standard 1 concentration

N

100 0 100 200

SCALE IN FEET

Filename X:\EEG001\01C010 Report\landfill 2 soil data.apr
Project ITG001-01C010
Created 09/25/00 jbelcher
Revised 09/07/01 asp
Source HydroGeoLogic, Inc. GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

Data Screening Values

Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	GWP MSC	Other Specific MSC
SW6010B/SW7041*	Antimony	0.56	0.6	0.712	0.712	0.6	
SW6010B	Barium	231	235	128.1	200	1740	
SW6010B	Cadmium	0.556	0.556	0.79	0.59	0.5	4.3
SW6010B	Chromium, total	25.86	5.86	16.31	6.31	10	150
SW6010B	Cobalt	13.09	610	9.19	610	610	
SW6010B/SW7471*	Lead	59.97	60.97	12.66	17.66	15	44.4
SW7471A	Mercury	0.14	0.2	0.035	0.1	0.2	0.57
SW6010B	Nickel	14.6	200	19.76	200	200	
SW6010B/SW7740	Selenium	0.907	5	0.313	5	5	
SW6010B/SW7 61	Silver	0.713	51	0.128	51	51	
SW6010B	Thallium	2.43	2.43	1.5	1.5	0.2	
SW6010B	Zinc	38.8	1200	21.3	1200	1200	
SW8081A	Aldrin	0.00083	0.0017	0.00083	0.0017	0.0017	
SW8081A	Endrin aldehyde	0.0017	3.1	0.0017	3.1	3.1	
SW8081A	Endrin ketone	0.0017	3.1	0.0017	3.1	3.1	
SW8081A	Heptachlor epoxide	0.08	0.08	0.08	0.08	0.02	
SW8081A	Heptachlor epoxide	0.00083	0.017	0.00083	0.017	0.02	
SW8081A	p,p' DDD	0.0017	0.12	0.0017	0.12	0.12	
SW8081A	p,p' DDE	0.0017	0.084	0.0017	0.084	0.084	
SW8081A	p,p' DDT	0.0017	0.084	0.0017	0.084	0.084	
SW8260B	Acetone	0.085	1000	0.005	1000	1000	
SW8260B	Ethylbenzene	0.005	70	0.005	70	70	
SW8260B	Methyl ethyl ketone	0.005	6100	0.005	6100	6100	
SW8260B	Methyl isobutyl ketone	0.005	0.5	0.005	0.5	0.5	
SW8260B	m,p-Xylene	0.005	1000	0.005	1000	1000	
SW8260B	o-Xylene	0.005	1000	0.005	1000	1000	
SW8270C	2-Methylnaphthalene	0.18	200	0.33	200	200	
SW8270C	2-Methylphenol(cresol)	0.33	NV	0.33	NV	NV	
SW8270C	Acenaphthene	0.33	610	0.33	610	610	
SW8270C	Acenaphthylene	0.042	610	0.042	610	610	
SW8270C	Anthracene	0.33	3100	0.33	3100	3100	
SW8270C	Benzo(a)anthracene	0.0017	3100	0.0017	3100	3100	37
SW8270C	Benzo(a)pyrene	0.33	0.33	0.33	0.33	0.039	
SW8270C	Benzo(b)fluoranthene	0.0042	0.039	0.0042	0.039	0.039	30
SW8270C	Benzo(g,h,i)perylene	0.33	0.33	0.33	0.33	0.039	27
SW8270C	Benzo(k)fluoranthene	0.0017	0.039	0.0017	0.039	0.039	
SW8270C	Benzoic Acid	0.33	310	0.33	310	310	13
SW8270C	Benzyl Alcohol	0.0067	310	0.0067	310	310	
SW8270C	Bis(2-Ethylhexyl)phthalate	0.33	0.39	0.33	0.39	0.39	12
SW8270C	Chrysene	0.0017	0.39	0.0017	0.39	0.39	
SW8270C	Dibenz(a,h)anthracene	0.33	0.6	0.33	0.6	0.6	
SW8270C	Dibenzofuran	0.33	3.9	0.33	3.9	3.9	33
SW8270C	Fluoranthene	0.042	3.9	0.042	3.9	3.9	
SW8270C	Fluorene	0.14	0.33	0.33	0.33	0.02	5
SW8270C	Indeno(1,2,3-cd)pyrene	0.017	0.62	0.017	0.62	0.02	
SW8270C	Naphthalene	0.33	41	0.33	41	41	
SW8270C	Phenanthrene	0.33	410	0.33	410	410	
SW8270C	Phenol	0.042	410	0.042	410	410	
SW8270C	Pyrene	0.33	410	0.33	410	410	
SW8270C	Pyridine	0.0083	410	0.0083	410	410	
SW8270C	Indeno(1,2,3-cd)pyrene	0.14	0.33	0.33	0.33	0.039	16
SW8310	Acenaphthene	0.33	0.039	0.33	0.039	0.039	
SW8310	Acenaphthylene	0.33	200	0.33	200	200	
SW8310	Anthracene	0.042	200	0.042	200	200	
SW8310	Benzo(a)anthracene	0.14	310	0.33	310	310	
SW8310	Benzo(a)pyrene	0.0033	310	0.0033	310	310	
SW8310	Benzo(b)fluoranthene	0.33	310	0.33	310	310	
SW8310	Benzo(g,h,i)perylene	0.33	310	0.33	310	310	
SW8310	Benzo(k)fluoranthene	0.0033	310	0.0033	310	310	
SW8310	Chrysene	0.33	310	0.33	310	310	
SW8310	Dibenz(a,h)anthracene	0.33	310	0.33	310	310	
SW8310	Fluoranthene	0.042	200	0.042	200	200	
SW8310	Fluorene	0.14	310	0.33	310	310	
SW8310	Indeno(1,2,3-cd)pyrene	0.0033	310	0.0033	310	310	
SW8310	Naphthalene	0.33	310	0.33	310	310	
SW8310	Phenanthrene	0.33	310	0.33	310	310	
SW8310	Pyrene	0.042	310	0.042	310	310	
SW846	Sulfide	35	NV	35	NV	NV	

HydroGeoLogic, Inc —Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB, Texas

Figure 2.3

File: D.E. 174-89

SWMU 29 / Landfill 2
Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center
For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Landfill Boundaries
- Existing Borehole Location (Lithology)
- Existing Borehole Location (Chemical Analysis)
- Existing Borehole/Piezometer Location (Lithology)
- Existing Borehole/Piezometer Location (Chemical Analysis)
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg.
Grey Headers indicate SWMU 17 Soil Samples
Pink Headers indicate Sample interval to be removed in IRA.
Yellow Header indicates SWMU 17 Soil Screening Values.
Appx. IX - Appendix IX analytical suite
GWP Groundwater Protection
MSC - Medium-Specific Concentration GWP-Industrial
na - Not Analyzed
RRS-1 - Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3
- Analyte detected at Standard 3 concentration.
- Analyte detected at Standard 3 concentration, but below site-specific MSC.
- Initial analyte detection at Standard 2 or 3, but not confirmed during subsequent sampling.
- Statistically less than background.
- Analyte not detected or detected at Standard 1 concentration.
- < RRS-1 Analytical Suite not detected or detected at Standard 1 concentration.

N

100 0 100 200
SCALE IN FEET

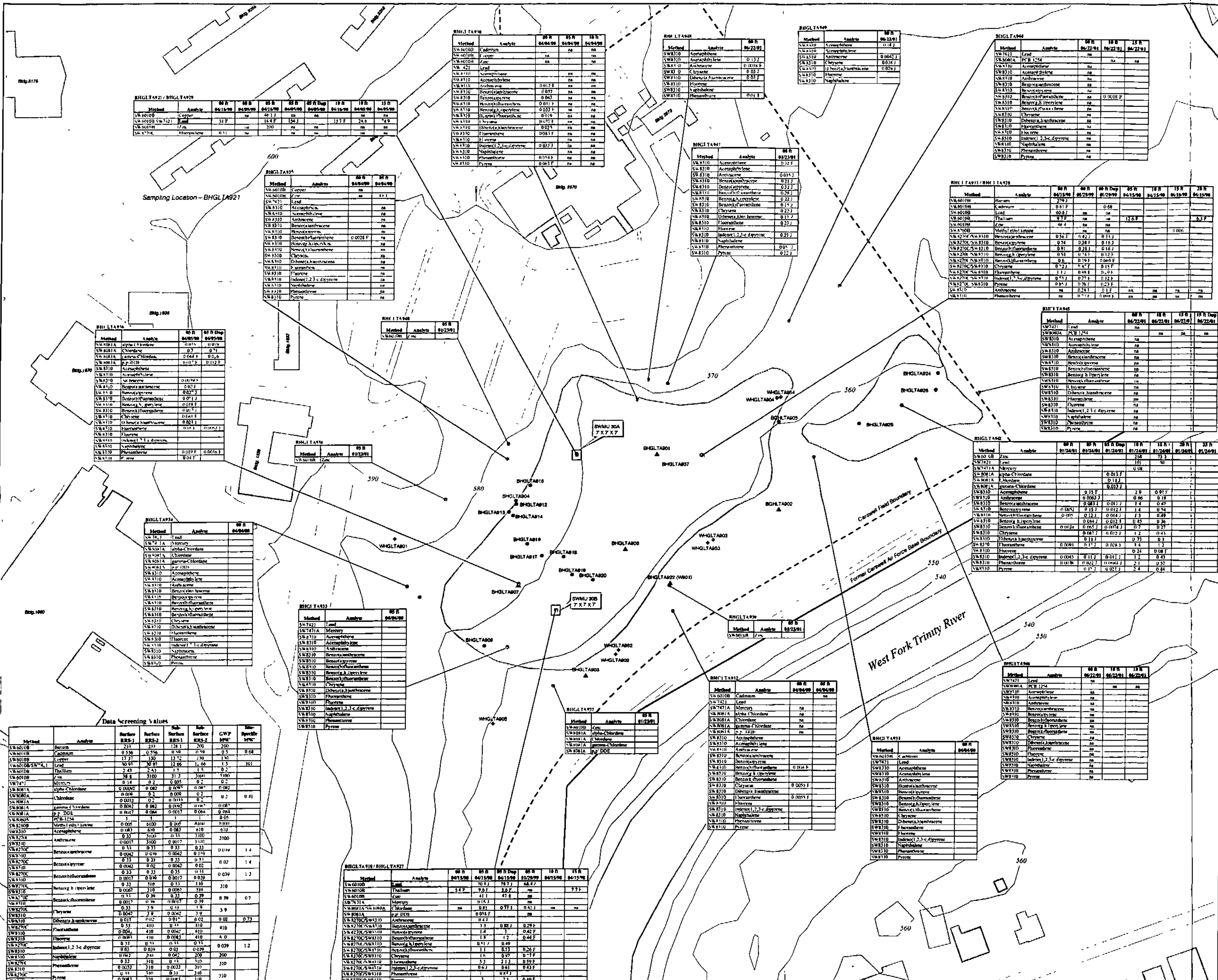
Filename X:\EEG001\01C010\Report\landfill 2 soil data.apr
Project. EEG001-01C010
Created 09/25/00 jbelcher
Revised 09/07/01 asp
Source HydroGeoLogic, Inc—GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.

Data Screening Values

Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	GWP MSC	Site-Specific MSC
SW6010B/SW7041*	Antimony	0.54	0.4	0.712	0.712	0.4	
SW6010B	Barium	739	739	194	200	200	1750
SW6010B	Cadmium	0.556	0.556	0.59	0.59	0.5	4.7
SW6010B	Chromium, total	25 for	25.88	16.1	16.21	30	150
SW6010B	Cobalt	21.05	610	8.19	610	610	
SW6010B/SW7421	Lead	30.91	30.97	12.66	12.66	1.5	44.4
SW7471A	Mercury	0.34	0.7	0.013	0.2	0.2	0.57
SW6010B	Nickel	14.4	200	19.76	200	200	
SW6010B/SW7740	Selenium	0.903	5	0.312	5	5	
SW6010B/SW7761	Silver	0.2111	51	0.228	5.11	5.1	
SW6010B	Thallium	2.43	2.43	1.5	1.5	0.2	
SW6010B	Zinc	38.8	3100	23.3	3100	3200	
SW8081A	Aldrin	0.00083	0.0037	0.00083	0.0037	0.00137	
SW8081A	Endrin aldehyde	0.0017	3.1	0.0017	3.1	3.1	
SW8081A	Endrin ketone	0.0017	3.1	0.0017	3.1	3.1	
SW8081A	Heptachlor epoxide	0.05	0.06	0.06	0.06	0.02	
SW8081A		0.00083	0.02	0.00083	0.02	0.02	
SW8082A	p,p'-DDD	0.003	0.12	0.007	0.12	0.12	
SW8081A		0.0017	0.12	0.0017	0.12	0.12	
SW8081A	p,p -DDE	0.0017	0.084	0.0017	0.084	0.084	
SW8081A	p,p -DDT	0.0017	0.084	0.0017	0.084	0.084	
SW8260B	Acetone	0.002	1000	0.005	1000	1000	
SW8260B	Ethylbenzene	0.003	70	0.005	70	70	
SW8260B	Methyl ethyl ketone	0.003	6000	0.005	6100	6100	
SW8260B	Methylene chloride	0.002	0.5	0.005	0.5	0.5	
SW8260B	m-Xylene	0.005	1000	0.005	1000	1000	
SW8260B	o-Xylene	0.005	1000	0.005	1000	1000	
SW8270C	2-Methylnaphthalene	0.33	200	0.33	200	200	
SW8270C	3-Methylchlorobenzene	0.33	NV	0.33	NV	NV	
SW8270C	Acenaphthene	0.33	610	0.33	610	610	
SW8310	Acenaphthylene	0.042	610	0.042	610	610	
SW8270C	Anthracene	0.033	3100	0.33	3100	3100	
SW8310		0.0017	3100	0.0017	3100	3100	
SW8270C	Benzo(a)anthracene	1.33	0.62	0.33	0.33	0.62	37
SW8310		0.042	0.039	0.042	0.039	0.039	
SW8270C	Benzo(a)pyrene	0.33	0.12	0.33	0.33	0.02	30
SW8310		0.042	0.02	0.0042	0.02	0.02	
SW8270C	Benzo(b)fluoranthene	0.33	0.33	0.33	0.33	0.079	27
SW8310		0.0017	0.039	0.0017	0.039	0.039	
SW8270C	Benzo(g,h,i)perylene	0.33	310	0.33	310	310	13
SW8310		0.0067	310	0.0067	310	310	
SW8270C	Benzo(k)fluoranthene	0.33	0.39	0.33	0.39	0.39	12
SW8310		0.017	0.39	0.0017	0.39	0.39	
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	0.33	0.6	0.6	
SW8270C	Chrysene	0.33	3.9	0.33	3.9	3.9	33
SW8310		0.0042	3.9	0.0042	3.9	3.9	
SW8270C	Dibenz(a,h)anthracene	0.33	0.33	0.33	0.33	0.02	1
SW8310		0.017	0.02	0.017	0.02	0.02	
SW8270C	Dibenzofuran	0.33	41	0.33	41	41	
SW8270C	Fluoranthene	0.33	410	0.33	410	410	
SW8310		0.0042	410	0.0042	410	410	
SW8270C	Fluorene	0.33	410	0.33	410	410	
SW8310		0.0083	410	0.0083	410	410	
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	0.33	0.33	0.079	16
SW8310		0.03	0.079	0.03	0.079	0.079	
SW8270C	Naphthalene	0.33	200	0.33	200	200	
SW8310		0.042	200	0.042	200	200	
SW8270C	Phenanthrene	0.33	310	0.33	310	310	
SW8310		0.0033	310	0.0033	310	310	
SW8270C	Pyrene	0.33	310	0.33	310	310	
SW6010B	Sulfide	25	NV	25	NV	NV	



HydroGeoLogic, Inc.—Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB, Texas

Figure 2.4

File 17A-89
D.E.

SWMU 30 / Landfill 9 Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center
For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Ground Elevation Contour (ft msl)
- Landfill Boundaries
- Existing Borehole Location (Lithology)
- Existing Borehole Location (Chemical Analysis)
- Existing Borehole/Piezometer Location (Lithology)
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg
Grey Headers indicate SWMU 17 Soil Samples
Pink Headers indicate Sample interval to be removed in IRA
Yellow Header indicates SWMU 17 Site Screening Values
Appx. IX - Appendix IX analytical suite
GWP - Groundwater Protection
MSC - Medium-Specific Concentration GWP Industrial
na - Not Analyzed
RRS-1 Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 1
- Analyte detected at Standard 1 concentration
- Analyte detected at Standard 3 concentration, but below site-specific MSC
- Initial analyte detection at Standard 2 or 3 but not confirmed during subsequent sampling
- Statistically less than background
- Analyte not detected or detected at Standard 1 concentration
- RRS-1 Analytical Suite not detected or detected at Standard 1 concentration

N

50 0 50 100 150 200
SCALE IN FEET

Filename X:\11G001\01C010\Reports\landfill9_soil_samps.apr
Project FLG001-01C010
Created 09/25/00 jbelcher
Revised 10/19/01 jb
Source HydroGeoLogic, Inc.—GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GEOLOGIC INC

Figure 2.4

File: D.E. 174-89

SWMU 30 / Landfill 9
Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center
For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- 600 Ground Elevation Contour (ft msl)
- Landfill Boundaries
- Existing Borehole Location (Lithology)
- Existing Borehole Location (Chemical Analysis)
- Existing Borehole/Piezometer Location (Lithology)
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg.

Surface Soil Headers indicate SWMU 17 Soil Samples

Subsurface Soil Headers indicate Sample interval to be removed in IRA

Yellow Header indicates SWMU 17 Site Screening Values.

Appx. IX - Appendix IX analytical suite

GWP - Groundwater Protection

MSC Medium-Specific Concentration GWP-Industrial

na - Not Analyzed

RRS-1 - Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3
- Analyte detected at Standard 3 concentration.
- Analyte detected at Standard 3 concentration, but below site-specific MSC.
- Initial analyte detection at Standard 2 or 3, but not confirmed during subsequent sampling.
- Statistically less than background.
- Analyte not detected or detected at Standard 1 concentration.
- < RRS-1 Analytical Suite not detected or detected at Standard 1 concentration.

N

50 0 50 100 150 200

SCALE IN FEET

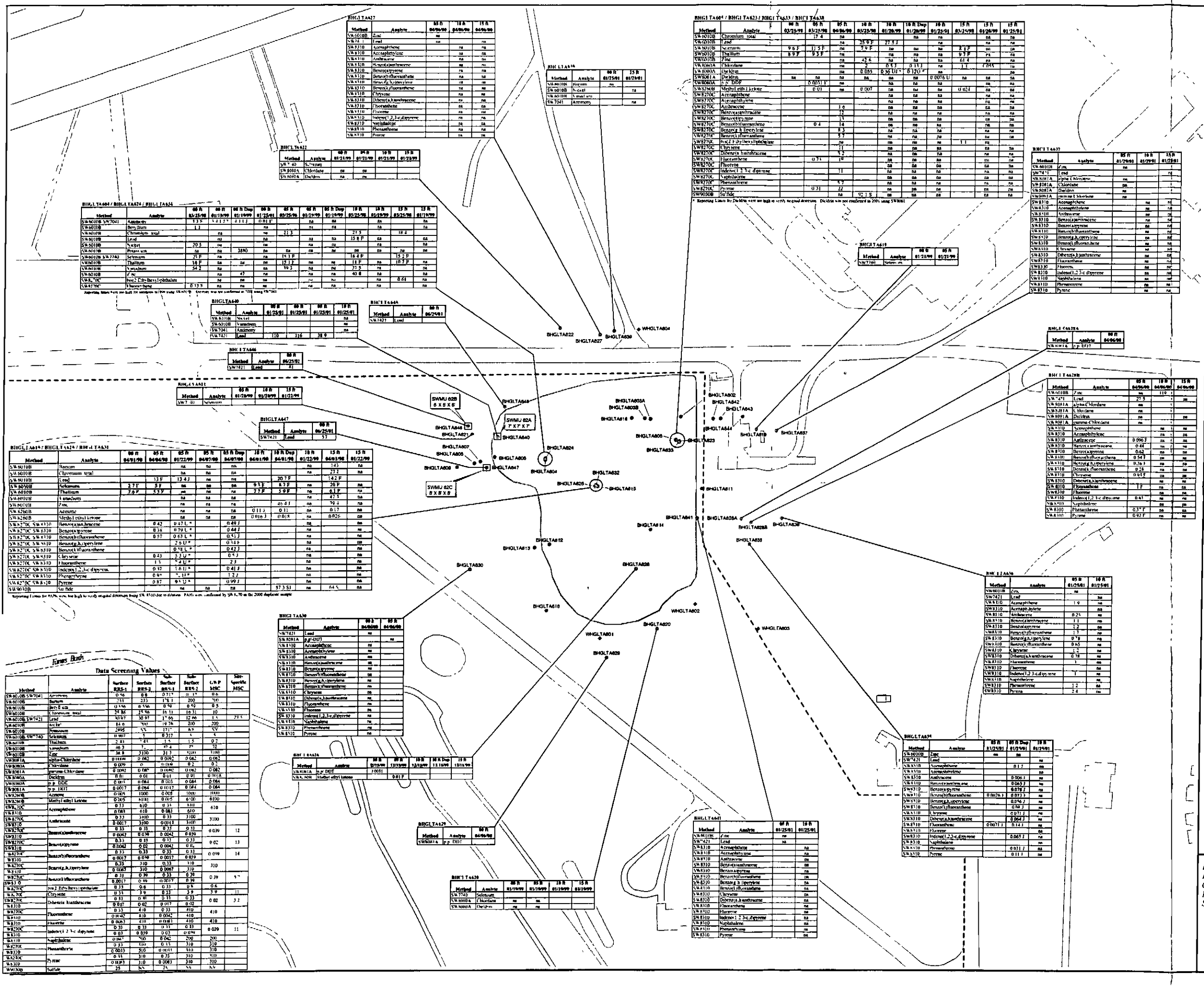
Filename X:\EEG001\01C010\Report\landfill9_soil_samps.apr
Project. EEG001-01C010
Created. 09/25/00 jbelcher
Revised. 10/19/01 jb
Source HydroGeoLogic, Inc—GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.

Data Screening Values

Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	GWP MSC	Site-Specific MSC
SW6010B	Barium	333	233	128 J	200	200	
SW6010B	Cadmium	0.556	0.556	0.59	0.59	0.5	0.68
SW6010B	Copper	77.37	130	13.72	130	130	
SW6010B/SW7421	Lead	30.97	30.97	12.56	12.66	15	101
SW6010B	Thallium	2.43	2.41	1.5	1.5	0.2	
SW6010B	Zinc	32.8	3100	33.5	3100	3100	
SW7471	Mercury	0.14	0.2	0.015	0.2	0.2	
SW8081A	alpha-Chlordane	0.00592	0.082	0.0592	0.082	0.082	
SW8082A	Chlordane	0.009	0.2	0.009	0.2	0.2	0.61
SW8081A	gamma-Chlordane	0.0033	0.2	0.0033	0.2		
SW8081A	p,p'-DDE	0.0097	0.082	0.0097	0.082	0.082	
SW8081A	p,p'-DDE	0.0017	0.084	0.0017	0.084	0.084	
SW8082A	PCB-1254	1	1	1	1	0.05	
SW8260B	Methyl ethyl ketone	0.05	6100	0.005	6100	6100	
SW8310	Acenaphthene	0.083	610	0.083	610	610	
SW8270C	Anthracene	0.33	3100	0.33	3100	3100	
SW8310	Anthracene	0.0017	3100	0.0017	3100		
SW8270C	Benzo(a)anthracene	0.33	0.33	0.33	0.33	0.039	1.4
SW8310	Benzo(a)anthracene	0.0062	0.039	0.0042	0.039		
SW8270C	Benzo(a)pyrene	0.33	0.33	0.33	0.33	0.02	1.4
SW8310	Benzo(a)pyrene	0.0042	0.02	0.0042	0.02		
SW8270C	Benzo(b)fluoranthene	0.33	0.33	0.33	0.33	0.039	3.5
SW8310	Benzo(b)fluoranthene	0.0017	0.039	0.0017	0.039		
SW8270C	Benzo(g,h,i)perylene	0.33	310	0.33	310	310	
SW8310	Benzo(g,h,i)perylene	0.0067	310	0.0067	310		
SW8270C	Benzo(k)fluoranthene	0.33	0.39	0.33	0.39	0.39	0.7
SW8310	Benzo(k)fluoranthene	0.0017	0.39	0.0017	0.39		
SW8270C	Chrysene	0.33	3.9	0.33	3.9	3.9	
SW8310	Chrysene	0.0042	3.9	0.0042	3.9		
SW8310	Dibenz(a,h)anthracene	0.017	0.02	0.017	0.02	0.02	0.73
SW8270C	Fluoranthene	0.33	410	0.33	430	410	
SW8310	Fluoranthene	0.0042	410	0.0042	410		
SW8310	Fluorene	0.0083	410	0.0083	410	410	
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	0.33	0.33	0.039	1.2
SW8310	Indeno(1,2,3-c,d)pyrene	0.03	0.039	0.03	0.039		
SW8310	Naphthalene	0.042	200	0.042	200	200	
SW8270C	Phenanthrene	0.33	310	0.33	310	310	
SW8310	Phenanthrene	0.0033	310	0.0033	310		
SW8270C	Pyrene	0.33	310	0.33	310	310	
SW8310	Pyrene	0.0083	310	0.0083	310		



Data Screening Values

Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	GWP MSC	Site-Specific MSC
SW6010B SW7041	Aluminum	0.56	0.6	0.717	0.17	0.6	
SW6010B	Barium	233	233	174	200	700	
SW6010B	Chromium, total	0.156	0.156	0.39	0.39	0.5	
SW6010B	Lead	24.86	25.96	16.11	16.31	10	
SW6010B SW7421	Lead	83.97	86.97	37.66	12.66	1.5	29 C
SW6010B	Nickel	14.6	15.1	10.76	200	200	
SW6010B	Potassium	2995	55	1717	85	55	
SW6010B SW7740	Selenium	0.887	5	0.317	5	5	
SW6010B	Thallium	2.43	2.43	1.5	1.5	0.2	
SW6010B	Vanadium	46.3	7	47.4	27	72	
SW6010B	Zinc	38.8	3100	31.3	9200	3100	
SW8081A	alpha-Chlordane	0.0156	0.062	0.0062	0.062	0.062	
SW8081A	Chlordane	0.0299	0	0.0299	0.2	0.2	
SW8081A	gamma-Chlordane	0.0092	0.062	0.00492	0.0062	0.062	
SW8081A	Dieldrin	0.01	0.01	0.01	0.01	0.00014	
SW8081A	p,p' DDE	0.0015	0.064	0.0015	0.064	0.064	
SW8081A	p,p' DDT	0.0057	0.064	0.00157	0.064	0.064	
SW8260B	Acetone	0.065	1000	0.065	1000	1000	
SW8260B	Methyl ethyl ketone	0.065	6000	0.065	6000	6000	
SW8270C	Acenaphthene	0.33	610	0.33	610	610	
SW8310	Anthracene	0.083	610	0.083	610	610	
SW8270C	Anthracene	0.33	3100	0.33	3100	3100	
SW8310	Benzo(a)anthracene	0.0017	3100	0.0018	3100	3100	
SW8270C	Benzo(a)anthracene	0.33	0.33	0.33	0.33	0.039	12
SW8310	Benzo(a)pyrene	0.0042	0.039	0.0042	0.039		
SW8270C	Benzo(a)pyrene	0.33	0.33	0.33	0.33	0.02	13
SW8310	Benzo(b)fluoranthene	0.0042	0.02	0.0042	0.02	0.039	14
SW8270C	Benzo(b)fluoranthene	0.0017	0.039	0.0017	0.039		
SW8310	Benzo(g,h,i)perylene	0.33	310	0.33	310	310	
SW8270C	Benzo(g,h,i)perylene	0.0067	310	0.0067	310		
SW8270C	Benzo(k)fluoranthene	0.33	0.39	0.33	0.39	0.39	9 C
SW8310	Benzo(k)fluoranthene	0.0017	0.39	0.00017	0.39		
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.5	0.33	0.5	0.6	
SW8270C	Chrysene	0.33	3.9	0.33	3.9	3.9	11
SW8310	Chrysene	0.33	0.33	0.33	0.33	0.02	12
SW8270C	Dibenz(a,h)anthracene	0.067	0.02	0.067	0.02		
SW8310	Dibenz(a,h)anthracene	0.33	410	0.33	410	410	
SW8270C	Fluoranthene	0.167	410	0.042	410		
SW8310	Fluoranthene	0.067	410	0.0083	410	410	
SW8270C	Indeno(1,2,3-cd)pyrene	0.33	0.33	0.33	0.33	0.039	11
SW8310	Indeno(1,2,3-cd)pyrene	0.03	0.039	0.03	0.039		
SW8310	Naphthalene	0.067	200	0.042	200	200	
SW8270C	Naphthalene	0.33	310	0.33	310	310	
SW8310	Phenanthrene	0.0033	310	0.0033	310	310	
SW8270C	Pyrene	0.33	310	0.33	310	310	
SW8310	Pyrene	0.0083	310	0.0083	310	310	
SW9030B	Sulfide	25	NV	25	NV	NV	

Forest Bush

HydroGeoLogic Inc —Work Plan—Interim Remedial Actions—Landfills
NAS Fort Worth JRB, Texas

Figure 2.5 File D.E. 170-87

SWMU 62 / Landfill 6 Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Landfill Boundaries
- Existing Borehole Location (Lithology)
- Existing Borehole Location (Chemical Analysis)
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg

Grey Headers indicate SWMU 17 Soil Samples
Pink Headers indicate Sample interval to be removed in IRA
Yellow Header indicates SWMU 17 Site Screening Values.
Appx IX Appendix IX analytical suite
GWP Groundwater Protection
MSC - Medium-Specific Concentration GWP-Industrial
na - Not Analyzed
RRS 1 Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3
- Analyte detected at Standard 1 concentration
- Analyte detected at Standard 3 concentration, but below site-specific MSC
- Initial analyte detection at standard 2 or 3, but not confirmed during subsequent sampling
- Statistically less than background
- Analyte not detected or detected at Standard 1 concentration
- <RRS 1 Analytical Suite not detected or detected at Standard 1 concentration

Filename X:\FFG001\01C010 Report landfill 6_soil samps.apr
Project 11G001-01C010
Created 09 04 01 jhelcher
Revised 10/19 01 jh
Source HydroGeoLogic, Inc.
ArcView GIS Database, 2001

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

Figure 2.5 File D.E. 174-89

SWMU 62 / Landfill 6 Analytical Results in Soil and Proposed Excavation Locations

U.S. Air Force Center For Environmental Excellence

Legend

- NAS Fort Worth JRB Boundary
- Landfill Boundaries
- Existing Borehole Location (Lithology)
- Existing Borehole Location (Chemical Analysis)
- Existing Monitoring Well Location
- Proposed Excavation Location

All results in mg/kg

Header indicates SWMU 17 Soil Samples

Header indicates Sample interval to be removed in IRA.

Yellow Header indicates SWMU 17 Site Screening Values.

Appx. IX - Appendix IX analytical suite

GWP - Groundwater Protection

MSC - Medium-Specific Concentration GWP-Industrial

na - Not Analyzed

RRS 1 Risk Reduction Standard 1

Color Codes

- IRA Excavation required due to presence of this analyte at Standard 3.
- Analyte detected at Standard 3 concentration.
- Analyte detected at Standard 3 concentration, but below site-specific MSC.
- Instal analyte detection at Standard 2 or 3, but not confirmed during subsequent sampling.
- RSE 2/3 — Statistically less than background.
- Analyte not detected or detected at Standard 1 concentration.
- < RRS-1 — Analytical Suite not detected or detected at Standard 1 concentration.

N

90 0 90 180

SCALE IN FEET

Filename X:\EEG001\01C010\Report\landfill 6_soil samps.apr
Project EEG001-01C010
Created 09/04/01 jbeicher
Revised 10/19/01 jb
Source HydroGeoLogic, Inc
ArcView GIS Database, 2001

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.

Data Screening Values

Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	GWP MSC	Site-Specific MSC
SW6010B/SW7041	Antimony	0.54	0.4	5.332	0.712	0.6	
SW6010B	Barium	233	233	148.1	200	200	
SW6010B	Beryllium	0.556	0.156	0.59	0.59	0.5	
SW6010B	Chromium, total	25.86	25.86	16.31	16.31	10	
SW6010B/SW7421	Lead	30.97	30.97	12.66	12.66	1.5	27.5
SW6010B	Nickel	14.6	200	19.76	200	200	
SW6010B	Potassium	2895	NV	1713	NV	NV	
SW6010B/SW7740	Selenium	0.907	3	0.313	5	5	
SW6010B	Thallium	2.43	2.43	1.5	1.5	0.2	
SW6010B	Vanadium	58.5	77	37.4	72	72	
SW6010B	Zinc	38.8	5100	51.3	5100	5100	
SW8081A	alpha-Chlordane	0.00092	0.082	0.0092	0.082	0.082	
SW8080A	Chlordane	0.009	0.3	0.009	0.3	0.1	
SW8081A	gamma-Chlordane	0.0092	0.082	0.0092	0.082	0.082	
SW8080A	Dieldrin	0.01	0.01	0.01	0.01	0.0038	
SW8080A	4,4'-DDE	0.008	0.084	0.028	0.084	0.084	
SW8081A	4,4'-DDT	0.0013	0.084	0.0017	0.084	0.084	
SW8260B	Acetone	0.005	1000	0.005	1000	1000	
SW8260B	Methyl ethyl ketone	0.009	6100	0.009	6100	6100	
SW8270C	Acenaphthene	0.33	610	0.33	610	610	
SW8310		0.083	610	0.083	610		
SW8270C	Anthracene	0.33	3100	0.33	3100	3100	
SW8310		0.0017	3100	0.0017	3100		
SW8270C	Benzo(a)anthracene	0.33	0.33	0.33	0.33	0.039	17
SW8310		0.0043	0.039	0.0042	0.039		
SW8270C	Benzo(b)pyrene	0.33	0.33	0.33	0.33	0.02	13
SW8310		0.0043	0.02	0.0042	0.02		
SW8270C	Benzo(k)fluoranthene	0.33	0.33	0.33	0.33	0.039	14
SW8310		0.0017	0.039	0.0017	0.039		
SW8270C	Benzo(g,h,i)perylene	0.33	310	0.33	310	310	
SW8310		0.0043	310	0.0042	310		
SW8270C	Benzo(b)fluoranthene	0.33	0.39	0.33	0.39	0.39	5.1
SW8310		0.0017	0.39	0.0017	0.39		
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	0.33	0.6	0.6	
SW8270C	Chrysene	0.33	3.9	0.33	3.9	3.9	11
SW8270C	Dibenz(a,h)anthracene	0.33	0.33	0.33	0.33	0.02	3.2
SW8310		0.017	0.02	0.017	0.02		
SW8270C	Fluoranthene	0.33	410	0.33	410	410	
SW8310		0.0043	410	0.0042	410		
SW8270C	Fluorene	0.0083	410	0.0083	410	410	
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	0.33	0.33	0.039	11
SW8310		0.01	0.039	0.05	0.039		
SW8310	Naphthalene	0.042	200	0.042	200	200	
SW8270C	Phenanthrene	0.33	310	0.33	310	310	
SW8310		0.0033	310	0.0033	310	310	
SW8270C	Pyrene	0.33	310	0.33	310	310	
SW8310		0.0083	310	0.0083	310	310	
SW9030B	Sulfide	25	NV	25	NV	NV	

TAB

APPENDIX A

FINAL

Field Sampling Plan

for

Interim Remedial Actions

at

Solid Waste Management Unit 17, 21, 30 and 40
NAS Fort Worth JRB, Texas

Prepared for

U.S. Air Force Center For Environmental Excellence
Brooks AFB, Texas

Prepared by

Ellis Environmental Group, LC
414 SW 140th Terrace
Newberry, FL 32669
(352) 332-3888
&
HydroGeoLogic, Inc.
1155 Herndon Parkway, Suite 900
Herndon, VA 20170

October 2001

Preface

This document is part of the Work Plan for a Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) at five Solid Waste Management Units (SWMUs) at Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas. The investigation is being conducted as part of the United States Air Force Installation Restoration Program (USAF IRP). This work is authorized as Delivery Order 0009 under Air Force Center for Environmental Excellence (AFCEE) Contract No. F41624-95-D-8032. The Work Plans consist of a Work Plan (WP), a Field Sampling Plan (FSP), and a Health and Safety Plan (HSP). The FSP describes in detail the proposed sampling and analysis and the specific procedures, measurements, and record keeping requirements for the field effort.

EEGs Assistant Program Manager, Mr. Rich Wheeler, PE will be responsible for reviewing and approving this FSP. The Project Manager, Mr Rick Levin, PG will be the prime point of contact with NAS Fort Worth JRB and AFCEE and will be responsible for technical, budget, and scheduling associated with this FSP. Quality Assurance, Laboratory, Technical, and Safety and Health Professionals will be responsible for maintaining a high degree of quality control for their associated tasks performed as part of the FSP and HydroGeoLogic (1998) Base-wide Quality Assurance Project Plan (QAPP).

Mr. Don Ficklen, AFCEE/ERD, the Team Chief for this scope of work, will be EEGs sole point of contact. The activities described in this FSP will begin after the date of agency concurrence on relevant portions of the FSP to Mr. Ficklen. Field investigative activities are tentatively scheduled to begin in October 2001, and should be completed by November 2001. Laboratory results for soil samples collected during the investigation should be available by December 2001.

Contents

Tables

Figures

Attachment

Abbreviations & Acronyms

3-D	three dimensional
Fe	iron
ft-bgs	feet below ground surface
kHz	kilohertz
L	liter
mg	milligrams
mL	milliliters
°C	degrees Celsius
B2EHP	bis(2-ethylhexyl)phthalate
COPC	chain of custody
COPC	contaminants of potential concern
DDD	4,4-dichlorodiphenyldichloroethane
DDE	4,4-dichlorodiphenyldrichloroethene
DDT	4,4-dichlorodiphenyltrichloroethane
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DOD	Department of Defense
DOT	Department of Transportation
DPT	direct-push technology
EEG	Ellis Environmental Group, LC
ERA	ecological risk assessment
FID	flame ionization detector
FS	feasibility study
FSP	field sampling plan
HSC	health and safety coordinator
HSP	health and safety plan
HW	hazardous waste
IAW	in accordance with
IDW	investigative derived waste
IRA	interim remedial action
IRP	installation restoration program
IRPIMS	Installation Restoration Program Information Management System
JRB	Joint Reserve Base
KCl	potassium chloride
LEL	lower explosivity limits
LF-01	Landfill No. 1 (a.k.a. SWMU 28)
LF-02	Landfill No. 2 (a.k.a. SWMU 29)
LF-06	Landfill No. 6 (a.k.a. SWMU 62)
LF-07	Landfill No. 7 (a k.a. SWMU 17)
LF-09	Landfill No. 9 (a.k.a. SWMU 30)
LNAPL	light-non-aqueous phase liquid

MSC	medium specific concentrations
NAS	naval air station
NCP	national contingency plan
NGVD	National Geodetic Vertical Datum
NTU	nephelometric turbidity unit
OC	organochlorine
OD	outside diameter
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenol
PID	photoionization detector
PM	project manager
POLs	petroleum, oil, and lubricants
PVC	polyvinyl chloride
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RFI	RCRA facility investigation
RI	remedial investigation
RRS	Risk Reduction Standards
SAP	sampling and analysis plan
SARA	1986 Superfund Amendments and Re-authorization Act
SI	site investigation
SOW	statement of work
SPLP	synthetic precipitation leaching procedure
SVOCs	semi-volatile organic compounds
SW-846	Solid Waste EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, 3rd edition, 1986
SWMU	solid waste management unit
SWMU 17	Solid Waste Management Unit No 17 (a.k.a. LF-07)
SWMU 28	Solid Waste Management Unit No. 28 (a.k.a. LF-01)
SWMU 29	Solid Waste Management Unit No. 29 (a.k.a LF-02)
SWMU 30	Solid Waste Management Unit No. 30 (a.k.a. LF-09)
SWMU 62	Solid Waste Management Unit No. 62 (a.k.a. LF-06)
TBD	to be determined
TCE	trichloroethene
TNRCC	Texas Natural Resource Conservation Commission
TOC	total organic carbon
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	U.S. Environmental Protection Agency

USGS	United Stated Geological Survey
UWCS	United Soil Classification System
VOC	volatile organic compound
WP	work plan

1.0 Introduction

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

Guidelines followed in the preparation of this plan are set out in the NAS Fort Worth RCRA Permit HW-50289 issued by the Texas Natural Resource Conservation Commission (TNRCC) on February 7, 1991 Additional reference documents followed in the preparation of this FSP include "AFCEEs Model Field Sampling Plan," (March, 1997) and the AFCEE "Handbook for the Installation Restoration Program (IRP) for Remedial Investigations and Feasibility Studies," (September, 1993). All laboratory analyses performed as part of this FSP will follow the Basewide Quality Assurance Project Plan (HydroGeoLogic, 1998).

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

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

2.0 Project Background

The following sections briefly describe the objective of the interim remedial action (IRA) and the rationale for implementing this IRA work plan (WP).

2.1 Site History

Carswell Air Force Base (CAFB) was officially closed on September 30, 1993. A parcel of the former Carswell AFB, NAS Fort Worth JRB, is in the process of being transferred from Air Force to Navy management. Before the property transfer can be completed, required environmental investigations of potential contamination related to USAF activities at the NAS Fort Worth property are to be completed and contaminated sites are to be remediated.

On February 7, 1991, the former Carswell AFB NAS Fort Worth JRB was issued an RCRA hazardous waste permit (HW-50289) by the TNRCC. This permit requires an RCRA facility investigation of all SWMUs listed in Permit Provision VIII (as well as those SWMUs subsequently added to the list) in order to determine whether hazardous constituents listed in 40 CFR Part 264, Appendix IX have been released into the environment.

SWMUs No. 17, 28, 29, 30, and 62 are the subject of this IRA. SWMU No. 62 was identified on the original list of RFI units in the permit. SWMUs No. 17, 28, 29, and 30 were added to the list of RFI units in the TNRCC letter dated March 2, 1995, to the Air Force Base Conversion Agency (AFBCA).

This investigation is managed by the USAF under the Environmental Restoration Account Other portions of the former AFB NAS Fort Worth JRB, that are not being transferred to the Navy, remain under the Base Realignment and Closure (BRAC) funding and management.

The primary regulatory programs that govern the IRA and potential closure of these sites are RCRA and the TNRCC Risk Reduction Standard (RRS) Program. The TNRCC is the lead regulatory agency for activities to be conducted at the subject sites.

This IRA has been designed to meet the requirements of Permit Provision VIII of the NAS Fort Worth HW-50289 permit. The IRA WP has been prepared using guidance documents from the USAF IRP, the U.S. Environmental Protection Agency (USEPA), TNRCCs RRS, and RCRA

2.2 Project Objectives

The purpose of this field investigation is to conduct IRAs necessary to obtain closure of five SWMUs located at NAS Fort Worth JRB under the TNRCC RRS Program An overview of the RRS program is presented in Section 2.0 of the Draft Technical Memorandum (HydroGeoLogic, 1998a). In addition, the SWMUs at NAS Fort Worth JRB are subject to the specific requirements of the Texas Natural Resource Conservation Commission (TRNCC) RCRA permit (HW-50289). Specific permit requirements are discussed in greater detail in Section 3.2 of the RFIs WPs (HydroGeoLogic, 1998b). The five SWMUs are SWMU 17 (Landfill No. 7 or LF-07), SWMU 28(Landfill No. 1 or LF-01), SWMU 29 (Landfill No. 2 or LF-02), SWMU 30 (Landfill No. 9 or LF-09), and SWMU 62 (Landfill No. 6 or LF-06).

Field studies that will be used to delineate RRS 2 and RRS 3 contaminants of potential concern (COPC) and confirm RRS 3 detections at the landfills include: (1) pre-excavation confirmation sampling using direct-push technology (DPT) to determine the actual size of the excavation and volume of contaminated soils prior to excavation activities; (2) soil borings with site-specific sampling will be advanced at each SWMU using direct-push coring to confirm the nature and extent of soil contamination at each location; (3) surface soil samples will be collected to delineate surface detections at SWMU 28.

2.3 Project Site Description

NAS Fort Worth JRB is located on 2,555 acres of land in Tarrant County, Texas, 8 miles west of downtown Fort Worth. The areas covered by this FSP are five landfills throughout the NAS Fort Worth JRB site. These landfills are identified as SWMU 17 (Landfill No. 7 or LF-07), SWMU 28 (Landfill No. 01 or LF-01), SWMU 29 (Landfill No.2 or LF-02), SWMU 30 (Landfill No. 9 or LF-09), (Landfill No. 2 or LF-02), and SWMU 62 (Landfill No. 6 or LF-06).

2.3.1 Solid Waste Management Unit 17 (Landfill 7)

The area designated as SWMU 17 is located within the flightline area near the intersection of Taxiway 197 and White Settlement Road. This landfill reportedly received construction debris in the form of concrete, asphalt, wood, trees, and potentially small amounts of undocumented hazardous materials from 1978 to 1983, but unauthorized dumping may have continued for several years thereafter (AFCEE, 1997). This area consists of approximately 3.5 acres of mostly vacant land covered by grasses and weeds and is littered with small pieces of concrete, asphalt, and rocks.

2.3.2 Solid Waste Management Unit 28 (Landfill 1)

SWMU 28 was a construction debris landfill for Carswell AFB in the 1940s and 1950s. It was located on the west bank of the West Fork Trinity River. In 1968, The U.S. Army Corps of Engineers excavated most of the landfill as part of a major flood control project. The exact location of the landfill materials was not documented; however, it appears that the excavated landfill materials were used as riprap along the west bank of the West Fork Trinity River. Landfill materials, not excavated during construction activities, appear to have been left in place and form part of the west bank of the West Fork Trinity River.

2.3.3 Solid Waste Management Unit 29 (Landfill 2)

This former borrow pit, located in the central section of the base near Haile Drive, was converted to a landfill in 1952, and accepted construction debris and moderate quantities of unspecified hazardous materials. In 1956, the site was covered (AFCEE, 1997). Currently, the site is surrounded by an 8-foot chain-link fence that provides security for Building 1055. This building occupies approximately one fourth of the 4.4-acre site. The remaining portion of the site is either occupied by temporary trailers or covered with asphalt or grass.

2.3.4 Solid Waste Management Unit 30 (Landfill 9)

This former landfill, located in the northeast section of the base adjacent to the West Fork of the Trinity River, received construction debris in the form of concrete, asphalt, and wood from 1978 to 1983 (AFCEE, 1997). At the eastern section of the landfill, a ditch has been created by runoff from an upgradient parking area located adjacent to Building 2570. Concrete, asphalt, telephone poles, and reinforcing steel are exposed in the newly formed banks of this ditch. The site is currently covered by vegetation, and current land use is limited to maintenance workers.

2.3.5 Solid Waste Management Unit 62 (Landfill 6)

This area is located between Roaring Springs Road and Haile Drive and is sparsely covered with vegetation. The site was a converted borrow pit used for the burial of construction materials and rubble, possibly drums of hydraulic fluid, and small quantities of other hazardous materials. It operated from 1975 to 1978, and was then covered. It has been documented that three drums of hydraulic fluid were placed in a centrally located pit to collect groundwater that seeped into the landfill (CH2M HILL, 1996c). It is unclear, from the file reviewed, whether this statement implies that the drums contain hydraulic fluid, or that they once contained hydraulic fluid, and the drums were simply used as a sump for water to be pumped from. Several stockpiles of fill dirt containing concrete, asphalt, crushed 55-gallon drums, and wood have accumulated adjacent to the site.

2.4 Project Site Contamination History

Section 1.2 of the WP provides the history of environmental investigations conducted at each site and documents subsequent contamination present at each site. Please refer to this section for the contamination history of the sites.

3.0 Project Scope and Data Quality Objectives

The following sections describe the objectives of the IRAs and the specific field activities that will be conducted during the investigation.

3.1 Objectives

The data generated by this project must be of sufficient quality and quantity to support the overall project objective to obtain closure of five SWMUs located at NAS Forth Worth JRB under the TNRCC RRS program. The objectives and focus of this work will be to (1) delineate RRS 2 and RRS 3 COPCs and confirm RRS 3 detections at each of the SWMUs, (2) conduct pre-removal confirmation sampling; (3) excavate a pre-determined volume of contaminated soil, (4) remove and properly contain and dispose of the excavated and contaminated soil; (5) backfill the excavations with the appropriate material; (6) re-grade and restore the site to the present configuration. Data from the following categories are required for this study:

- **Pre-excavation Confirmation Sampling:** Data will be used to determine the actual size of the excavation and the volume of contaminated soil to be removed prior to initiation of excavation activities.

- **Health and Safety:** Data will be used to establish the level of protection needed for the work party and other site related personnel. This data will be gathered by the use of organic vapor analyzers, Draeger tubes, and the lower explosivity limits (LEL)/O_2 meter during intrusive activities

Pre-excavation confirmation sampling data will be collected as definitive data. Health and safety data will be collected as screening data. The definitions of screening data and definitive data, as established by the "Data Quality Objectives Process for Superfund Interim Final Guidance," (EPA/540/G-93/071, 1993) are described below:

- **Screening Data with Definitive Confirmation:** Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures, such as dilution with a solvent, instead of elaborate extraction / digestion and cleanup. Screening data provides analyte identification and quantification. Although the quantification may be determined using analytical methods with QA/quality control (QC) procedures and criteria associated with definitive data, screening data without associated confirmation data are not considered to be data of known quality.

- **Definitive Data:** Definitive data will be generated using rigorous analytical methods such as approved EPA reference methods. Data will be analyte-specific with confirmation of analyte identity and concentration. These methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied For the data to be definitive, either analytical or total measurement error must be determined.

The data generated by the laboratory analysis of samples must be sufficiently sensitive to allow comparison of the results to the TNRCC RRS. The basewide QAPP (HydroGeoLogic, 1998) describes each method that will be performed as part of the investigation and outlines the quality assurance measures the contract laboratory must follow The methods of analysis selected for samples collected from NAS Fort Worth JRB will produce screening as well as definitive data.

3.2 Sample Analysis Summary

Samples collected will be analyzed, as specified, for each SWMU in Section 3.3 of this FSP. In accordance with the AFCEE basewide QAPP (HydroGeoLogic, Feb. 1998), the following USEPA methods will be used:

- SW8260B - Volatile Organics
- SW8270C - Semivolatile Organics
- SW8080A - Organochlorine (OC) Pesticides and Polychlorinated Biphenyls (PCBs)
- SW8310 -Polynuclear Aromatic Hydrocarbons (PAHs)
- SW6010B - Appendix IX Metals
- SW7470A/7471A - Mercury
- SW7421 -Lead
- SW7761 -Silver
- SW1312 – Synthetic Precipitation Leaching Procedure (SPLP)

Table 3.1 presents the list of the number of samples to be collected and the analytical methods to be performed for soil samples collected during the IRA field investigation.

3.3 Field Activities

The proposed field tasks described in this FSP will be conducted to achieve the project objectives as presented in the WP. Field investigative activities will be conducted at each of the five subject SWMUs. Table 3-2 contains a summary of the field activities planned during this IRA. Details, as to the justification for each sample to be collected, are presented in the WP. Table 3-3 is a summary of the data quality levels and intended use for data collected during the IRA.

The following sections describe the proposed field investigation activities for each site to be investigated during this study. More detailed descriptions of the rationale and justification for each of the proposed activities are presented in the WP.

3.3.1 Solid Waste Management Unit 17

Alternative medium specific concentrations (MSC) for COPCs, detected at several SWMU 17 boring locations, could not be established using SPLP and the COPCs currently remain at Standard 3 concentrations. An IRA consisting of two excavations is to be conducted in order to remove Standard 3 contaminant concentrations.[1] The proposed excavations appear to be the best interim remedy for attaining Standard 2 closure for the site soils (Figure 2-1). With the goal being to attain Standard 2 closure, confirmation sampling on excavation floors and sidewalls must

[1]IRA excavation boundaries may be altered and/or additional IRA sites may be added to the area of all SWMUs in this IRA WP and are subject to confirmation sampling of the excavated area.

indicate that COPCs are below site-specific RRS-2 concentrations. This is determined by comparing the confirmation sampling result to the TNRCC established RRS-2 value, or the site-specific MSC, if it exists (Figure 2-1). The primary COPC at SWMU 17 is lead, and the current site-specific MSC value for lead at SWMU 17 is 73.1 mg/kg.

Pre-excavation confirmation sampling using DPT methods will be utilized to assure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities. If Standard 3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and / or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that Standard 2 concentrations of COPCs have been established on all faces of the excavation area. The excavation intervals and COPCs driving the excavations are also noted with pink colored cells on Figure 2-1 analytical tables. Specific details about each excavation are outlined below.

3.3.1.1 Excavation Description

Excavation SWMU 17A is for the removal of lead-contaminated soils at the surface interval of boring B701/B718. Excavation SWMU 17A will be centered on the location of boring B701/B718 The dimensions of the excavation will extend to 5 feet wide by 5 feet long, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B701/B718 at a depth of 2 feet below ground surface (ft-bgs). Four additional samples, analyzed for lead will be collected at the zero to 0.5 foot interval with locations centered on each the north, south, east, and west sidewalls of the excavation. The proposed SWMU 17A excavation location and dimensions are presented in Figure 2-1.

Excavation SWMU 17B is for the remediation and removal of surface soils contaminated with Standard 3 concentrations of lead Excavation SWMU 17B is to be centered on the location of boring BHGLTA725/768. The initial excavation will extend to 5 feet long by 5 feet wide, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B725/B768 at a depth of 2 ft bgs. Four additional samples, analyzed for lead, will be collected at the zero to 0.5 foot interval with locations centered on each the north, south, east, and west sidewalls of the excavation. The proposed SWMU 17B excavation location and dimensions are presented in Figure 2-1.

3.3.2 Solid Waste Management Unit 28

Alternative MSCs for COPCs, at most SWMU 28 boring locations, were established using SPLP and most of the COPCs are at or below site-specific Standard 2 concentrations However, Standard 3 concentrations for several compounds encountered at one of the 2001 characterization borings still exist. Confirmation/SPLP sampling is proposed for these compounds. In addition, delineation is required for some of the COPCs detected at Standard 2 and 3 concentrations in at all three of the characterization borings installed in June 2001. Rationale for additional sampling is presented below. Proposed sample locations are presented in Figure 2-2.

3.3.2.1 Proposed Surface Soil Sampling

Soil sample locations B127 and B128 are proposed to delineate surface detections of cadmium and silver at B123 to the west and north of B123. The detection of zinc in the surface interval of B123 at a concentration of 40.4 mg/kg is considered to be a natural variation of the background value of 38.8 mg/kg.

Soil boring B130 is proposed to delineate cadmium, lead, silver, zinc, and p,p'-DDE detections at B126 to the west of B126. Soil boring B132 is proposed to delineate surface detections of zinc and p,p'-DDE south of B126. Note that cadmium, lead, and silver are already delineated in surface soil south of B126 by B128.

Soil sample locations B133 and B134 are proposed to delineate surface detections of silver to the south and west of B111.

3.3.2.2 Proposed Subsurface Soil Sampling

Soil boring B129 is proposed to delineate subsurface detections at B124 of metals, mercury, pesticides, volatile organic compounds (VOCs), and polynuclear aromatic hydrocarbons (PAHs) to the west of B124. Lead, zinc, p,p'-DDE, and toluene will be delineated in the 5-foot interval of B129, and toluene will be delineated in the 10-foot interval of B129. Note that lead is delineated to the west of B124 in the 10-foot interval of B106/B120 Appendix IX metals, mercury, p,p'-DDD, p,p'-DDE, toluene, and PAHs will be delineated in the 15-foot interval of B129, and toluene will be delineated in the 20-foot interval of B129. Detections of chromium (18.2 mg/kg) and zinc (34.5 mg/kg) in the 20-foot interval of B126 are considered to be natural variations of the background concentrations of 16.31 mg/kg and 31.3 mg/kg respectively. If bedrock is encountered before deeper samples can be collected, then all analyses and analytes proposed for the deeper sample intervals should be consolidated into a soil sample collected just above bedrock to provide delineation of these compounds

Soil boring B130 is proposed to delineate subsurface detections at the 5-foot interval of B126 of toluene and -bis(2-ethylhexyl)phthalate (B2EHP) to the west of B126. Depth to bedrock is approximately 6 ft-bgs next to B130. The sample interval just above bedrock should be sampled for Appendix IX metals, mercury, p,p'-DDD, p,p'DDE, toluene, B2EHP, and naphthalene. If bedrock is encountered at 6-ft-bgs, then these samples should be consolidated into the 5-foot interval of B130.

Soil boring B131 is proposed to confirm Standard 3 detections of mercury and B2EHP detected in the 5-foot and 10-foot intervals of B126. SPLP analysis should be performed on each of these analytes to potentially obtain site-specific MSCs for these compounds. If alternative MSCs cannot be established for any of these compounds, then excavation of the remaining Standard 3 COPCs may be necessary to obtain closure of SWMU 28 under RRS-2. Note that confirmation/SPLP is currently being performed for Standard 3 copper detected in the 15-foot interval of B126. Potential excavation dimensions could range in size and volume if the groundwater MSC is exceeded in the SPLP extract of confirmed Standard 3 COPCs in the various sample intervals. Excavation dimensions per interval are: 5-foot interval - 7 feet wide by 7 feet long, with an excavation depth of 7 feet (12.7 cubic yards); 10-foot interval – 12 feet wide by

12 feet long, with an excavation depth of 12 feet (64 cubic yards); 17 feet wide by 17 feet long, with an excavation depth of 17 feet (182 cubic yards).

Soil boring B132 is proposed to delineate subsurface detections to the south of B126. The 5-foot interval of B132 will be sampled for cadmium, copper, lead, zinc, mercury, toluene, and B2EHP. Silver is delineated in the 5-foot interval by B108. The 10-foot interval of B132 will be sampled for cadmium, copper, lead, tin, zinc, p,p'DDD, p,p'-DDE, toluene, B2EHP, and naphthalene. Note that arsenic, mercury, and silver are delineated in the 10-foot interval south of B126 by B108 The 15-foot interval of B132 will be sampled for Appendix IX metals (less mercury) and toluene. The 20-foot interval of B132 will be sampled for toluene only. The detection of acetone in the 20-foot interval of B126 is considered to be a laboratory artifact. If bedrock is encountered before all subsurface samples can be collected, then the deeper proposed subsurface samples should be consolidated into the interval just above bedrock to obtain delineation of these compounds

3.3.3 Solid Waste Management Unit 29

Two of the COPCs at SWMU 29 currently remain at Standard 3 concentrations. An IRA consisting of one excavation will be conducted in order to remove Standard 3 contaminant concentrations. The proposed excavation appears to be the best interim remedy for attaining Standard 2 closure for the site soils (Figure 2-3). With the goal being to attain Standard 2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COPCs are below site-specific RRS-2 concentrations. This is determined by comparing the confirmation sampling result to the TNRCC established RRS-2 value for B2EHP and the site-specific MSC of 44.4 mg/kg for Lead (Figure 2-3).

Pre-excavation confirmation sampling using (DPT methods will be utilized to assure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities. If Standard 3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and / or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that Standard 2 concentrations of COPCs have been established on all faces of the excavation area. The excavation intervals and COPCs driving the excavations are also noted with pink colored cells on the Figure 2-3 analytical tables. Specific details about the excavation are outlined below.

3.3.3.1 Excavation Description

Excavation SWMU 29A is for the removal of lead and B2EHP-contaminated soils at the surface interval of borings B231 and B251. The dimensions of the excavation will extend to 10 feet wide by 10 feet long, with an excavation depth of 2 feet (7.4 cubic yards). A confirmation sample will be collected and analyzed for lead and B2EHP directly below B231/B251 at depth of 2 ft-bgs. Four additional samples, analyzed for lead and B2EHP (68, 4J mg/kg at B910/B927) only, will be collected at the zero to 0.5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 29A excavation location and dimensions are presented in Figure 2-3 Note that proposed excavations SWMU 31A and SWMU 31B will be completed under a separate work plan as part of the IRAs for Waste Accumulation Areas.

3.3.4 Solid Waste Management Unit 30

One of the COPCs at SWMU 30 remains at Standard 3 concentrations. An IRA consisting of two excavations will be conducted in order to remove Standard 3 contaminant concentrations. The proposed excavation appears to be the best interim remedy for attaining Standard 2 closure for the site soils (Figure 2-4). With the goal being to attain a Standard 2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COPCs are below site-specific RRS-2 concentrations. This is normally determined by comparing the confirmation sampling result to the site-specific MSC of 101 mg/kg for lead at SWMU 30 (Figure 2-4); however, a soil sample with a lower lead concentration (68.4 J mg/kg at B910/B927) exceeded the industrial groundwater protection limit and therefore could not be used as an alternate MSC from boring B910/B927.

The next highest lead results that can be used as site-specific MSCs are B921/B929 at the 15-foot interval (78.9 mg/kg) and B942 at the 15-foot interval (30 mg/kg). As 30 mg/kg is the highest lead concentration that is also below the 68.4 mg/kg concentration at B910/B927, an SPLP test should be run on Standard 3 confirmation samples in the excavation of B910/B927 that exceed 30 mg/kg to determine if these particular concentrations are protective of the environment.

Pre-excavation confirmation sampling using DPT methods will be utilized to assure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities If Standard 3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and/or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that Standard 2 concentrations of COPCs have been established on all faces of the excavation area. The excavation intervals and COPCs driving the excavations are also noted with pink colored cells on Figure 2-4 analytical tables. Specific details about the excavation are outlined below.

3.3.4.1 Excavation Description

Excavation SWMU 30A is for the removal of lead contaminated soils at the 5-foot interval of borings B921/B929. The dimensions of the excavation will extend to 7 feet wide by 7 feet long, with an excavation depth of 7 feet (12.7 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B921/B929 at a depth of 7 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. Since the site-specific MSC of 101 mg/kg is less than the concentration of 154 J mg/kg (B921/B927-5-foot) that exceeded the industrial groundwater MSC in the SPLP analysis, the site-specific MSC of 101 mg/kg should be used at as a comparison value at excavation SWMU 30A. The proposed SWMU 30A excavation location and dimensions are presented in Figure 2-4.

Excavation SWMU 30B is for the removal of lead contaminated soils at the 5-foot interval of borings B910/B927. The dimensions of the excavation will extend to 7 feet wide by 7 feet long, with an excavation depth of 7 feet (12.7 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B910/B927 at a depth of 7 ft-bgs. Four additional samples, analyzed for lead only, will be collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. SPLP should be run on each Standard 3

confirmation sample that exceeds 30 mg/kg to determine if the lead concentrations are protective of the environment at this excavation location. Note that lead was not detected above RRS-1 in the 10-foot interval of B910/B927 If the confirmation sample collected in the 7-foot interval exceeds the industrial groundwater MSC in the SPLP extract, the excavation should be completed to a depth of 10-ft-bgs where lead is known to be below background concentrations. The proposed SWMU 30B excavation location and dimensions are presented in Figure 2-4.

3.3.5 Solid Waste Management Unit 62

Previously, an alternative MSC for COPCs detected at several SWMU 62 boring locations could not be established using SPLP. These COPCs currently remain at Standard 3 concentrations. An IRA consisting of three excavations will be conducted in order to remove Standard 3 contaminant concentrations.[2] The proposed excavations appear to be the best interim remedy for attaining Standard 2 closure for the site soils (Figure 2-5). With the goal being to attain Standard 2 closure, confirmation sampling on excavation floors and sidewalls must indicate that COPCs are below site-specific RRS-2 concentrations. This is determined by comparing the confirmation sampling result to the TNRCC established RRS-2 value, or the site-specific MSC, if it exists (Figure 2-5). The primary COPC at SWMU 62 is lead, and the current RRS-2 value for lead at SWMU 62 is 27.5 mg/kg.

Pre-excavation confirmation sampling using DPT methods will be utilized to assure that the actual size of the excavation and volume of contaminated soils removed is known prior to the initiation of excavation activities. If Standard 3 concentrations are identified on the floor or sidewall of the excavation, then the aerial extent and / or depth of the excavation should be incrementally enlarged until confirmation sampling indicates that Standard 2 concentrations of COPCs have been established on all faces of the excavation area The excavation intervals and COPCs driving the excavations are also noted with pink colored cells on the Figure 2-5 analytical tables. Specific details about each excavation are outlined below.

3.3.5.1 Excavation Description

Excavation SWMU 62A is for the removal of lead contaminated soils at the surface and 5-foot interval of boring B640 Excavation SWMU 62A will be centered on the location of boring B640. The dimensions of the excavation will extend to 7 feet wide by 7 feet long, with an excavation depth of 7 feet (12.7 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B640 at a depth of 7 ft-bgs. Four soil samples, analyzed for lead, will be collected at the surface interval with locations centered on the north, south, east, and west sidewalls of the excavation. An additional four soil samples, also analyzed for lead, will be collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 62A excavation location and dimensions are presented in Figure 2-5

Excavation SWMU 62B is for the remediation and removal of surface soils contaminated with Standard 3 concentrations of lead. Excavation SWMU 62B is to be centered on the location of

[2]IRA excavation boundaries may be altered and/or additional IRA sites may be added to the area of all SWMUs in this IRA WP and are subject to confirmation sampling of the excavated area.

depth of 5 feet (4.6 cubic yards). A confirmation sample will be collected and analyzed for lead directly below B646 at a depth of 5 ft-bgs. Four additional samples, analyzed for lead, will be collected at the zero to 0.5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 62B excavation location and dimensions are presented in Figure 2-5. Note that the 5-foot interval will provide western delineation of the lead detection at the 5-foot interval of B640 as well as vertical delineation at B646. The surface samples will delineate lead detected at B646 to the north, west, and south.

Excavation SWMU 62C is for the remediation and removal of surface soils contaminated with Standard 3 concentrations of lead. Excavation SWMU 62C is to be centered on the location of boring B647. The initial excavation will extend to 5 feet long by 5 feet wide, with an excavation depth of 5 feet (4.6 cubic yards) A confirmation sample will be collected and analyzed for lead directly below B647 at a depth of 5 ft-bgs. Four additional samples, analyzed for lead, will be collected at the zero to 0.5 foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The proposed SWMU 62C excavation location and dimensions are presented in Figure 2-5. Note that the 5-foot interval will provide southern delineation of the lead detection at the 5-foot interval of B640 as well as vertical delineation at B647. The surface samples will delineate lead detected at B646 to the west, south, and east.

4.0 Project Organization and Responsibility

Figure 4-1 shows the project organization, reporting relationships, and line authority. Table 4-1 lists key project personnel and their respective telephone numbers. Other personnel will be assigned as necessary The specific responsibilities are described in the following subsections.

4.1 Management Responsibilities

4.1.1 Assistant Program Manager

The project manager will be the prime point of contact with AFCEE and will have primary responsibility for technical, budget, and scheduling matters. His duties will include:

- Reviewing and approving the WP, QAPP, FSP, HSP.
- Providing sufficient resources to the project team so that it can respond fully to the requirements of the investigation
- Providing direction and guidance to the PM
- Reviewing the final project report
- Providing other responsibilities as requested by the PM

4.1.2 Project Manager

The PM will be the prime point of contact with AFCEE and will have primary responsibility for technical, budget, and scheduling matters. His duties will include:

- Reviewing and approving project plans and reports
- Assigning duties to the project staff and orienting the staff to the needs and requirements of the project
- Obtaining the approval of the QA manager for proposed variances to the WP and FSP
- Supervising the performance of project team members
- Providing budget and schedule control
- Reviewing subcontractor work and approving subcontract invoices
- Ensuring that major project deliverables are reviewed for technical accuracy and completeness before their release, including data validity
- Ensuring that all resources of the laboratory are available on an as-required basis
- Overseeing final analytical reports

4.2 Quality Assurance and Health and Safety Responsibilities

4.2.1 Quality Assurance Manager

Responsibilities of the QA manager will include:

- Serving as official contact for QA matters for the project
- Identifying and responding to QA/QC needs and problem resolution needs
- Answering requests for guidance or assistance
- Reviewing, evaluating, and approving the FSP and QAPP and all changes to these documents
- Verifying that appropriate corrective actions are taken for all non-conformances

- Verifying that appropriate methods are specified in the FSP and QAPP for obtaining data of known quality and integrity
- Fulfilling other responsibilities as requested by the PM
- Evaluating subcontractor quality program
- Training staff on QA subjects
- Supervising staff in QA program related tasks
- Recommending changes in the QA program

4.2.2 Health and Safety Coordinator

Responsibilities of the Health and Safety Coordinator (HSC) will include:

- Developing the HSP
- Ensuring that the requirements of the QAPP are satisfied
- Providing other responsibilities as identified in the HSP

4.3 Laboratory Responsibilities

4.3.1 Laboratory Project Manager

The laboratory's PM will report directly to EEG's PM and will be responsible for the following:

- Ensuring that all resources of the laboratory are available on an as-required basis
- Overseeing final analytical reports

4.3.2 Laboratory Operations Manager

The laboratory's operation manager will report to the laboratory's PM and will be responsible for the following

- Coordinating laboratory analyses
- Supervising in-house chain-of-custody
- Scheduling sample analyses
- Overseeing data review
- Overseeing preparation of analytical reports
- Approving final analytical reports prior to submission to EEG

4.3.3 Laboratory Quality Assurance Officer

The laboratory's QA officer has the overall responsibility for data after it leaves the laboratory. The QA officer will be independent of the laboratory but will communicate data issues through the laboratory's PM. In addition, the QA officer will:

- Conduct audits of laboratory analyses
- Provide oversight of laboratory QA
- Provide oversight of QA/QC documentation
- Conduct detailed reviews of data
- Determine whether to implement laboratory corrective actions, if required
- Define appropriate laboratory QA procedures
- Prepare laboratory standard operation procedures

4.3.4 Laboratory Sample Custodian

The laboratory's sample custodian will report to the operations manager. Responsibilities of the sample custodian will include

- Receiving and inspecting the incoming sample containers
- Recording the condition of the incoming sample containers
- Signing appropriate documents
- Verifying chain of custody and its correctness
- Notifying laboratory manager and laboratory supervisor of sample receipt and inspection
- Assigning a unique identification number and customer number, and entering each into the sample receiving log
- Initiating transfer of the samples to appropriate lab sections with the help of the laboratory operations manager
- Controlling and monitoring access/storage of samples and extracts

4.4 Field Responsibilities

4.4.1 Project Geologist

The project geologist will be responsible for geologic interpretations as well as acting as lead coordinator for field activities. The project geologist's duties and responsibilities will include

- Providing orientation and any necessary training to field personnel (including subcontractors) on the requirements of the FSP, HSP, and QAPP before the start of work
- Providing direction and supervision to the sampling crews
- Monitoring sampling operations to ensure that the sampling team members adhere to the QAPP and FSP
- Ensuring the use of calibrated measurement and test equipment
- Maintaining a field records management system
- Coordinating activities with the PM
- Supervising geological data interpretation activities
- Overseeing field data documentation and conducting quality checks on interpretive geologic work products
- Reviewing reports for compliance with State of Texas and EPA requirements
- Assuming the duties of the HSC if directed by the HSC

4.5 Subcontractors

Subcontractors will be used for line locating, drilling of soil borings, excavation of test pits, and surveying, during the field investigation. In addition, laboratory analyses of all samples collected during the investigation will also be subcontracted to an analytical laboratory.

Qualified subcontractors will be selected in accordance with AFCEE requirements and EEG procurement and QA procedures. Subcontractors will meet predetermined qualifications developed by the PM and defined in the procurement bid packages. Each bid submitted will be reviewed for technical, QA, and purchasing requirements. All subcontractors will be required to follow the procedures of the WP, FSP, QAPP, and HSP. Periodic QC inspections of each

subcontractor may be performed as specified in the FSP (Section 7.5), QAPP (Section 9.1), and HSP (Section 1.3.2). These inspections will be performed by the QA manager, or his designee, as unannounced audits to confirm adherence to the procedures and guidance outlined in the aforementioned documents. Such inspections may relate to health and safety, QAPP requirements, or field standard operating procedures.

5.0 Field Operations

The overall project field logistics and activities necessary to complete the project sampling objectives described in the work plan are presented in this section. All field work will be conducted in accordance with the site HSP. EEG is the prime contractor for the field investigation. The point-of-contact (POC) at the base will be Mr. Mike Dodyk. EEG's project geologist/field coordinator will be Mr. Rick Levin, PG.

5.1 Geologic Standards

The lithologic descriptions for consolidated materials (igneous, metamorphic, and sedimentary rocks) shall follow the standard professional nomenclature (cf. Tennissen, A.C., 1983, Nature of Earth Materials, 2nd Edition, pp. 204-348), with special attention given to describing fractures, vugs, solution cavities and their fillings or coatings, and any other characteristics affecting permeability. Colors shall be designated by the Munsell Color System.

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

The sedimentary, igneous, and metamorphic rocks and deposits shall be represented graphically by the patterns shown in Figure 5-1. Columnar sections, well and boring logs, well construction diagrams, cross sections, and three-dimensional (3-D) diagrams shall use these patterns. Supplementary patterns shall follow Swanson, R. G., 1981, Sample Examination Manual, American Association of Petroleum Geologists, pp. IV-41 and 43. Geologic structure symbols shall follow American Geological Institute Data Sheets, 3d Edition, 1989, sheets 3.1 through 3 8.

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

For orientation, the cross sections shall show the northern end on the viewer's right. If the line of cross section is predominantly east-west, the eastern end is on the right. Maps shall be oriented with north toward the top, unless the shape of the area dictates otherwise. Indicate orientation with a north arrow.

5.2 Site Reconnaissance, Preparation, and Restoration Procedures

Areas designated for intrusive sampling shall be surveyed for the presence of underground utilities. Utility locations are determined using existing utility maps; in the field, they are verified

by using a hand-held magnetometer or utility probe. Prior to commencement of drilling activities, utility clearances will be obtained through the services of an established utility locating service subcontractor, and dig permits will be secured from the Navy Public Works office. Those locations not clear of underground utilities will be relocated to achieve clearance, and then verified for clearance a second time. Vehicle access routes to sampling locations shall be determined prior to any field activity

A centralized decontamination area shall be provided for drilling rigs and equipment. The decontamination area shall be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. The decontamination area shall be lined with a heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. Solid wastes shall be accumulated in 55-gallon drums and subsequently transported to a waste storage area designated by the USAF. Smaller decontamination areas for personnel and portable equipment shall be provided as necessary. These locations shall include basins or tubs to capture decontamination fluids, which shall be transferred to a large accumulation tank as necessary. These designated areas of decontamination shall be determined during the pre-construction meeting.

The field office and the primary staging area for field equipment and supplies will be the contractor trailer at 1346A Range Road, and the IDW yard south of Building 1337.

Each work site or location shall be returned to its original condition when possible. Efforts shall be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a site, all drums, trash, and other waste shall be removed. Decontamination and/or rinse water and soil cuttings shall be transported to the designated locations as described in Section 5.7. At the completion of field activities, all capital equipment and consumable materials will be removed or turned over to base personnel in accordance with AFCEE procedures. A final site walk will be conducted with the base representative, at his/her discretion, to ensure that all sampling locations have been restored satisfactorily before final demobilization from the site.

5.3 Excavations

Figures 2-1, 2-2, 2-3, 2-4, and 2-5 show the areas to be excavated and dimensions for each site The location of each excavation site will be clearly marked in the field by EEG before the excavation activities commence At each site, the excavation subcontractor will maintain an excavation of sufficient size to allow workers to complete all necessary tasks related to this IRA in a safe and timely manner. All contractors and subcontractors shall follow Occupational Safety and Health Administration (OSHA) rules for excavation and confined space entry. Sheeting, bracing, or shoring shall be installed in the absence of adequate side slopes if there is a need for workers to enter the excavated area. The subcontractor will submit specifications to EEG for sheeting, bracing, or shoring that shall be installed in the absence of adequate side slopes, if there is a need for workers to enter any excavation areas that are greater than 4 feet deep.

Excavation and sampling activities will be monitored with an organic vapor monitor such as a photo-ionization detector (PID) or an organic vapor analyzer (OVA). Additional monitoring

devices may be deemed advisable such as Draeger tubes and a LEL/O_2 for benzene monitoring at depth.

Surface water shall be diverted to prevent entry into the excavation. The subcontractor will protect the site from puddling or running water, or accumulation of standing water in excavations. Excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. All excavated soils will be temporarily stored in such a way as to prevent movement of COPC soils from the containment area. This would include protection from precipitation events or displacement of material by wind. This could involve utilization of a water impermeable tarp between the ground and the bottom of the pile that is protected from surface water by a berm structure around its perimeter and under the tarp. The berm structure can be achieved by clean fill, or dimensional lumber laid end-to-end, or uncontaminated soil. The whole pile would also be covered by a secured water impermeable tarp to protect the deposited COPC soil from precipitation and wind.

It is not expected that excavation activity will come into contact with the water table at any of the landfills addressed by this IRA. Nevertheless, the subcontractor shall be prepared to deal with any dewatering of the excavation pit necessary for the adequate completion of the proposed work. If large volumes of water are to be pumped, the subcontractor will station a portable water storage tank for collection of removed water. Any dewatering that might be needed shall be limited to that necessary to assure adequate access, safe excavation, and to ensure that compaction requirements can be met.

No blasting will be permitted. No open burning of trash, brush, or refuse will be permitted. In addition, the subcontractor will take steps to ensure that no accumulation of litter or debris shall accumulate or be deposited at the IRA site herein described. The subcontractor, where necessary, shall provide appropriate waste containers.

The subcontractor will treat areas subject to dust-producing activities with liquid palliatives that will not harm re-growth of vegetation, or another such method of dust control that complies with base regulations. Likewise, excavated materials stored for subsequent use as backfill will be treated or protected to control the production of dust in accordance with base regulations.

EEG will conduct all soil and water sampling in accordance with TNRCC regulations during excavation activities. EEG will provide all bottleware, sampling supplies, and sample analyses. Sampling intervals for each SWMU excavation is as stated above in Section 3.0. Stockpiled soils will also be tested after removal so as to determine suitability for backfill or appropriate containment and disposal. Each sample shall be homogenized and quartered before being containerized. Samples collected for VOC analysis shall be containerized prior to sample homogenization. Stainless steel scoops or trowels, glass jars with Teflon™ lids, or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples. Any above ground vegetative matter or debris will be excluded from the sample.

Specific suites of laboratory analyses are prescribed for each individual SWMU addressed by this IRA WP. Analytical methods and COPCs to be tested are listed in Figures 2-1, 2-2, 2-3, 2-4, and 2-5.

Appropriate methods for the collection of samples will be dependent upon the method of analysis chosen. Samples will be collected from the exposed soil surface using a stainless steel hand trowel for metals, total petroleum hydrocarbon (TPH), or semi-volatile compounds. VOC samples will be collected using the EnCoreTM soil sampler. The Quality Assurance Project Plan (HydroGeoLogic, 2000c) will be used to assure that the data collected is accurate and representative.

The sampling crew will record any unusual surface conditions that may affect the chemical analyses such as (1) asphalt pieces that may have been shattered by mowers, thus spreading small fragments of asphalt over the sampling area, (2) distance to roadways, aircraft runways, or taxiways, (3) obvious deposition of contaminated or clean soil at the site, (4) evidence of dumping or spillage of chemicals, (5) soil discoloration, and/or (6) unusual condition of growing plants, etc.

5.4 Borehole Drilling, Lithologic Sampling, Logging, and Abandonment

5.4.1 General Drilling Procedures

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

The location of all borings will be coordinated, in writing, with the base civil engineer, or equivalent, before drilling commences. When drilling boreholes through more than one water bearing zone or aquifer, EEG and its subcontractors will take measures to prevent cross-connection or cross-contamination of the zones or aquifers.

The Geoprobe will be cleaned and decontaminated in accordance with (IAW) the procedure in Section 5.9. The Geoprobe® shall not leak any fluids that may enter the borehole or contaminate equipment placed in the hole. The use of rags or absorbent materials to absorb leaking fluids is unacceptable, and will not be permitted

As DPT is to be used for this project; drilling fluids shall not be used. A log of drilling activities will be kept in a bound field notebook. Information in the logbook will include location, time on site, personnel and equipment present, down time, materials used, samples collected, measurements taken, and any observations or information that would be necessary to reconstruct field activities at a later date. At the end of each day of drilling, the drilling supervisor will complete a Log of Daily Time and Materials Form. An example of this form is provided in Attachment A.

EEG will dispose of all trash, waste grout, cuttings, and drilling fluids as coordinated with the NAS Fort Worth JRB representative.

5.4.2 Sampling and Logging

The lithology in all boreholes will be logged. The boring log form (Attachment A) will be used for recording the lithologic logging information Information on the boring log sheet includes the

borehole location, drilling information, sampling information (such as sample intervals), and sample description information.

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

Plasticity of fines description include: (1) color using Munsell Color System, (2) moisture (dry, wet, or moist), (3) consistency of fine grained soils, (4) structure of consolidated materials, and (5) cementation (weak, moderate, or strong).

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

Lithologic descriptions of consolidated materials encountered in the boreholes will generally be described in accordance with Section 5.1. Consolidated samples for lithologic description will be obtained continuously using DPT method. The samples shall be handled in such a way as to minimize the loss of volatiles; these procedures are described in Section 6.0. Cuttings will be examined for their hazardous characteristics. Materials suspected to be hazardous because of abnormal color, odor, or organic vapor monitor readings will be containerized in conformance with RCRA, state, and local requirements.

5.4.3 Abandonment

Boreholes that are not converted to monitor wells will be abandoned in accordance with 30 TAC Chapter 238, Water Well Driller Rules (TNRCC, 1997). Since the borings will not exceed 100 feet, the boring will be plugged to a depth not exceeding 2 ft bgs with a solid column of either cement, or 3/8 inch or larger granular sodium bentonite. The granular bentonite shall be hydrated at frequent intervals while strictly adhering to the manufacturers specifications. The top 2 feet of each boring will be filled with cement as an atmospheric barrier (TNRCC, 1997).

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

5.5 Surveying

All surveying locations of field activities will be measured by a State of Texas certified land surveyor as the distance in feet from a reference location that is tied to the state plane system. The surveys will be third order (cf. Urquhart, L.C., 1962 Civil Engineering Handbook, 4th Edition, p. 96 and 97). An XY-coordinate system will be used to identify locations. The X-coordinate will be the east-west axis; the Y-coordinate will be the north-south axis. The reference location is the origin. All surveyed locations will be reported using the state plane coordinate system. The surveyed control information for all data collection points will be recorded and displayed in a table. The table will give the X and Y coordinates in state plane coordinate values, the ground elevation, and the measuring point elevation, if the location is a ground-water monitor well. The X and Y coordinates for each sample location will be determined to within 0.1 foot and referenced to the state plane coordinate system. Vertical control will be to the National Geodetic Vertical Datum (NGVD) and will be within 0.01 foot for all sampling locations.

5.6 Equipment Decontamination

All equipment that may directly or indirectly contact samples will be decontaminated in a designated decontamination area. This includes the core samplers, and the portions of the Geoprobe® that stand above boreholes, sampling devices, and instruments, such as spoons or bowls. In addition, EEG and its subcontractors will take care to prevent the sample from coming into contact with potentially contaminating substances such as tape, oil, engine exhaust, corroded surfaces, and dirt.

The following procedure will be used to decontaminate large pieces of equipment such as coring samplers, probing rods, and those portions of the Geoprobe® that may stand directly over a boring or well location or that come into contact with casing, pipe, or rods. The external surfaces of equipment will be washed with high-pressure hot water and Alconox, or equivalent laboratory-grade detergent, and if necessary, scrubbed until all visible dirt, grime, grease, oil, loose paint, rust flakes, etc., have been removed. The equipment will then be rinsed with potable water. The inside surfaces of drill rods, and soil boring probes will also be washed as described.

The following procedure will be used to decontaminate sampling and drilling devices such as bailers and augers that can be hand-manipulated. For sampling and smaller drilling devices, the equipment will be scrubbed with a solution of potable water and Alconox, or equivalent laboratory-grade detergent. The equipment will then be rinsed with copious quantities of potable water followed by a rinse with ASTM Type II Reagent Water High pressure liquid chromatograph-grade water and distilled water purchased in stores are not acceptable substitutes for ASTM Type II Reagent-Grade Water. The equipment will then be rinsed with pesticide-grade methanol followed by a rinse with pesticide-grade hexane. The equipment will then be allowed to air dry on a clean surface or rack, such as Teflon, stainless steel, or oil-free aluminum, elevated at least 2 feet above ground. If the sampling device will not be used immediately after being decontaminated, it will be wrapped in oil-free aluminum foil, or placed in a closed stainless steel glass, or Teflon[7] container.

Reagent-Grade II Water, methanol, and hexane will be purchased, stored, and dispensed only in glass, stainless steel, or Teflon[7] containers. These containers will have Teflon[7] caps or cap liners EEG and its subcontractors will assure that these materials remain free of contaminants. If any question of purity exists, new materials will be used.

All fluids, generated during decontamination activities, will be placed in 55-gallon drums. All drums will be properly labeled as to content and shall be staged in a central location designated by the base representative for temporary storage, pending removal and disposal.

5.7 Waste Handling

Waste handling will be dealt with on a site-by-site basis. Waste will be classified as either non-investigative waste or investigative waste per the requirements of 30 TAC '335 Subchapter R and 40 CFR Part 261, Subpart C.

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

Waste containers will be labeled with the following information type of matrix being contained, depth from which matrix was obtained, date matrix was contained, company name and phone number, and whether matrix is considered hazardous or not.

Characterization of investigative derived waste (IDW) will be based on sample analysis obtained during the field investigation following EPA approved methods. Hazardous waste classification will first be determined as per 40 Code of Federal Regulations Sections 261 2, 261.3, or 261.4. Waste that is non-hazardous, is then classified as Class 1, Class 2, or Class 3 according to 30 TAC Sections 335.505 through 335.507. Once the IDW has been characterized, an eight-digit waste code number will be provided as required in Section 335.501. The disposal of IDW will be conducted in a timely and cost effective manner, and in accordance with all state and federal regulations.

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

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

Waste generated during the field activities will be handled and disposed of in accordance with applicable federal, state, and local regulations. Disposable materials such as latex gloves,

aluminum foil, paper towels, etc., shall be placed and sealed in plastic garbage bags for disposal with sanitary waste from the site. Soil cuttings will be placed in 55-gallon steel open-top drums with lids. Development and purge waters evacuated from groundwater monitoring wells, and all fluids generated during decontamination activities, will be placed in 55-gallon steel drums. Drums will be properly labeled with the appropriate boring or well number and content, and will be staged in a central location designated by the base representative for temporary storage pending removal and disposal.

5.8 Corrective Action

Table 5-1 contains a summary of field quality control procedures and corrective actions.

6.0 Environmental Sampling

6.1 Sampling Procedures

All sampling equipment will be decontaminated, according to the specifications in Section 5 6, prior to any sampling activities and will be protected from contamination until ready for use. The construction material of the sampling devices (e.g., plastic, PVC, metal) discussed below will be appropriate for the contaminant of concern and shall not interfere with the chemical analyses being performed.

6.1.1 Direct-Push Sampling

Direct-push sampling involves advancing a sampling probe by direct hydraulic pressure or by using a slide or rotary hammer. Samples may be collected at specific depths. The samples are collected in plastic sleeves. The sample shall be homogenized and quartered before being containerized. Samples collected for VOC analysis shall be containerized prior to sample homogenization. Stainless steel scoops or trowels, glass jars with Teflon[7] lids or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples. Once the containers have been filled, the appropriate information shall be recorded in the field log book.

6.1.1.1 Subsurface Soil Sampling

Soil samples will be collected as specified in Section 4.0 of the WP. The sample shall be homogenized and quartered before being containerized. Sample collected for VOC analysis shall be containerized prior to sample homogenization. Stainless steel scoops or trowels, glass jars with Teflon[7] lids or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples.

6.1.1.2 Surface Soil Sampling

Surface soil samples will be collected as specified in Section 4.0 of the WP Surface soil samples shall be collected from zero to 0.5 inch from the surface. The sample shall be homogenized and quartered before being containerized. Sample collected for VOC analysis shall be containerized prior to sample homogenization. Stainless steel scoops or trowels, glass jars with Teflon[7] lids, or equivalent equipment compatible with the chemical analyses proposed, shall be used to collect and store samples. Above ground plant parts and debris will be excluded from the sample. Record unusual surface conditions that may affect the chemical analyses, such as (1) asphalt chunks that may have been shattered by mowers, thus spreading small fragments of asphalt over the sampling area, (2) distance to roadways, aircraft runways, or taxiways, (3) obvious, deposition of contaminated or clean soil at the site, (4) evidence of dumping or spillage of chemicals, (5) soil discoloration, and/or (6) unusual condition of growing plants, etc

6.2 Sample Handling

6.2.1 Sample Containers

Sample containers will be provided to field personnel, precleaned and treated according to EPA specifications for the methods. No sampling containers will be reused for the sampling events of this RFI. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles are used routinely where glass containers are specified in the sampling protocol.

6.2.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on AFCEE samples are listed in Table 6-2. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods used in this FSP are specified in Table 6-2.

6.2.3 Sample Identification

The following information will be written in the logbook and on the sample label when samples are collected for laboratory analysis:

- Project identification (name and number)
- Sample identification number
- Sample location
- Preservatives added
- Date and time of collection
- Requested analytical methods
- Sampler's name

Each sample will be assigned a unique identification number that describes where and what type of sample was collected. The number that will be used in the field will consist of a maximum 15 digit alphanumeric code. Once data is ready to be entered into the Installation Restoration Program Information Management System (IRPIMS) database, the alphanumeric code will be truncated to 10 digits. This system is explained in detail as follows.

abbbccccccdd-ee

where:

a	represents the medium (e.g., W = monitoring well, P = wipe sample, R = rinse sample, B = soil boring, U = surface water sample, or E = sediment sample)
bbb	represents Ellis Environmental Group, LC designation (e.g., EEG)
cccccc	represents the SWMU/area of concern (AOC) number (e.g., SWMU05, SWMU51, AOC015, etc.)
dd	represents the location identification (LOCID) (e.g., 01, 02)

ee represents the order that the sample was obtained within the soil boring, i.e , a surface soil sample would be 01, a 5- to 7-foot sample would be 02, etc. These two digits will be dropped once the data is entered into the IRPIMS database.

For example, the first soil sample collected from soil boring 01 located at SWMU05 would be identified as "BEEGSWMU0501-01." The second sample collected from soil boring 01 located at SWMU05 would be identified as "BEEGSWMU0501-02." Duplicate samples will be submitted to the laboratory blind. A note in the field log book and the Field Sampling Report form will identify the location and sample number that has been duplicated

QC samples will be identified by the use of a similar system of identifiers with a maximum of 10 characters. The QC sampling number system is summarized below

aabbccdd

where:

aa represents medium (e.g., ER = equipment rinsate, TB = trip blank, AB = ambient blank, EB = equipment blank)

bb represents the day (e.g., 15)

cc represents the month (e.g., 06)

dd represents the year (e.g., 98)

For example, an equipment blank collected on the 15th day of June in the year 1998 will be "EEB150698."

The field coordinator will maintain a list that describes how each QC sample corresponds with specific environmental samples. For instance, each trip blank will be correlated with a particular set of samples shipped to the laboratory, and each rinsate will be correlated to those samples collected by a particular set of decontaminated sampling tools

6.3 Sample Custody

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

Chain of custody (COC) records will be maintained for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view, after being in their possession, (3) it was in their possession, and they locked it up, or (4) it is in a designated secure area. All sample containers will be sealed in a manner that will prevent or detect tampering if it occurs. In no instance will tape be used to seal sample containers. Samples will not be packaged with activated carbon. Attachment A contains a sample COC form.

The following minimum information concerning the sample will be documented on the COC form (as illustrated in Attachment A):

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

All samples will be uniquely identified, labeled, and documented in the field at the time of collection in accordance with Section 6.2.3 of the FSP. Samples collected in the field will be transported to the laboratory or field testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated, the samples will be packed in ice or chemical refrigerant to keep them cool during collection and transportation During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a VOC sampling vial filled with water) will be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

6.4 Field Quality Control Samples

Field quality control samples such as blanks and duplicates will be collected as described in the following sections.

6.4.1 Ambient Blank

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

Ambient blanks are used to assess the potential introduction of contaminants from ambient sources (e g., active runways, engine test cells, gasoline motors in operation, etc.) to the samples during sample collection. Ambient blanks will be collected downwind of possible VOC sources. One ambient blank will be collected at the beginning of the field investigation. Additional ambient blanks will be collected if site conditions warrant.

6.4.2 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent-grade water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the

laboratory for analysis. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. Equipment blanks will be collected immediately after the equipment has been decontaminated. The blank will be analyzed for all laboratory analyses requested for the environmental samples collected at the site. One equipment blank will be collected per day for each type of sampling equipment used.

6.4.3 Trip Blank

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

6.4.4 Field Duplicates

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

Duplicate sample results are used to assess precision of the sample collection process Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. One duplicate sample will be collected for every 10 groundwater samples collected.

6.4.5 Field Replicates

A field replicate sample is a second sample divided into two equal parts for analysis. The sample containers are assigned an identification number in the field such that they cannot be identified as replicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection. Replicate sample results are used to assess precision One replicate sample will be collected for every 10 soil samples.

7.0 Field Measurements

7.1 Air Monitoring

IRA field activities will utilize air monitoring to determine if there are threats to human health. Excavation and sampling activities will be monitored with an organic vapor monitor such as a PID, an OVA, or an LEL/O_2 meter. Background readings and any high readings will be recorded in the field log book.

7.2 Equipment Calibration and Quality Control

Field equipment will be maintained and calibrated to the standards in their respective operations manuals. Equipment failures will be repaired in the field, if possible; if not, the instrument will be tagged, removed from use, and returned for repair or replacement. Field equipment will be calibrated daily before the start of sampling activities. Calibration records will be maintained on the Calibration Log (Attachment A). The calibration record will include a unique instrument number (e.g., serial number), standards used, concentrations, and meter readings.

7.3 Equipment Maintenance and Decontamination

7.3.1 Equipment Maintenance

Field equipment will be kept in a controlled storage room and will be decontaminated prior to return to storage; any malfunctions will be reported to the field coordinator. The field coordinator will initiate actions necessary for the repair or replacement of defective equipment. Equipment maintenance logs are kept updated and on file. Power supplies of battery-powered instruments will be checked daily. Rechargeable instruments will be recharged daily.

7.3.2 Decontamination of Field Instruments

Decontamination of field instruments will be instrument-specific. No decontamination is required for the OVA.

7.4 Field Performance and System Audits

The project geologist or a designated representative will conduct weekly informal audits of the field activities. The weekly audit for completeness will include the following items:

- Sample labels
- Chain of custody records
- Field notebooks
- Sampling operations
- Document control

The first three items above will be checked for completeness. Sampling operations will be reviewed to determine if they are performed as stated in the WP or as directed by the project geologist. The informal document control audit will consist of checking each document for completeness, including items such as signatures, dates, and project numbers

An unscheduled systems audit of field operations will be conducted using the project-specific work plan and will be used to review the total data generation. The audit will include on-site review of the field operational system, physical facilities for sampling, and equipment calibrations. A performance audit may be conducted by the PM and project geologist if deemed necessary by the PM, project geologist, lab coordinator, or client. The audit may focus on verifying that proper procedures are being followed so that subsequent sample data will be valid. Prior to the audit, a checklist will be prepared by the PM and project geologist that will serve as a guide for the performance audit.

The audit will verify whether or not (1) collection of samples follows the available written procedures, (2) chain of custody procedures are followed for traceability of samples origin, (3) appropriate QC checks are being made in the field and documented in the field log book, (4) specified equipment is available, calibrated, and working properly, (5) sampling crews are adequately trained, (6) record-keeping procedures are being followed and appropriate documentation is maintained, and corrective action procedures are followed. An audit report summarizing the results and corrections will be prepared and filed in the project files.

8.0 Record Keeping

EEG will maintain field records sufficient to recreate all sampling and measurement activities and to meet all IRPIMS data loading requirements. The information shall be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records shall be archived in an easily accessible form and made available to the USAF upon request.

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

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

The following section describes the field documentation procedures, which will be followed as a means of recording observations and findings during the RFI field investigation. Documentation will include the form of field logbooks, various sample and calibration forms, site photographs, and drawings/sketches All documentation will be completed in indelible ink and corrections will be stricken out with a single line and initialed. Examples of field forms are included in Attachment A.

8.1 Field Logbook

Logbooks with sequentially numbered pages will be kept at the site during all field activities and will be assigned to each sample team. These logs will be updated, continually, and will constitute master field investigation documents. Information to be recorded in the logs includes, but is not limited to, the following:

- Project identification
- Field activity subject
- General work activity, work dates, and general time of occurrence
- Unusual events
- Subcontractor progress or problems
- Communication with the client or others
- Weather conditions
- EEG personnel, subcontractors, and visitors on site
- Sample number and time of day for each sample collected for analysis
- Listing by sample number of samples collected during the day, sorted by chain-of-custody record number (compiled at the end of the day)
- Record of telephone call to laboratory informing it of sample shipment
- Accomplishment of decontamination of drilling rig, construction materials, and sampling equipment
- Accomplishment of required calibration checks

- Disposition of purge water, decontamination fluids, and soil cuttings
- Variances from project plans and procedures (details will be recorded in the log book and presented in the IRA)
- Accomplishment of tailgate safety meetings
- Review of project procedures with site personnel
- Breathing zone readings
- Accomplishment of decontamination of water sampling equipment
- Photographs taken and identification numbers
- Name and signature of person making log book entries
- Inspections and results of inspections

8.2 Field Equipment Logbook

A field equipment logbook will be kept on site to document the proper use, maintenance, and calibration of field testing equipment. Accompanying the field equipment logbook will be a three ring binder containing operator manuals, specifications, and calibration requirements and procedures for all field-testing equipment. Information to be recorded in the field equipment logbook includes the following:

- Equipment calibration status
- Equipment decontamination status
- Equipment nonconformance
- Equipment inspection and repair records
- Name and signature of person making entry
- Date of entry
- Name of equipment and its identifying number
- Nature of work conducted
- List or reference of procedures used for calibration or maintenance
- Manufacturer, lot number, and expiration date of calibration standards
- Measurement results

8.2.1 Sample Collection Log

A sample collection log form (i e , Field Sampling Report) will be completed for each sample collected during the investigation. An example of the Field Sampling Report form is included in Attachment A. Information to be included on the form includes the following:

- Date and time of sample collection
- Sample location
- Sample type (i.e., surface soil, sediment, groundwater, etc.)
- Name of person collecting samples
- Sample volumes and container types

9.0 References

Air Force Center for Environmental Excellence (AFCEE), 1993, Handbook for the Installation Restoration Program (IRP) for Remedial Investigations and Feasibility.

Air Force Center for Environmental Excellence (AFCEE), 1996, AFCEE's Model Field Sampling Plan.

Air Force Center for Environmental Excellence (AFCEE), 1997, Annex A to F41624-95-D-8005-005 Statement of Work, RCRA Facility Investigation of Landfills at Naval Air Station Fort Worth Joint Reserve Base, Carswell Field, Texas, Information on Landfill Sites.

American Geological Institute Data Sheets, 1989, 3rd Edition.

American Society for Testing and Materials, 1990, Standard Practice for Description and Identification of Soils (D-2488-90).

CH2M HILL, 1996, Interim Draft Base-Wide Quality Assurance Project Plan, NAS Fort Worth JRB, Carswell Field, Texas.

CH2M HILL, 1996b, Draft Groundwater Sampling and Analysis Plan, NAS Fort Worth JRB, Carswell Field, Texas.

CH2M HILL, 1996c, Site Characterization Summary - Informal Technical Information Report, NAS Fort Worth JRB, Carswell Field, Texas.

CH2M HILL, 1997, NAS Fort Worth JRB Base-wide Groundwater Sampling and Analysis Program. Quarterly Groundwater Sampling Event (January 1997).

Driscoll, F.G , 1986, Groundwater and Wells 2nd Edition.

HydroGeoLogic, Inc., 1998, Basewide Quality Assurance Project Plan, NAS Fort Worth JRB, Texas.

Ohio Environmental Protection Agency, 1993, Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs.

Swanson, R.G., 1981, Sample Examination Manual, American Association of Petroleum Geologists.

Tennissen, A.C , 1983, Nature of Earth Materials, 2nd Edition.

Texas Natural Resource Conservation Commission, 1997, Texas Administrative Code, Environmental Quality, Chapter 238 Well Drillers and Water Well Pump Installers.

U.S. Army Corps of Engineers, Fort Worth District, 1993, Preliminary Assessment/Site Investigation for Site LF-06 Landfill Number 6, SWMU No. 62.

U.S. Environmental Protection Agency (EPA), 1986, Test Methods for Evaluating Solid Waste· Physical/Chemical Methods, 3rd Edition.

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

U.S. Environmental Protection Agency (EPA), Nov. 1992, RCRA Ground-Water Monitoring: Draft Technical Guidance.

U.S. Environmental Protection Agency (EPA) Research Paper, Apr. 1996, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.

Urquhart, L.C., 1962, Civil Engineering Handbook 4th Edition, Water Measurement Manual, Bureau of Reclamation.

Tables

Table 3-1. Sample Analysis Summary

Site	Method	Matrix Soil	# Samples	# Equipment Blanks	# Ambient Blanks	# Trip Blanks	# Field Replicates	# MS/MSD	Total #Samples
SWMU 17	6010B/7421	Subsurface	10[2]	1	0	1	1	2/2	17
SWMU 28	8080A	Surface	2	1	0	0	1	1/1	6
SWMU 28	6010B	Surface	6	1	0	0	1	2/2	12
SWMU 28	7761	Surface	5	1	0	0	1	1/1	9
SWMU 28	7421	Surface	1	1	0	0	1	1/1	5
SWMU 28	6010B	Subsurface	7	0	0	0	2	2/2	13
SWMU 28	7421	Subsurface	4[1]	1	0	0	1	1/1	8
SWMU 28	7471	Subsurface	5	1	0	0	1	1/1	9
SWMU 28	8260B	Subsurface	7[1]	1	1	1	2	2/2	16
SWMU 28	8270C	Subsurface	5	1	0	0	1	1/1	9
SWMU 28	8310	Subsurface	1	1	0	0	2	1/1	6
SWMU 28	1312	Subsurface	4	1	0	0	1	1/1	8
SWMU 28	8080A	Subsurface	4	1	0	0	1	1/1	8
SWMU 29	8270C	Subsurface	5	1	1	1	1	1/1	11
SWMU 29	6010B/7421	Subsurface	5	1	0	0	1	1/1	9

Site	Method	Matrix Soil	# Samples	# Equipment Blanks	# Ambient Blanks	# Trip Blanks	# Field Replicates	# MS/MSD	Total #Samples
SWMU 30	6010B/7421	Subsurface	10[2]	0	0	0	1	2/2	15
SWMU 62	7421	Subsurface	19	1	0	0	2	4/4	30

Notes:

1 = SPLP method should be performed on mercury and B2EHP at soil boring B131 to potentially obtain site-specific MSCs

2 = SPLP should be run on each RRS 3 confirmation sample that exceeds 30 mg/kg to determine if the lead concentrations are protective of the environment at SWMU 30B If the confirmation sample at the 7-foot interval exceeds the industrial groundwater MSC in the SPLP extract, the excavation should be completed to a depth of 10 ft-bgs

Field Duplicates = Collected on a 10 percent basis of investigation samples

Trip Blanks = One trip blank will be included per cooler when at least one sample is analyzed for VOCs from that cooler.

Ambient Blanks = One ambient blank will be collected at the beginning of the field investigation for soil and groundwater

Matrix Spike/ Matrix Spike Duplicate = Collected on a 20 percent basis of samples

Table 3-2. Field Activities Summary

Site	Activity	Number of DPT Borings, Surface Soil Samples, or Excavations
SWMU 17 (Landfill 7)	DPT Borings	10+
SWMU 17 (Landfill 7)	Excavations	2
SWMU 28 (Landfill 1)	Surface Soil Samples	6
SWMU 28 (Landfill 1)	DPT Borings[1]	4+
SWMU 29 (Landfill 2)	DPT Borings	5+
SWMU 29 (Landfill 2)	Excavation	1
SWMU 30 (Landfill 9)	DPT Borings[2]	10+
SWMU 30 (Landfill 9)	Excavations	2
SWMU 62 (Landfill 6)	DPT Borings[3]	15+
SWMU 62 (Landfill 6)	Excavations	3

Notes:
1 = See section 4 2 2 of the Work Plan for specific sampling instruction
2 = If the confirmation sample collected in the 7-ft. bgs interval exceeds the industrial groundwater MSC in the SPLP extract, the excavation should be completed to a depth of 10-ft bgs
3 = Four additional samples at the 5-ft. bgs interval will be analyzed for lead to provide delineation for all three boreholes in SWMU 62
DPT = Direct Push Technology

Table 3-3. Data Quality Levels and Intended Use for Field and Laboratory Data

Sampling Matrix / Location	Parameters	Analytical Method	Field/Lab Analysis	Data Quality Level	Intended Use
Soil, all locations	VOCs	PID LEL/O_2 Boring Logs	Field Field Field	Screening	Field screening for selecting samples for Health and Safety to differentiate the stratigraphy,
Surface Soil	Metals Lead Silver Organochlorine Pesticides	6010B 7421 7761 8080A	Lab Lab Lab Lab	Definitive Definitive Definitive Definitive	Nature/extent of contaminants, risk assessment
Subsurface Soil	IX metals Mercury Lead Silver VOCs SVOCs Organochlorine Pesticides PAHs SPLP	6010B / 7000 7470A / 7471A 7421 7761 8260B 8270C 8080A 8310 1312	Lab Lab Lab Lab Lab	Definitive Definitive Definitive Definitive Definitive	Nature/extent of contaminants, risk assessment

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi Volatile Organic Compounds
PAHs = Polynuclear Aromatic Hydrocarbons
NA = Not Applicable

Table 4-1. Key Project Personnel
RCRA Facility Investigation - SWMUs 17, 28, 29, 30, and 62

Name	Title	Organization	Telephone
Don Ficklen, PG	Team Chief	AFCEE/ERD	(210) 536-5290
Michael Dodyk, PE	NAS Fort Worth JRB POC	AFCEE/ERD	(817) 732-9734
Richard Wheeler, PE	Assistant Program Manager	EEG	(352) 332-3888
Rick Levin, PG	Project Manager	EEG	(352) 332-3888
Mark Bagel, PG	QA Manager	EEG	(352) 332-3888
Jason Shannon	Health & Safety Officer	EEG	(352) 332-3888
TBD	Project Geologist	HydroGeoLogic	(703) 478-5186
Jeffrey Finn	Project Geologist	EEG	(352) 332-3888
Karen Hatfield	Data Mgmt Supervisor/ Chemist	EEG	(352) 332-3888
Miquette Rochford, PG	Project Manager	HydroGeoLogic	(703) 478-5186

TBD - To Be Determined

Table 5-1. Field Corrective Action Procedures

Situation	Calibration	Frequency	Field Objective Affected	Corrective Action Procedure
Equipment malfunction				
PID/OVA	Calibrated to 20% of known calibration gas	Daily	Equipment is calibrated and operating properly	Notification of site supervisory personnel Correct problem, recalibrate Repair or replace malfunctioning parts
LEL/O_2	Calibrated to 20% of known calibration gas	Daily	Equipment is calibrated and operating properly	Document to Project Geologist, Project Manager, and Quality Assurance Manager
Incorrect sample collection procedures	NA	NA	Samples are taken according to standard operating procedures	Notification of site supervisory personnel Review of situation and correct procedures Document to Project Geologist, Project Manager, and Quality Assurance Manager
Insufficient sample volume collection	NA	NA	Sufficient sample volume is provided to maintain sample integrity so that all required analyses can be conducted	Notification of site supervisory personnel by laboratory manager Review site affected and impact of samples on site charactenzation - correct procedures Document to Project Geologist, Project Manager, and Quality Assurance Manager
Incorrect measurement data collection	NA	NA	Measurements are conducted according to standard operating procedures	Notification of site supervisory personnel Review of situation and correct procedures Document to Project Geologist, Project Manager, and Quality Assurance Manager

Table 6-2. Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
Metals (except mercury)SPLP	SW6010B SW7421 SW 7761 1312	P, G, T	HNO_3 to pH < 2, 4°C	500 mL or 8 ounces	180 days (water and soil)
Mercury	SW7470 SW7471	P, G, T	HNO_3 to pH < 2, 4°C	500 mL or 8 ounces	28 days (water and soil)
Cyanide, total and amenable to chlorination	SW9010A SW9012	P, G, T	4°C, NaOH to pH >12, 0 6g ascorbic acid	500 mL or 4 ounces	14 days (water and soil)
Dioxins and furans	SW8290	G, Teflon-lined cap, T	4°C, 0 008% $Na_2S_2O_3$ (Kept Dark)	1 liter or 8 ounces	30 days to extraction and 45 days after extraction (water and soil)
Organochlorine pesticides and polychlorinated biphenyls (PCBs)	SW8080A SW8081	G, Teflon-lined cap, T	4°C, pH 5 to 9	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Organo-phosphorus Pesticides	SW8140	G, Teflon-lined cap, T	4°C, pH 5 to 9	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water), 14 days until extraction and 40 days after extraction (soil)
Sulfide	SW9030	P, G, T	4°C; NaOH to pH >9, 2ml zinc acetate	500ml or 4 ounces	7 days
Total Organic Carbon	SW9060	one 250 m/L polyethylene	4°C, H_2SO_4 to pH < 2	250 m/L	28 days
Methane	SW3810 Mod	3 40 mL clear glass vials with rubber septa & Teflon lined caps	4°C	120mL	14 days
Ferrous Iron	HACH method #8146	100-ml glass vials	NA	NA	Field method-analyze immediately
Alkalinity	E310 1	One 500-mL polyethylene	4°C	250mL	14 days
Common Anions	SW9056	one 1-L polyethylene	4°C	100mL	28 days for Br^-, F^-, Cl^- and SO_4^{-2} 48

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
					hours for NO_3^-, NO_2^-, and PO_4^{-3}
Semivolatile organics PAHs	SW8270B SW8310	G, Teflon-lined cap, T	4°C, 0 008% $Na_2S_2O_3$	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Volatile organics	SW8010, SW8020, SW8260A	G, Teflon-lined septum, T	4°C, 0 008% $Na_2S_2O_3$ (HCl to pH < 2 for volatile aromatics by SW8260)[b]	2 x 40 mL or 4 ounces	14 days (water and soil), 7 days if unpreserved by acid

a = Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).
b = No pH adjustment for soil.
c = Preservation with 0.008 percent $Na_2S_2O_3$ or by ascorbic acid is only required when residual chlorine is present.

Figures

Figure 4-1. Project Organization Chart

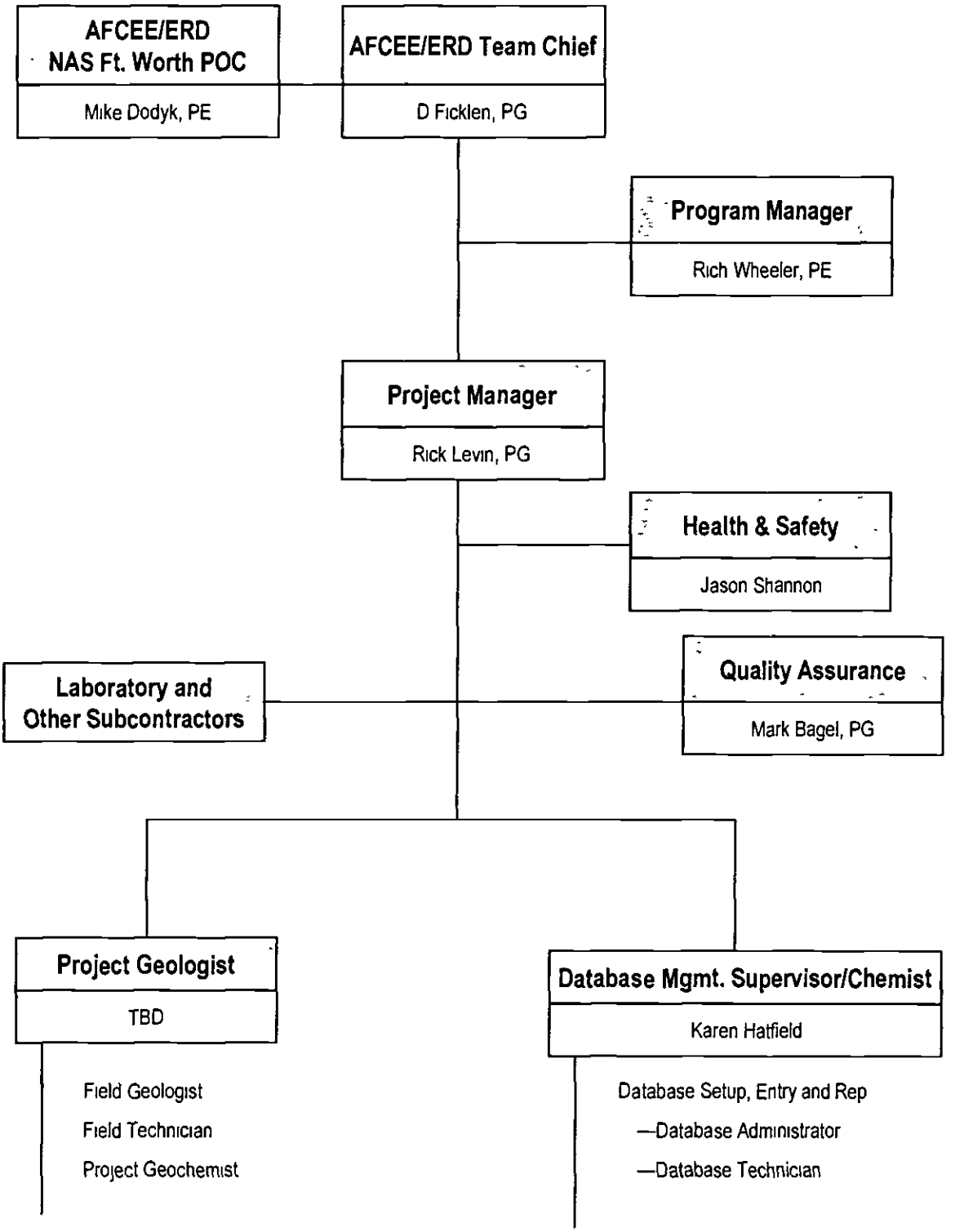
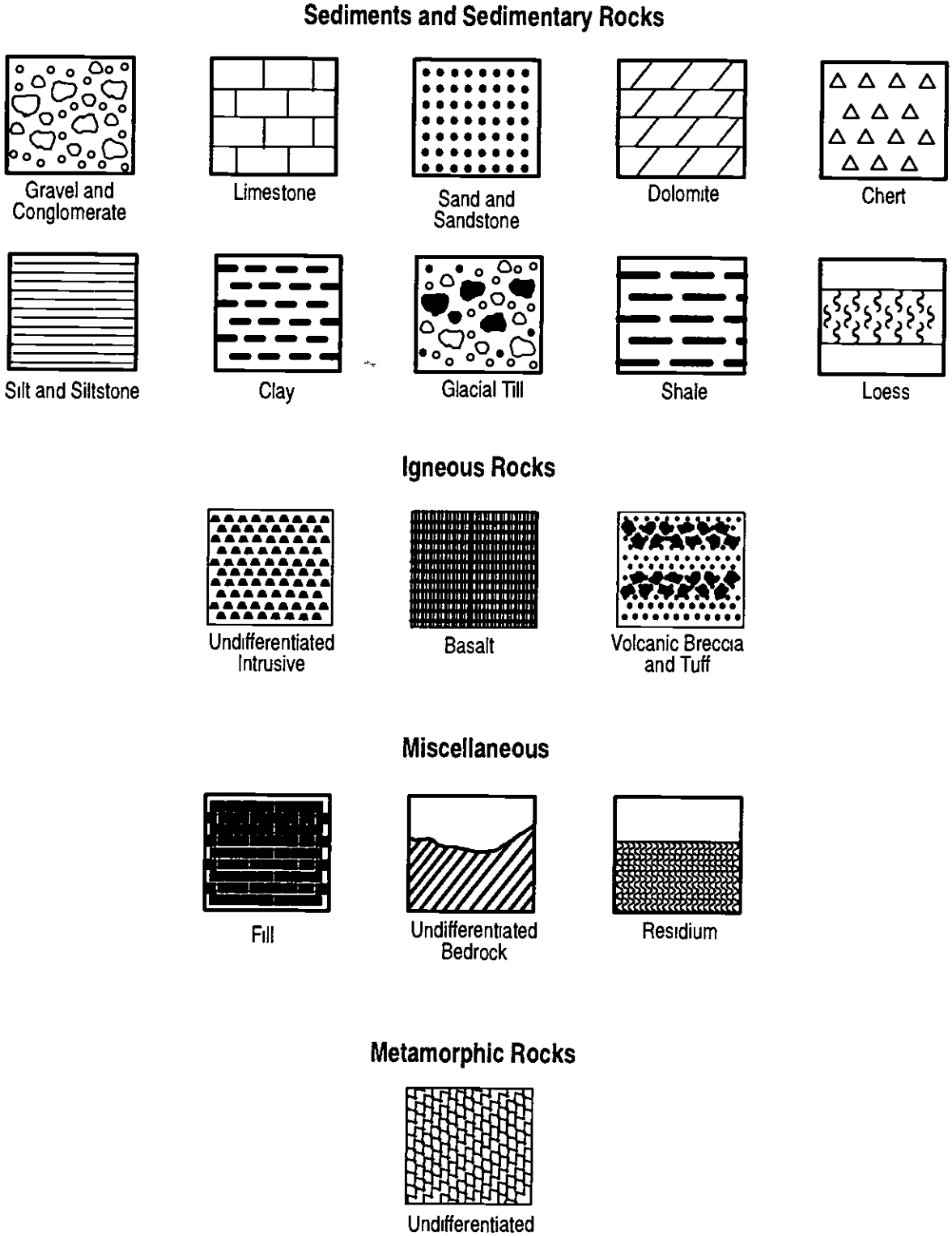


Figure 5-1
Lithologic Patterns for Illustration



ATTACHMENT A

Field Forms

ELLIS ENVIRONMENTAL GROUP, LC

BORING LOG

Borehole ID: _____
Sheet ____ of ____

AFIID		LOCID		
Project Name	Project Number	LTCCODE	Site ID	LPRCODE (IRPIMS)
Drilling Company DRL Code	Driller	Ground Elevation	Total Drilled Depth	EXCODE
Drilling Equipment	Drill/Excav Method / Borehole Diameter	Date/Time Drilling Started	Date/Time Total Depth Reached	
Type of Sampling Device		Water Level (bgs) First/Final	Site Name	
Sample Hammer Type	Driving Wt. / Drop	Hydrogeologist	Checked by/Date	SITEXREF

Depth	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Lithology	Water Content	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc.)

ELLIS ENVIRONMENTAL GROUP, LC

FIELD SAMPLING REPORT

LOCATION: _____ PROJECT : _____

SITE: _____

SAMPLE INFORMATION

MATRIX _____ SAMPLE ID: _____

SAMPLING METHOD _____ DUP./REP. OF : _____

BEGINNING DEPTH _____ MATRIX SPIKE/MATRIX SPIKE DUPLICATE
YES ( ) NO ( )

END DEPTH _____

GRAB ( ) COMPOSITE ( ) DATE: _____ TIME: _____

CONTAINER		PRESERVATIVE/	EXTRACTION	ANALYTICAL	ANALYSIS
SIZE/TYPE	#	PREPARATION	METHOD	METHOD	

NOTABLE OBSERVATIONS

PID READINGS	SAMPLE CHARACTERISTICS	MISCELLANEOUS
1st	COLOR:	
2nd	ODOR:	
	OTHER:	

pH _____ Temperature _____ Dissolved oxygen _____ Specific Conductivity_____

GENERAL INFORMATION

WEATHER: SUN/CLEAR _____ OVERCAST/RAIN _____ WIND DRIECTION _____ AMBIENT TEMP _____

SHIPMENT VIA: FED-X _____ HAND DELIVER _____ COURIER _____ OTHER _____

SHIPPED TO: _____

COMMENTS: _____

SAMPLER: _____ OBSERVER: _____

MATRIX TYPE CODES

DC=DRILL CUTTINGS
WG=GROUND WATER
LH=HAZARDOUS LIQUID WASTE
SH=HAZARDOUS SOLID WASTE
SE=SEDIMENT
SL=SLUDGE
SO=SOIL
GS=SOIL GAS
WS=SURFACE WATER
SW=SWAP\WIPE

SAMPLING METHOD CODES

B=BAILER
BR=BRASS RING
CS=COMPOSITE SAMPLE
C=CONTINUOUS FLIGHT AUGER
DT=DRIVEN TUBE
W=SWAB\WIPE
G=GRAB
HA=HAND AUGER
H=HOLLOW STEM AUGER
HP=HYDRO PUNCH
SS=SPLIT SPOON
SP=SUBMERSIBLE PUMP

ELLIS ENVIRONMENTAL GROUP, LC

MONITOR WELL PURGING FORM

PROJECT : _____ DATE: _____

LOCATION: _____ EXPLOSIMETER BOREHOLE READING _____

WELL ID: _____ PURGE VOLUME (3 WELLBORE VOLUMES): _____ (L)

WELL DEPTH: _____

Time	Depth to Water (ft)	Flow Meter Reading	Volume Purged (L)	Temp. (°C)	pH	Electrical Conductivity (mmho)	Turbidity N.T.U	Comments

Note: Condition of the well: _____

pH - Calibrate at start and before last reading.

Sampler _____ Observer _____

ELLIS ENVIRONMENTAL GROUP, LC

MONITOR WELL STATIC WATER LEVEL FORM

PROJECT NAME:_____ DATE: _____

PROJECT NO.: _____

WATER LEVEL INDICATOR ID NO.: _____ FIELD BOOK NO.: _____

LOCATION: _____ PAGE NO.: _____

Monitor Well Name	LOCID	Time	Depth to Static Water Level (from T.O.C.)	Total Well Depth (ft)	Explosimeter Reading (above background)	PID Reading (above background)

Note: Total well depth to be measured at time of gauging.

Comments: _____

_____

_____

Sampler _____ Observer _____

ELLIS ENVIRONMENTAL GROUP, LC

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID _____
SHEET _____ of _____

AFIID: _____ LOCID: _____ SITEID: _____

PROJECT NAME: _____ PROJECT NO. : _____ DATE: _____

LOCATION: _____ DATE INSTALLED: _____

TOTAL DEPTH (FTOC) _____ CASING DIAMETER _____ LOGCODE: HGL-H

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe _____

Equipment decontaminated prior to development ☐ Yes ☐ NO

Describe _____

EQUIPMENT NUMBERS:

pH Meter _____ EC Meter _____ Turbidity Meter _____ Thermometer _____

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION.

Measured Well Depth (B) _____ ft.

Static Water Level Depth (C) _____ ft.

Length of Static Water Colume (D) _____ (B) - _____ (C) = _____ ft.

Casing Water Volume (E) = _____ (A) x _____ (D) = _____ gal

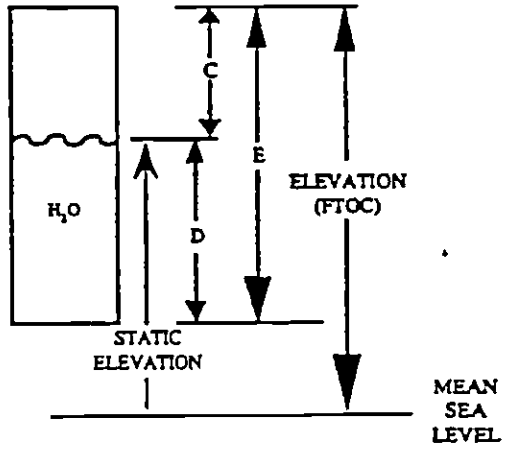
Total Purge Volume = _____ (gal)

Pumping/Purge Rate (PRODRATE) = _____ (gal/min)

Pumping Depth (PUMPDEP) = _____ (ft)

Water Level Recovery Depth (DEPWAT) = _____ (ft)

Recovery Time (LECTIME) = _____ (min)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity (NTU)	Comments

ELLIS ENVIRONMENTAL GROUP, LLC

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: _____

DRILLING CONTRACTOR: _____

DRILLING TECHNIQUE: _____
AUGER SIZE AND TYPE: _____

BOREHOLE IDENTIFICATION: _____
BOREHOLE DIAMETER: _____
WELL IDENTIFICATION: _____

WELL CONSTRUCTION START DATE: _____
WELL CONSTRUCTION COMPLETE DATE: _____

SCREEN MATERIAL: _____
SCREEN DIAMETER: _____
STRATUM-SCREENED INTERVAL (FT): _____

CASING MATERIAL: _____
CASING DIAMETER: _____

TYPE OF FILTER PACK: _____
GRADIATION: _____
AMOUNT OF FILTER PACK USED: _____

TYPE OF BENTONITE: _____
AMOUNT BENTONITE USED: _____

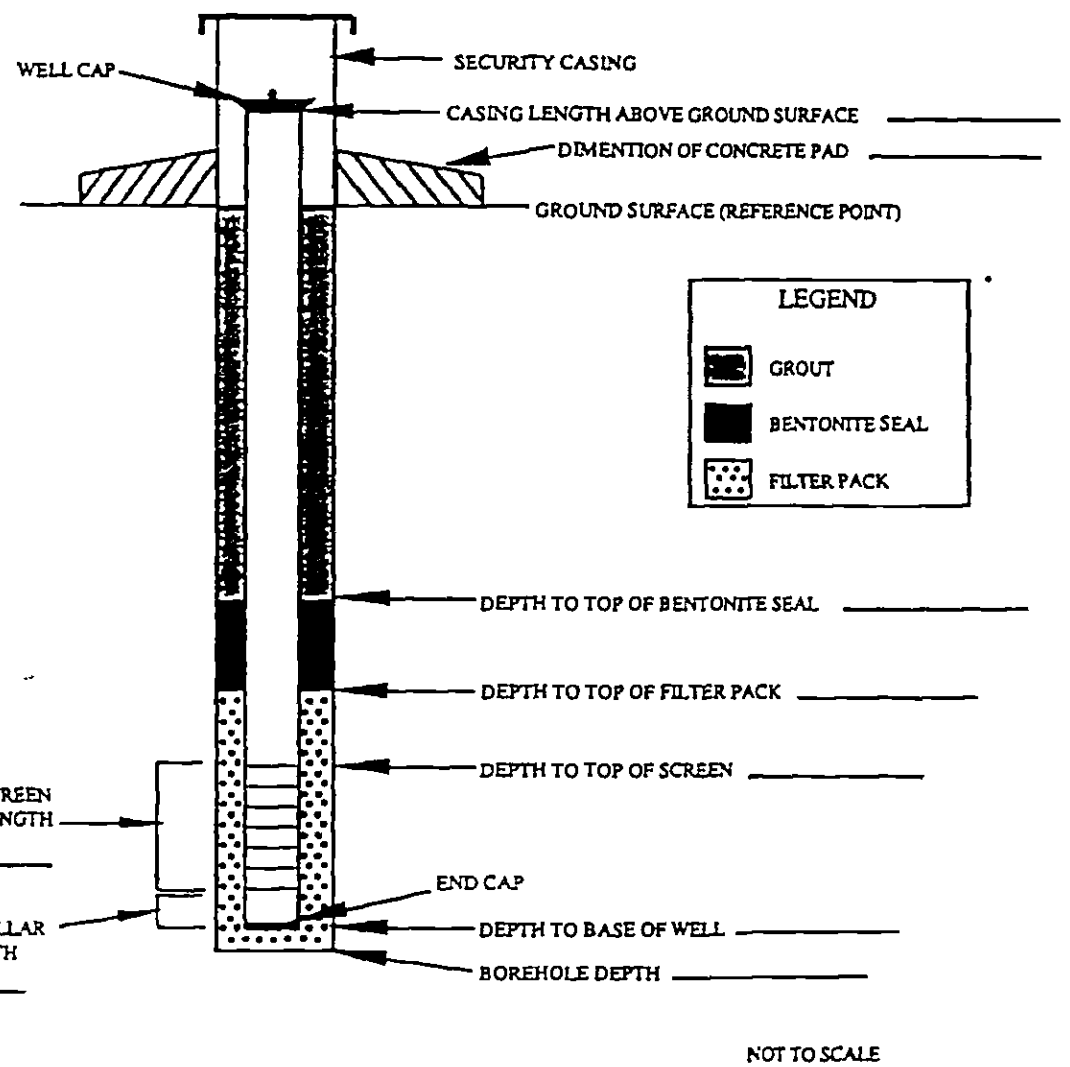
TYPE OF CEMENT: _____
AMOUNT CEMENT USED: _____
GROUT MATERIALS USED: _____

DIMENSIONS OF SECURITY CASING: _____

TYPE OF WELL CAP: _____
TYPE OF END CAP: _____

COMMENTS:

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: _____ INSTALLATION OBSERVED BY: _____

DISCREPANCIES: _____

TAB

APPENDIX B

FINAL

Health and Safety Plan

for

Interim Remedial Actions

at

Solid Waste Management Units 17, 28, 29, 30, and 82
NAS Fort Worth JRB, Texas

Prepared for
U.S. Air Force Center For Environmental Excellence
Brooks AFB, Texas

Prepared by
Ellis Environmental Group, LC
414 SW 140th Terrace
Newberry, FL 32669
(352) 332-3888
&
HydroGeoLogic, Inc.
1155 Herndon Parkway, Suite 900
Herndon, VA 20170

October 2001

FINAL

Health and Safety Plan
for
Interim Remedial Actions
at
Solid Waste Management Units 17, 28, 29, 30, and 62
NAS Fort Worth JRB, Texas

Project:	U.S. Air Force Center for Environmental Excellence
Project Number:	Contract No. F41624-00-D-8032
Project Site Location:	NAS Fort Worth JRB, Texas
Project Manager:	Rick Levin, PG
Health and Safety Director:	Jason Shannon
Site Safety and Health Officer:	Mark Webster, PG
Preparation Date:	October 2001

Approved By:

Jason P. Shannon 10/26/01

Jason P. Shannon — Date
Ellis Environmental Group, LC
Health and Safety Director

10/26/01

Rick Levin, PG — Date
Ellis Environmental Group, LC
Project Manager

Contents

Figures

Tables

Forms

Abbreviations & Acronyms

°C	degees Celsius
dB(A)	decibels (A-weighted)
KCl	potassium chloride
mg/m^3	milligrams per cubic meter
O_2	oxygen
T	air temperature
T_{aj}	adjusted air temperature
AFB	Air Force Base
AFCEE	U.S. Air Force Center for Environmental Excellence
ANSI	American National Standards Institute
CAFB	Carswell Air Force Base
CFR	Code of Federal Regulations
CIH	certified industrial hygienist
CMS	corrective measures study
COR	contracting officer's representative
CPC	chemical protective clothing
CPR	cardiopulmonary resuscitation
DOT	Department of Transportation
EPA	Environmental Protection Agency
FAR	Federal Acquisition Regulation
FSP	field sampling plan
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCS	Hazard Communication Standard
HEPA	high efficiency particulate air
HSD	health and safety director
IRA	interim remedial action
JRB	Joint Reserve Base
LEL	lower explosive limit
LF	landfill
MSDS	Material Safety Data Sheet
NAS	Naval Air Station
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photo-ionization detector
PM	project manager
POC	point of contact
PPE	personal protective equipment
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan

SOW	statement of work
SSHO	site safety and health officer
SWMU	solid waste management unit
TLV	threshold limit value
UEL	upper explosive limit
USCG	United States Coast Guard
VOC	volatile organic compound
WP	work plan

1.0 Introduction

This Health and Safety Plan (HASP) has been adapted from a HASP prepared by HydroGeoLogic, Inc. for a RCRA facility investigation at NAS Fort Worth JRB, Texas.

1.1 Purpose

This HASP is designed to assign responsibilities, establish personnel protection standards, specify mandatory operating procedures, and provide for emergency contingencies with respect to health and safety issues that may arise while Ellis Environmental Group, LC (EEG) personnel are performing interim remedial actions at Solid Waste Management Units (SWMUs) 17, 28, 29, 30, and 62 at the former Carswell Air Force Base (CAFB), now referred to as the Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), located in Fort Worth, Texas. This HASP conforms to the requirements of the Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910 and 1926. Detailed OSHA requirements for hazardous waste operations are contained in OSHA Standard 29 CFR 1910.120 and OSHA Standard 29 CFR 1926.65, *Hazardous Waste Operations and Emergency Response*. Additional guidance for hazardous waste operations may be found in the Environmental Protection Agency (EPA) publication *Standard Operating Safety Guides* (November 1987), the National Institute of Occupational Safety and Health (NIOSH)/OSHA/U S. Coast Guard (USCG)/EPA publication *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (October 1985), and the Federal Acquisition Regulation (FAR) clause 52.236-13: *Accident Prevention*.

This HASP is based on available background information regarding possible chemical, physical, and biological hazards that may exist at the site. If more information concerning the nature and/or concentrations of contaminants becomes available, this HASP will be amended accordingly.

1.2 Applicability

The provisions of the HASP are mandatory for all official visitors, EEG employees, and subcontractors while activities are being conducted at NAS Fort Worth JRB. These activities will include subsurface soil sampling using direct-push technology, surface soil sampling, and excavations. Inadequate health and safety precautions on the part of visitors or subcontractors, or the belief that personnel on the site are or may be exposed to an immediate health hazard, can be cause for EEG to suspend on-site activities and require all personnel to evacuate the area of concern

1.3 Project Organization, Personnel, and Responsibilities

This section provides EEG's personnel organization for this project as presented in Figure 4-1 of the Field Sampling Plan (FSP) and establishes the roles and responsibilities of various project personnel in regard to site health and safety. The authority and responsibilities of each EEG individual utilized for this project are presented in the following sections.

1.3.1 Health and Safety Director

The EEG health and safety director (HSD) is Jason Shannon. The HSD has the authority to:

- Suspend work or otherwise limit exposure to personnel if health and safety plans appear to be unsuitable or inadequate.
- Direct personnel to change work practices if existing practices are deemed to be hazardous to their health and safety.
- Remove personnel from projects if their actions or conditions endanger their health and safety or the health and safety of co-workers.
- Approve the qualifications of employees to work at hazardous waste sites.
- Approve health and safety plans.
- Interface with project manager (PM) in matters of health and safety.
- Develop or review and approve project health and safety plans prior to submittal.
- Conduct staff training and orientation on health and safety related activities.
- Appoint or approve site safety and health officer (SSHO).
- Monitor compliance with health and safety plans and conduct site audits.
- Assist in obtaining required health and safety equipment.
- Approve personnel to work on hazardous waste management projects with regard to medical examinations and health and safety training.
- Maintain records pertaining to medical surveillance, training, fit testing, chemical exposure, and accidents/incidents.
- Provide industrial hygiene/chemical safety guidance.

1.3.2 Project Manager

The PM for this project will be Rick Levin, PG. The PM has the authority to

- Coordinate with the HSD on health and safety matters.
- Assign HSD-approved SSHO to project and, if necessary, assign a suitably qualified replacement.
- Temporarily suspend field activities if health and safety of personnel are endangered, pending an evaluation by the HSD.

- Temporarily suspend an individual from field activities for infractions of the health and safety plan, pending an evaluation by the HSD.
- Ensure that the project is performed in a manner consistent with the health and safety program.
- Ensure that the project health and safety plan is prepared, approved, and properly implemented.
- Provide the HSD with the information needed to develop health and safety plans.
- Assure that adequate funds are allocated to fully implement project health and safety plans.

1.3.3 Site Safety and Health Officer

The SSHO will direct all on-site health and safety training and daily safety inspections. A qualified EEG employee who has performed these functions before will be the designated SSHO. The SSHO has the authority to temporarily suspend field activities if health and safety of personnel are endangered, pending further consideration by the HSD, and to temporarily suspend an individual from field activities for infractions of the health and safety plan, pending an evaluation by the HSD.

The SSHO will report any problems or concerns to the EEG HSD and PM. The HSD will also review accident reports and air monitoring data sheets; however, because these reviews are necessarily conducted after the fact, the SSHO remains the principal person responsible for on-site safety. At the facilities, the SSHO has primary responsibility for:

- Directing health and safety activities on a site.
- Ensuring that appropriate personal protective equipment (PPE) is available and properly utilized by EEG personnel, visitors, and subcontractor personnel.
- Ensuring that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are aware of planned procedures for dealing with emergencies.
- Ensuring that personnel are aware of the potential hazards associated with investigation activities.
- Monitoring the safety performance of all personnel to ensure that required work practices are followed.
- Monitoring the physical condition of site workers for heat and cold stress.
- Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.

- Ensuring the completion of the site-specific HASP forms presented in Section 14.1 (i.e., Compliance Agreement, Accident/Incident Reports, Site Safety Briefing Form, etc.).

- Ensuring that a copy of the HASP is maintained on the site during all investigation activities.

- Ensuring that all air monitoring and equipment calibrations required by the HASP are preformed and recorded, and that logs/forms that include these activities are maintained (Section 14.1).

- Ensuring that the subcontractor's medical monitoring program is adequate per OSHA Standard 29 CFR 1910.120 and this document.

- Verifying OSHA 40-Hour Health and Safety training before admitting official site visitors (Air Force and regulatory representatives) into the exclusion zone, and verifying medical certification and fit-testing for respirator use when visitors request admittance into a Level C PPE exclusion zone (per OSHA Standard 29 CFR 1910 120).

1.3.4 Project Field Personnel

Personnel working on this project will be approved by the PM and the HSD and will meet the qualifications outlined in OSHA Standard 29 CFR 1910.120 and this HASP. The project personnel involved in on-site investigations and operations are responsible for:

- Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.

- Implementing the HASP and reporting any deviations from the anticipated conditions described in the plans to the SSHO.

- Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SSHO.

1.3.5 Subcontractor Responsibilities

It is the responsibility of each EEG subcontractor to ensure compliance with all applicable federal, state, and OSHA regulations, including OSHA Standard 29 CFR, Parts 1900 through 1910, Part 1926, and the contents of this HASP. Specifically contained within these OSHA regulations is OSHA Standard 29 CFR 1910.120, which includes requirements for training and medical surveillance for employees engaged in certain hazardous waste operations.

2.0 Site Description Information

A detailed description of the NAS Fort Worth JRB sites under investigation is presented in Section 1.0 of the Work Plan. Please refer to this section for detailed site description information.

The areas of interest for this investigation are five landfills. A brief description of the materials believed to have been deposited at each site is presented as follows: SWMU 17 reportedly historically received construction debris in the form of concrete, asphalt, wood, trees, and potentially small amounts of undocumented hazardous materials. SWMU 28 was a construction debris landfill in the 1940s and 1950s. SWMU 29 reportedly historically accepted construction debris and moderate quantities of unspecified hazardous wastes. SWMU 30 reportedly historically received construction debris such as concrete, asphalt, and wood. Finally, SWMU 62 reportedly historically accepted construction debris, moderate quantities of unspecified hazardous wastes, and three drums of hydraulic fluid.

3.0 Interim Remedial Actions Activities

The IRA activities to be conducted at the NAS Fort Worth JRB will include:

- Excavation of lead-contaminated soils at SWMU 17. Confirmation sampling using direct-push technology.
- Subsurface soil sampling using direct-push technology at SWMU 28. Surface soil sampling.
- Excavation of lead- and B2EHP-contaminated soils at SWMU 29. Confirmation sampling using direct push technology.
- Excavation of lead-contaminated soils at SWMU 30. Confirmation sampling using direct-push technology.
- Excavation of lead contaminated soils at SWMU 62. Confirmation sampling using direct-push technology.

4.0 Hazard Assessment

This section identifies and evaluates potential site hazards that may be encountered during RFI activities. Control measures to protect site personnel from these potential hazards are incorporated throughout this HASP, but are mainly contained in the following sections:

- Section 6.0, Air Monitoring
- Section 7.0, Personal Protective Equipment
- Section 11.0, Standard Work Practices

4.1 Chemical Hazards

Based upon the information obtained from previous site investigations (groundwater and soil), the primary chemicals of concern at NAS Fort Worth JRB have been listed in Table 4-1.

The primary concerns from a chemical exposure standpoint are inhalation, ingestion, and absorption by direct skin contact with contaminants in locations expected to be source areas. The specific contaminants, their exposure limits, and their recognition qualities are presented in Table 4-1. The acute and chronic symptoms of overexposure to these chemical contaminants and first aid procedures are presented in Table 4-2. If additional contaminants are identified at the NAS Fort Worth JRB, this HASP will be amended accordingly.

4.2 Decontamination Solutions and Preservatives

Chemicals used to decontaminate sampling equipment and to preserve environmental sampling also present hazards to the project personnel who use them. The chemicals likely to be brought to the site for use in this manner include the following:

- Nitric Acid
- Hydrochloric Acid
- Methanol
- Hexane
- Alconox™
- Liquid Tide™

Although overexposure to these chemicals is unlikely, the acute and chronic symptoms and first aid procedures are also presented in Table 4-2.

In order to communicate the hazards of these chemicals to site personnel, Material Safety Data Sheets (MSDSs) for each of these chemicals will be maintained on-site and presented as part of the site-specific training (Section 10.2).

4.3 Physical Hazards

The following section titles identify physical hazards that may be encountered. They include, but are not limited to:

- Hot or Cold Work Environments (Stress)
- Noise Hazards
- Materials Handling

- Utility Hazards
- Fall, Trip, and Slip Hazards (Section 11.0)
- Flammable/Explosive Atmospheres (Section 6.0)
- Heavy Equipment/Vehicular Activity (Section 11.0)

Control measures to help protect site personnel from these potential hazards are incorporated in the following subsections and throughout this HASP, specifically Section 11.0, Standard Work Practices, for safety hazards associated with drilling rigs and support vehicles.

4.3.1 Heat Stress

Heat stress can be a problem especially if personnel must perform site activities while wearing PPE in warm, humid weather conditions. The four types of heat illness in increasing order of severity include heat rash, heat cramps, heat exhaustion, and heat stroke.

- Heat rash may result from continuous exposure to heat or humid air.

- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

- Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include pale, cool, and moist skin, heavy sweating; dizziness, fainting and nausea.

- Heat stroke is the most serious form of heat stress. Temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. When heat stroke is suspected, professional medical help must be obtained immediately Signs and symptoms include red, hot, and unusually dry skin; lack of or reduced perspiration; dizziness and confusion; strong, rapid pulse; and coma.

Proper training and preventive 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 injuries. To avoid heat stress, the following steps should be taken:

- Work schedules should be adjusted. The following guidelines of rest and cooling of the body will be followed to minimize the effects of heat stress:
  —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 semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 4-3). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

- Shelter (air conditioners and other cooling devices, if possible) or shaded areas should be provided to protect personnel during rest periods.

- Workers' body fluids should be maintained at normal levels to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water perspired, which will vary from day to day. The normal thirst mechanism is not sensitive enough to ensure that water intake is sufficient to replace water lost through perspiration. When heavy sweating occurs, workers should be encouraged to drink more. Have workers drink fluid (preferably water or diluted drinks) before beginning work. Urge workers to drink a cup or two at each scheduled break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but will depend on actual fluid replacement needs, which will vary depending on the sweat rate.

- The drinking water temperature should be maintained at 50°F to 60°F (10°C to 15.6°C).

- Disposable cups that hold about 16 ounces should be provided.

- Encourage workers to maintain an optimal level of physical fitness. Where indicated, acclimatize workers to site work conditions.

- Train workers to recognize, identify, and treat heat stress.

When heat stress is suspected, the following steps should be taken:

- Get the victim out of the heat

- Loosen tight clothing.

- Remove perspiration-soaked clothing.

- Apply cool, wet cloths to the skin.

- Fan the victim.

- If the victim is conscious, give cool water to drink. Do not give electrolyte solutions (i.e., those containing salt) to victims of heat stress because it can cause nausea and vomiting. Only small sips of cool water should be administered to heat stress victims.

- Call for an ambulance if the victim refuses water, vomits, or starts to lose consciousness.

4.3.2 Cold Stress

If site work is to be conducted during the winter, cold stress is a concern to the health and safety of personnel. Cold stress is of special concern when wearing Tyvek™ or other impermeable suits

because perspiration does not evaporate, and the suits can become wet. Wet clothes combined with cold temperatures can lead to hypothermia. If the air temperature is less than 40°F and an employee perspires, the employee must change to dry clothes.

The following are the five degrees of cold stress in increasing order of severity:

- Incipient frostbite is a mild form of cold stress characterized by sudden blanching or whitening of the skin.

- Chilblain is an inflammation of the hands and feet caused by exposure to cold moisture. It is characterized by a recurrent localized itching, swelling, and painful inflammation of the fingers, toes, or ears. Such a sequence produces severe spasms, accompanied by pain.

- Second-degree frostbite is manifested by skin with a white, waxy appearance that is firm to the touch Individuals with this condition are generally not aware of its seriousness because the underlying nerves are frozen and unable to transmit signals to warm the body. Immediate first aid and medical treatment are required.

- Third-degree frostbite will appear as blue, blotchy skin. The tissue is cold, pale, and solid. Immediate medical attention is required.

- Hypothermia develops when body temperature falls below a critical level In extreme cases, cardiac failure and death may occur. Immediate medical attention is warranted when the following symptoms are observed: involuntary shivering, irrational behavior, slurred speech, and sluggishness.

To care for any frostbite, handle the area gently. Never rub an affected area because rubbing causes further damage to soft tissues. Warm the affected area gently by soaking the affected part in water no warmer than 105°F. Keep the frostbitten part in the water until it looks red and feels warm. Loosely bandage the affected area with a dry, sterile dressing. If fingers or toes are frostbitten, place cotton or gauze between them. Do not break any blisters caused by frostbite. Obtain professional medical attention as soon as possible.

To care for hypothermia, start by caring for any life-threatening problems and call for emergency medical assistance. Remove any wet clothing and dry the victim. Warm the body gradually by wrapping the victim in blankets or putting on dry clothing and moving him or her to a warm place If available, apply heat pads or other heat sources to the body, but be sure to keep a barrier such as a blanket, towel, or clothing between the heat source and the victim to avoid burning the victim. If the victim is alert, give warm liquids to drink. Do not warm the victim too quickly, such as by immersing the victim in warm water, because rapid rewarming can cause dangerous heart problems. In cases of severe hypothermia, when the victim may be unconscious, give rescue breathing when necessary and be prepared to administer cardiopulmonary resuscitation (CPR).

4.3.3 Noise Hazards

The SSHO or designee will monitor high noise levels when equipment or machinery (e.g , backhoe, drill rig, etc.) is being used on-site. Field personnel working in areas where noise levels

can be expected to reach or exceed 85 decibels A-weighted [dB(A)] will be issued hearing protection to reduce the level below the 85 dBA threshold. Compliance standards for occupational noise exposure are found in 20 CFR 1910.95.

4.3.4 Materials Handling

The most common type of materials handling accident involves fingers or toes of field personnel being caught between two objects. Special precautions must be implemented during the moving, shifting, or rolling of materials and should never be attempted by a single individual. Workers are required to use proper lifting techniques for handling materials, and oversize or heavy loads require "team lift" procedures.

4.3.5 Utility Hazards

The locations of all underground utilities must be identified and marked prior to initiating any subsurface investigations. In addition, drilling within 20 feet in any direction of overhead power lines will not be permitted.

4.4 Biological Hazards

The biological hazards that could be encountered by site personnel include, but are not limited to, the following:

- Poisonous snakes and spiders
- Stinging insects
- Ticks and chiggers
- Poisonous plants (e.g , poison sumac, poison ivy, poison oak)

Control measures to protect site personnel from these biological hazards are included in the following sections.

4.4.1 Poisonous Snakes and Spiders

Reactions from a snakebite are aggravated by acute fear and anxiety. Other factors that affect the severity of local and general reaction from a poisonous snakebite include the amount of venom injected and the speed of absorption of venom into the victim's circulation; the size of the victim; protection from clothing, including shoes and gloves; quick anti-venom therapy; and location of the bite.

Spiders in the United States are generally harmless, with two notable exceptions: the black widow spider (*Latrodectus Mactans*) and the brown recluse or violin spider (*Lox Osceles Reclusa*) The symptoms of a black widow spider bite are slight local reaction, severe pain produced by nerve toxin, profuse sweating, nausea, painful cramps in abdominal muscles, and difficulty in breathing and speaking. Victims recover in almost all cases, but an occasional death is reported.

Field personnel should exercise caution when lifting logs, rocks, covers to manholes, sumps, etc.

4.4.1.1 First Aid Procedures (Snakebite)

The objective of first aid is to reduce the circulation of blood through the bite area, to delay absorption of venom, to prevent aggravation of the local wound, and to sustain respiration. Several steps are listed to properly care for a snakebite victim. The most important step is to get the snakebite victim to the hospital quickly. Since all investigation activities will be performed at NAS Fort Worth JRB, the base hospital will be within reasonable travel time. Meanwhile, take the following first aid measures.

- Keep the victim from moving around.
- Keep the victim as calm as possible and preferably in a lying position.
- Immobilize the bitten extremity and keep it at or below heart level. If the victim can reach a hospital within 4 to 5 hours, and if no symptoms develop, no further first aid measures need to be applied.
- If mild-to-moderate symptoms develop, apply a constricting band 2 to 4 inches above the bite, but not around a joint (the elbow, knee, wrist, or ankle) and not around the head, neck, or trunk. The band should be 3/4 to 1-1/2 inches wide, not thin like a rubber band. The band should be snug but loose enough for a finger to be slipped underneath. Watch for swelling and loosen the band if it becomes too tight, but do not remove it Periodically check the pulse in the extremity beyond the bite to insure that the blood flow has not stopped.

Several other factors must be considered in cases of snakebite:

- **Shock.** Keep the victim lying down and comfortable, and maintain his or her body temperature.
- **Breathing and heartbeat.** If breathing stops, give mouth-to-mouth resuscitation. If breathing stops and there is no pulse, perform CPR if you have been trained to do so.
- **Identifying the snake.** If you can kill the snake without risk or delay, bring it to the hospital for identification, but exercise extreme caution in handling the snake.
- **Cleaning the bitten area.** You may wash the bitten area with soap and water and blot it dry with sterile gauze. You may apply dressings and bandages, but only for a short period of time.
- **Medicine to relieve pain.** Do not give the victim alcohol, sedatives, aspirin, or any medicine containing aspirin. Consult a doctor or other medical personnel for specific medications that may be used.
- **Snakebite kits.** Keep a kit accessible for all outings in primitive areas or areas known or suspected to be snake infested.

It is not recommended that cold compresses, ice, dry ice, chemical ice packs, spray refrigerants, or other methods of cold therapy be used in the first aid treatment of a snakebite

4.4.1.2 General First Aid for Poisonous Insect Bites

For minor bites and stings use cold applications and soothing lotions, such as calamine For more severe reactions, take the following first aid measures:

- Apply a constricting band above the injection site on the victim's arm or leg (between the site and the heart). Do not apply tightly. You should be able to slip your index finger under the band when it is in place Give artificial respiration if necessary.
- Keep the affected part below the level of the victim's heart.
- If medical care is ready available, leave the band in place; otherwise, remove it after 30 minutes.
- Apply ice contained in a towel or plastic bag, or cold cloths, to the site of the sting or bite.
- Give home medicine, such as aspirin, for pain.
- If the victim has a history of allergic reactions to insect bites or is subject to attacks of hay fever or asthma, or if he or she is not promptly relieved of symptoms, call a physician or take the victim immediately to the nearest location where medical treatment is available. In a highly sensitive person, do not wait for symptoms to appear, since delay can be fatal
- In case of a bee sting, remove and discard the stinging apparatus and venom sac.

Workers who have had severe allergic reactions to bee/wasp stings in the past will inform the SSHO when they arrive at the site for the first time.

4.4.2 Ticks and Chiggers

Field personnel should be aware of the presence of ticks (i.e., deer tick) and chiggers at the site. Common carriers of ticks and chiggers are the white-footed mouse and white-tailed deer, both of which are prevalent in the area. The deer tick is about the size of a sesame seed, as distinguished from the dog tick, which is significantly larger. The deer tick is principally found along the Atlantic coast, living in grassy and wooded areas, and feeds on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Common diseases caused by ticks are presented in the following subsections.

Removal of ticks is best accomplished using small tweezers. Do not squeeze the tick's body. Grasp it where the mouth parts enter the skin and tug gently, not firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Wipe the bite thoroughly with an antiseptic. Seek medical attention in the event tick-related disease symptoms develop.

When in an area suspected of harboring ticks (grassy, bushy, or woodland area) the following precautions can minimize the chances of being bitten by a tick:

- Wear long pants and long-sleeved shirts that fit tightly at the ankles and wrists.
- Wear light colored clothing so ticks can be easily spotted.
- Wear tick repellents.
- Inspect clothing frequently while in tick habitat.
- Inspect your head and body thoroughly when you return from the field.
- Remove any attached ticks by tugging with tweezers where the tick's mouth parts enter the skin. Do not squeeze or crush it.

4.4.2.1 Lyme Disease

Lyme disease is an illness caused by a bacterium that may be transmitted by the bite of a tick (*Ixodes Dammini*), commonly referred to as the deer tick. Not all ticks are infected with the bacterium, however. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies. The various stages and symptoms of the disease are well recognized and, if detected early, can be treated with antibiotics.

The illness typically occurs in the summer and is characterized by a slowly expanding red rash, which develops a few days to a few weeks after the bite of an infected tick. This may be accompanied by flu-like symptoms along with headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage treatment by a physician is usually effective, but, if left too long, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis. Other problems that may occur include meningitis and neurological and cardiac abnormalities. It is important to note that some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of later symptoms is more difficult than early symptoms and is not always successful

4.4.2.2 Rocky Mountain Spotted Fever

In the eastern and southern United States, this tick-borne disease is transmitted by the infected dog tick (*Dermacentor Variabilis*) It is important to note that the dog tick is significantly larger than the deer tick. Nearly all cases of infection occur in the spring and summer, generally several days after exposure to infected ticks. The onset of illness is abrupt and often accompanied by high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash that usually starts on the hands and feet and gradually extends to most of the body. As with Lyme disease, early detection and treatment significantly reduces the severity of illness. The disease responds to antibiotics.

4.4.2.3 Other Diseases

Ticks transmit several other diseases, most of which are rare and occur only in specific areas. Babesiosis occurs mainly in the Cape Cod area and eastern Long Island. Colorado tick fever is similarly regional and occurs only among those who live or work at altitudes above 4,000 feet.

4.4.3 Poisonous Plants

The majority of skin reactions following contact with offending plants are allergic in nature and are characterized by general symptoms of headache and fever, itching, redness, and rash.

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group including poison ivy, poison oak, and poison sumac. The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants also have greenish-white flowers and berries that grow in clusters. Such plants produce a severe rash characterized by redness, blistering, swelling, and intense burning and itching. The victim can also develop a high fever and become very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours.

4.4.3.1 First Aid Procedure

- Remove contaminated clothing.
- Wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol.
- Apply calamine or other soothing skin lotion if the rash is mild.
- Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

5.0 Hazard Communication

The EEG Hazard Communication Program complies with the OSHA Hazard Communication Standard (HCS) found in OSHA Standard 29 CFR 1910.120 and 1926.59, which applies to any chemical present in the workplace in such a manner that employees may be exposed to under normal conditions of use in a foreseeable emergency. Although waste materials are excluded from the OSHA requirements, decontamination chemicals and calibration standards require MSDSs.

The principle of communicating the hazards of materials used in the workplace applies to company-wide activities, from informational programs on the conduct of hazardous waste activities to the company's insistence upon adequate health and safety training. It is also important for personnel to have an awareness of client concern for hazard communication due to federal, state, and local regulations directly affecting certain client activities.

In order to comply with the HCS, EEG has made the following determinations:

- All containers of hazardous chemicals must be appropriately labeled or tagged to identify the hazard and provide information on effects and appropriate protective measures.
- Labels, tags, or signs must be properly affixed and visible at all times while a hazard is present and removed promptly when the hazard no longer exists.
- Written information (i.e., MSDSs) on hazardous chemicals in the workplace must be available to employees working with the substances.
- Appropriate MSDSs will be available to any contractor or subcontractor employee working on projects under EEG's control.

When investigation results indicate potential imminent health risks to contracted or Federal personnel, or the public at large, the contracting officer's representative (COR) and the base point of contact (POC) will be notified as soon as practicable. Written notification and supporting documentation will be provided within 3 days of finding potential imminent health risks during investigation activities.

6.0 Air Monitoring

This section presents requirements for the use of real-time air monitoring instruments during site activities involving potential for exposure to site contaminants It establishes the types of instruments to be used, the frequency of their use, the techniques for their use, the action levels for upgrading/downgrading levels of protection, and the methods for instrument maintenance and calibration.

6.1 Instruments and Use

A photo-ionization detector (PID) equipped with an appropriate lamp will be utilized for detecting the presence of emissions from chemicals of concern. A Draeger pump and colorimetric tubes will be used to confirm any detections observed with the PID in accordance with Table 6-1. Additionally, lower explosive limit/oxygen (LEL/O_2) detectors will be used during all drilling and excavation activities to detect the presence of flammable/explosive atmospheres. Visual observation will be used to detect the presence of airborne particulates.

6.2 Air Monitoring Requirements

6.2.1 Photo-Ionization Detector

Air monitoring with the PID will be initiated at potential sources of vapor emissions (source monitoring) at specified frequencies. The frequencies will be increased where concentrations of constituents are measured. The following potential sources and monitoring frequencies are anticipated:

- Excavations – Upon initial opening and continuous thereafter
- Surface/subsurface soil sampling – Every 5-foot depth

If source monitoring indicates the presence of airborne emissions, air monitoring will then be initiated in the breathing zones of those workers who could be affected by the emissions Air monitoring will also occur upon the request of site workers who notice unusual site odors or an increase in their intensity. If work is to be performed downwind of a site, air monitoring will be conducted to determine what type of PPE, if any, is required to protect workers and to determine the potential for an imminent threat to public health.

The presence of elevated readings in the worker's breathing zone as identified in Table 6-1 requires amendments to the HASP before workers are allowed to enter the exclusion zone. Depending on the air monitoring readings, air-purifying respirators may not be acceptable because some contaminants of concern have poor warning properties and/or cannot be filtered from inspired air with chemical cartridges (Table 6-1). Elevated readings will be based on confirmation sampling using a Draeger pump and colorimetric tubes in accordance with Table 6-1.

6.2.2 Draeger Pump and Tubes

A hand-operated Draeger pump with colorimetric tubes will be used to confirm the results of PID testing. If the results of the PID tests show concentrations greater than 0.5 parts per million (ppm)

above background concentrations in the breathing zone, then the colorimetric tubes will be used to identify the contaminants in the breathing zone. The colorimetric tube utilized will depend on the chemical anticipated to be present at the site.

6.2.3 LEL / O_2 Detectors

Air monitoring with LEL/O_2 meters will be conducted during excavation activities. If elevated (above background) LEL readings are observed, personnel must be advised of the potential explosive nature and must initiate the use of spark-proof tools in accordance with Table 6-1. LEL readings in excess of 10 percent requires cessation of activities until readings subside.

6.2.4 Visual Observations

If airborne particulate are observed and air monitoring results (as indicated in Table 6-1) warrant, personnel must don air-purifying respirators equipped with organic vapor cartridges and high efficiency particulate air (HEPA) filters. If airborne particulate are observed due to intrusive activities at these sites, dust control measures will be implemented.

6.3 Modification of Air Monitoring Requirements

The action levels and protection measures presented in Table 6-1 are based upon the assumption that the contaminants listed in Table 4-1 are the only contaminants that pose a reasonable health risk to site workers covered by this HASP. In the event that this assumption is found to be invalid through analysis of samples collected, or by some other means, the action levels will be modified as necessary.

6.4 Instrument Maintenance and Calibration

Air and noise monitoring instruments will be calibrated before being brought on site. The user's manual provided with each instrument will be followed to field calibrate the instrument prior to each day of use under the environmental conditions (temperature and humidity) that sampling will occur.

6.5 Record Keeping

Instrument calibrations and readings will be recorded on the Air Monitoring Log Sheet provided in Section 14.1 of this HASP. Copies of these log sheets will be maintained on-site until field activities covered by this HASP have been completed, at which time the log sheets will be stored in the project file.

7.0 Personal Protective Equipment

This section presents requirements for the use of PPE for each of the activities being conducted. This section includes anticipated levels of protection for each of the activities, the criteria used for selecting various levels of protection, and criteria for modifying levels of protection based on monitoring instrument readings, and personal observations.

7.1 Anticipated Levels of Protection

All work is anticipated to be performed in Level D protection, as defined in Appendix B of OSHA Standard 29 CFR 1910.120. Many activities may require the use of chemical-resistant coveralls, gloves, and boot covers as presented in Table 7-1.

The items of PPE anticipated to be used for each activity are presented in Table 7-1 Where overlap in activities occurs, the more protective requirement will apply.

7.2 Personal Protective Equipment Selection Criteria

The need for respiratory protection is not anticipated unless air monitoring warrants it in accordance with Table 6-1. See Section 7.3 for modification criteria of respiratory protection. Basic requirements of field personnel prior to using respiratory protection include.

- All field personnel will be medically certified to wear a full-face respirator and have the proper fit test documentation within the past 12 months prior to assignment.
- Only NIOSH-approved respirators are to be used on-site. The respirators are to be properly cleaned, inspected, and maintained prior to and at the conclusion of the work day.
- Cartridges to air-purifying respirators will be disposed of at the end of each work day and when load-up or breakthrough occurs.
- Field personnel will be clean-shaven in areas that might prevent the seal of the respirator to the face.

Hard hats, safety glasses, and steel-toe work boots will be used as minimum protection to reduce the potential for injury resulting from exposure to the physical hazards associated with on-site investigations

Boot covers, disposable nitrile gloves, and Tyvek™ coveralls were selected to minimize contamination of work clothes and to prevent direct skin contact with low-level contamination Nitrile gloves of 11-millimeter thickness or greater were selected for activities that may involve direct contact with appreciable concentrations of contaminants thought to be present as site contaminants.

Polyvinyl chloride (PVC) or Saranex coveralls, hoods, and/or splash shields will be worn to prevent saturation or work clothes during activities involving large volumes of liquids and/or saturated soils/equipment.

7.3 Personal Protective Equipment Modification Criteria

This section presents criteria for upgrading and downgrading chemical protective clothing (CPC) and/or respiratory protection. When uncertainties arise, the more protective requirement will apply.

7.3.1 Chemical Protective Clothing Modification Criteria

Tyvek™ coveralls and boot covers must be worn anytime there is a reasonable potential for contamination of street clothes.

Disposable nitrile gloves must be worn anytime there is a reasonable potential for contact with unsaturated soils or equipment that may contain trace contamination.

Nitrile gloves (11 mil or greater) must be worn anytime there is a reasonable potential for contact with groundwater, saturated soils, and/or soils producing elevated PID readings.

PVC or Saranex coveralls must be worn anytime there is a reasonable potential for saturation of work clothes.

8.0 Decontamination

This section describes the steps site personnel will follow to prevent the spread of site contaminants into areas that may affect unprotected, unsuspecting site personnel or the public It includes requirements for decontamination of personnel, sampling equipment, and excavation/DPT equipment.

8.1 Personnel Decontamination

The decontamination of personnel and their protective clothing will be performed within the decontamination zone. Table 8-1 presents the six stages for decontamination for Modified Level D protection.

Washtubs containing an appropriate decontamination solution and soft-bristle brushes will be used to wash reusable PPE and boots. Clean water will be used for the final rinse. The choice of decontamination solution is dependent upon the type of materials that must be removed from reusable protective equipment. Based on the current understanding of potential site contaminants, a detergent and water solution is recommended for general-purpose decontamination. Acceptable detergents include laboratory-grade cleaners (e.g., Alconox™ or equivalent), or a high strength consumer detergent such as Liquid Tide™.

Alternative decontamination solutions may be called for if the contaminants encountered are different or in a more concentrated state than anticipated. Alternative solutions include

- Dilute acids for removal of basic (caustic) compounds, amines, and hydrazines.
- Dilute bases (soaps and detergents) for removal of acidic compounds, phenols, thiols and some nitro and sulfonic compounds.
- Organic solvents for removal of nonpolar compounds (organic).

Gloves and other PPE should be inspected frequently for integrity, and manufacturers' data for breakthrough times should be considered if concentrated contaminants are encountered.

The decontamination of personnel and their protective clothing will be performed in 18 stages for Level C protection, if necessary. The 18 stages are presented in Table 8-2.

All decontamination fluids generated will be contained and disposed of as specified in the WP. The decontamination area will be physically identified with rope or flagging and will be sufficiently equipped to be conducive for completion of the stages listed in Table 8-2.

8.1.1 Closure of the Personnel Decontamination Station

All disposable clothing and plastic sheeting used during the operation will be double-bagged and contained on-site prior to removal to an approved off-site disposal facility as identified in the WP. Decontamination and rinse solution will be contained on-site prior to disposal. Reusable rubber clothing will be dried and prepared for future use. If contamination of non-disposable clothing

has occurred, the item will be discarded. All wash tubs, pail containers, etc., will be thoroughly washed, rinsed, and dried prior to removal from the site.

8.1.2 Disposal of Decontamination and Other Wastes

All PPE, polyethylene sheeting, and sampling support materials will be collected at the end of each work day, placed in plastic trash bags, and left at the site overnight. The following day, the air within the plastic trash bag will be tested using a PID. If the air within the bag does not show significant concentrations of organic vapors (greater than 10 ppm above background), the plastic trash bag will be double-bagged and placed in the municipal waste dumpster for disposal.

All other wastes generated during decontamination other than decontamination fluids will be placed into 55-gallon drums; the drums will be fully opening with a top cover bung (type 17E/H) as identified in the FSP. The drums will be filled partially or completely, depending upon the difficulty of transporting them from the work site. All containers will be numbered and clearly labeled with the date of filling. The mixing of solid and liquid wastes will be avoided. The containers will be stored at a designated site for disposal after analyses of the samples have been obtained.

8.2 Equipment Decontamination

All sampling equipment will be decontaminated prior to use, between sampling locations, and at the end of sampling activities to avoid cross-contamination, and to decrease contact between personnel and contaminated materials, and to reduce the probability of removing contamination from the site. The procedures for decontaminating equipment are presented in Section 5.9 of the FSP.

9.0 Medical Surveillance

9.1 Requirements for EEG Personnel

All employees involved in field activities will be active participants in the EEG medical surveillance program. All medical examinations and procedures will be performed by or under the supervision of a licensed occupational physician. The examination will include the tests, procedures, and frequencies that comply with the requirements of OSHA Standard 29 CFR 1910.120(f) and American National Standards Institute (ANSI) Z-88.2 to ensure that personnel will be medically qualified to perform hazardous waste site work under respiratory protection. Medical surveillance documents confirming the worker's fitness to perform hazardous waste operations on this project are on file at EEG's headquarters in Newberry, Florida, and can be made available upon request.

9.2 Requirements for Subcontractors

Subcontractors are also required to obtain a certificate of their ability to perform hazardous waste operations work and to wear respiratory protection. Subcontractors, that have a company medical surveillance program meeting the requirements of OSHA Standard 29 CFR 1910.120(f) will be required to submit a letter, on company letterhead, confirming that all on-site workers to be utilized for this project are medically qualified to perform the investigation activities. In addition, medical surveillance documents for personnel assigned to this project must be made available upon request.

10.0 Training Requirements

10.1 Initial Training

10.1.1 Requirements for EEG Personnel

All EEG personnel to be utilized are currently enrolled in the EEG continuous training program in accordance with OSHA Standard 29 CFR 1910 120 Individuals working on a site have successfully completed an approved 40-hour Hazardous Waste Site Operations (HAZWOPER) course including 24 hours of actual field experience under the direction of a trained supervisor, and any subsequent annual 8-hour refresher courses. In addition, the on-site field leader will have completed an 8-hour supervisory course In addition, a majority of EEG field personnel are current in first aid/CPR training requirements. EEG employee records are on file at the home office in Newberry, Florida.

10.1.2 Requirements for Subcontractors

All EEG subcontractor personnel must also have completed a 40-hour HAZWOPER training course as defined in OSHA Standard 29 CFR 1910.120(e) prior to performing work at the site. In addition, subcontractor personnel must also have successfully completed any subsequent 8-hour refresher training.

EEG subcontractors must certify that each subcontractor employee who will perform work at the site has had training meeting the requirements of OSHA Standard 29 CFR 1910 120(e). This certification can be accomplished by submitting a letter to EEG, on company letterhead, containing such information.

10.1.3 Requirements for Site Visitors

No person will be allowed in the work zones (exclusion and decontamination) unless they have completed the necessary health and safety training as required by OSHA Standard 29 CFR 1910.120(e) and are wearing the necessary protective equipment as required by this HASP.

10.2 Site-Specific Training

EEG will provide site-specific training to all EEG employees and subcontractor personnel who will perform work at the site. Daily health and safety meetings will be held prior to beginning field activities to discuss each day's activities, potential hazards, and any new health and safety issues not previously discussed. Personnel who do not participate in training will not be permitted to perform work at the site. Site-specific training will include:

- Contents of the HASP
- Name of the SSHO
- Safety, health, and other hazards present on the site
- Use of PPE

- Work practices by which the employees can minimize risks from hazards
- Safe use of engineering controls and equipment on the site
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazards
- Decontamination procedures
- Emergency response procedures

EEG and subcontractor personnel will be required to sign a statement indicating receipt of site-specific training and understanding of site hazards and control measures. This form is presented in Section 14.1.

11.0 Standard Work Practices

All site investigation activities will follow these appropriate health and safety standard work practices

11.1 General Requirements / Prohibitions

- A copy of this HASP will be available on-site for all field personnel, including visitors, to reference during investigation activities
- No running or horseplay.
- Eating, drinking, chewing gum or tobacco, taking medication, applying cosmetics, and/or smoking are prohibited in the exclusion and decontamination zones, or any location where a possibility for contact with site contaminants exists.
- The required level of PPE must be worn by all on-site personnel to include steel-toed safety boots, safety glasses, and hard hat, if necessary.
- Upon leaving the exclusion zone, each worker's hands and face must be thoroughly washed. Any protective outer clothing is to be decontaminated and removed as specified in this HASP and left at a designated area prior to entering the clean area.
- Contact with potentially contaminated substances must be avoided. Contact with the ground or with contaminated equipment must also be avoided Air monitoring equipment must not be placed on potentially contaminated surfaces.
- No facial hair that interferes with a satisfactory fit of the mask-to-face seal is permitted on personnel required to wear respiratory protective equipment.
- All personnel must satisfy medical monitoring procedures.
- No flames or open fires will be permitted on-site.
- All personnel must be aware of and follow the action levels presented in this HASP for upgrading respiratory protection
- Any new analytical data must be promptly conveyed via telephone to the project HSD by the laboratory technician or field leader.
- Personnel must develop hand signals with users of heavy equipment (e.g , drillers, geoprobe operators, etc.). Standard hand signals to be used by personnel for nonverbal communication include:
  —**Stop.** With arm extended to the side and palm down, hold position rigidly.
  —**Hoist.** With forearm and forefinger pointing up, move hand in small horizontal circle.
  —**Lower.** With forearm extended and forefinger pointing down, move hand in a small horizontal circle.

—**Travel.** With palm up, fingers closed, and thumb pointing in the direction of motion, jerk hand horizontally.
—**Slow Move.** Use one hand to give any motion signal, and place the other hand motionless in front of the hand giving the motion signal.
—**Emergency Stop.** With arm extended to the side and palm down, move hand rapidly right and left.

Standard hand signals will be discussed during each daily health and safety meeting when the use of heavy equipment is anticipated.

- A copy of the OSHA "Job Safety and Health Protection" poster must be prominently posted at each site.

- Medicine and alcohol can potentate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage intake will not be allowed at any time, including during breaks.

- No person will enter the exclusion zone alone.

- Safety devices on equipment must be left intact and used as designed.

- Equipment and tools will be kept clean and in good repair and used only for their intended purpose.

- Eye protection must be worn when any hammering or pounding is performed that may product flying particles or slivers.

- Field personnel are not allowed to lift more than 60 pounds. Rules to remember when attempting to lift heavy objects include:
  —Size up the load before trying to lift it, test the weight, and get help if needed
  —Bend the knees and look up to keep the neck and back straight.
  —Do not twist or turn your body once you have made the lift.
  —Make sure you can carry the load where you need to go before lifting it.
  —Set the load down properly, lower slowly by bending the knees.
  —Always push, not pull, the object when possible.

- Leather gloves must be worn when handling objects that may produce slivers (e g., driving wood stakes, handling drill rods/augers).

- The SSHO must make an entry into the site field logbook at least daily to include:
  —Weather conditions
  —Site personnel
  —New arrivals and their clearance for site work
  —Air monitoring data summary
  —Monitoring instrument calibration
  —Indications of inhalation exposure

—PPE used per task
—Deviations from HASP
—Inspection and cleaning of respiratory equipment
—General health and safety problems/corrective actions

- If personnel note any warning properties of chemicals (irritation, odors, symptoms, etc.) or even remotely suspect the occurrence of exposure, they must immediately notify the SSHO for further direction.

11.2 Excavations

- Personnel must stand a minimum of 2 feet from the edge of any excavation and are prohibited from leaning over the edge of any excavations. Unstable pits must be sloped at the sides to prevent cave-ins. Equipment and excavated soil should be kept at least 4 feet away from the edge of the excavation. The SSHO may increase these distances if non-cohesive soils (sands and gravels) are encountered.

- Equipment operators will be advised during the daily safety meeting of each worker who will be in the immediate vicinity during excavating, and the operators will be responsible for visual verification of workers' locations before moving equipment

- Personnel must develop hand signals with the backhoe operator prior to digging

- The backhoe operator will not undermine the excavation.

- Personnel must stand upwind from the excavations and away from the reach of the backhoe, tires, and outrigging.

- The SSHO will inspect the excavations for slide or cave-in potential on several occasions during the excavation.

- Excavations will not be left open and unguarded overnight. At the end of each day, any open pit must be completely surrounded by protective fencing.

Excavations have the potential for release to the atmosphere. Gases and vapors may be either lighter than air or heavier than air. In general, the only containment that can be done for a release to the air is termination of the release at the source, i.e., cover the excavated area with soil. Depending on the nature of the release, it may be necessary to evacuate persons located downwind of the area of the release to an upwind location. Emergency response personnel should be notified (Section 13 6) if air concentrations at the perimeter of the exclusion zone exceed TLVs or PELs.

11.3 Housekeeping

Housekeeping is a very important aspect of an investigation program and will be strongly stressed in all aspects of field work. Good housekeeping plays a key role in occupational health protection and is a way of preventing dispersion of dangerous contaminants. All work areas will be kept as

clean as possible at all times and spills will be cleaned up immediately. Housekeeping will be the responsibility of all employees.

EEG will implement a housekeeping program for the field activities to minimize the spread of contamination beyond the work site. The program will include

- Daily scheduling to police the area of debris including paper products, cans, and other materials brought on-site
- Changing of wash and rinse water for hands, face, and equipment as needed
- Periodic (daily minimum) removal of all garbage bags and containers used to dispose of food products, plastic inner gloves, and contaminated disposable clothing

11.4 Work Limitations

All investigation activities will be performed during normal daylight hours.

11.5 Confined Space Entry

Site personnel are not to undertake any activity that could be considered a confined-space entry. Personnel must not enter excavations under any circumstances.

11.6 Spill Containment

The procedures defined in this section comprise the spill containment activities in place at the site.

- All drums and containers used during the cleanup will meet appropriate Department of Transportation (DOT), OSHA, and EPA regulations for the waste that they will contain.
- Drums and containers will be inspected and their integrity ensured prior to being moved Drums or containers that cannot be inspected before being moved because of storage conditions will be positioned in an accessible location and inspected prior to further handling.
- Operations on-site will be organized so as to minimize the amount of drum or container movement.
- Employees involved in the drum or container operations will be warned of the hazards associated with the containers.
- Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area. The spill containment program must be sufficient to contain and isolate the entire volume of hazardous substances being transferred.

- Drums or containers that cannot be moved without failure will be emptied into a sound container.

- Fire extinguishing equipment meeting 29 CFR Part 1910, Subpart l shall be on hand and ready for use to control fires.

12.0 Site Control

Each location will be physically barricaded with rope flagging or caution tape to control entry into and exit from the area. These barricaded areas will be referred to as the exclusion zones. Each person leaving an exclusion zone will proceed directly to the decontamination zone, which will be located adjacent to the exclusion zone and also identified by physical barriers The decontamination zone will consist of a low-lying area covered with plastic sheeting. At the completion of decontamination procedures at each location, the debris will be enclosed in the plastic sheeting and deposited into 55-gallon type 17 E/H drums for later disposal as identified in the WP and FSP. Only personnel who are cleared by the EEG field leader and SSHO will be permitted in the exclusion zones and/or decontamination zones. Clearance for accessing these areas will be given only to personnel who meet the training and medical surveillance requirements of OSHA Standard 29 CFR 1910.120 and are wearing the appropriate PPE required for the work activity.

The support zone, where the administrative, communications, and other support services will be based, will be in a controlled area off the site or on the far end upwind of potential site contamination or areas of potential exposure Only persons and equipment that are free of contamination will be permitted in the support zone.

12.1 On-Site / Off-Site Communciations

Communications will consist of a centrally located telephone within the designated support zone (i.e., trailer, office) in addition to a mobile phone stationed within the on-site vehicle utilized for transportation. Field personnel may also utilize telephones located at NAS Fort Worth JRB in emergency situations.

13.0 Emergency Response

This HASP has been developed in an attempt to prevent the occurrence of situations that may jeopardize the health and safety of on-site personnel However, supplemental emergency procedures must be identified in the event that an unforeseen health and safety accident or incident occurs. In general, EEG will evacuate their employees and subcontractors from the workplace if an emergency involving chemical spills, chemical fires, chemical exposure, and/or chemical emissions occurs. For this reason, emergency response planning will be in accordance with OSHA Standard 29 CFR 1910.38(a).

13.1 Preplanning

Upon initial arrival at the site, the SSHO will visit the AFB's fire department to determine the status of emergency response services. This meeting will include a determination as to the need for further coordination with local rescue and police services.

Another aspect of preplanning for emergencies includes completion of the Medical Data Sheet (Section 14.1). This sheet must be completed by all EEG personnel and subcontractors so that, in the event of personal injury or illness, the examining physician has background information readily available on the injured/ill party.

13.2 Emergency Procedures and Assignments

Upon notification of a site emergency requiring evacuation, all EEG personnel and subcontractors will proceed directly to the support zone (i.e., trailer, office). If personnel cannot reach the support zone without endangering life or health, an alternate meeting point will be specified by the EEG SSHO. Emergency egress routes and meeting points will be discussed at each daily health and safety briefing.

In the event of an emergency, the following procedures will be implemented:

- The SSHO will evaluate the incident, assess the need for assistance, and call the appropriate contacts, if necessary.
- The SSHO will act as the point of contact for outside emergency personnel and on-site personnel.
- The SSHO will advise emergency response and emergency room personnel as to the types of contamination potentially contacted by injured workers receiving emergency care.
- The SSHO will promptly notifies the EEG PM and HSD of the incident

13.2.1 Chemical Inhalation

It is not anticipated that chemicals of concern will be present at the site in concentrations to cause immediate danger to life and health. However, any field personnel exhibiting or complaining of

symptoms of chemical exposure as described in Section 4 1 will be removed from the work zone and transported to the designated medical facility for examination and treatment.

13.2.2 Eye and Skin Contact

Field personnel who have come into contact with contaminants while in the exclusion zone will proceed immediately to the decontamination zone, where an eye wash station will be located. At the eyewash station the following procedures will be followed:

- Do not decontaminate prior to using the eye wash.
- Remove necessary PPE to perform the eye wash procedures.
- Flush the eye with the clean water for at least 15 minutes.
- Arrange for prompt transport to the designated medical facility.

Unless skin contact with contaminants is severe, personnel should proceed through the decontamination zone. Field personnel should remove any contaminated PPE and wash the affected area for at least 15 minutes. If the personnel show signs of skin irritation, they will be transported to the designated facility.

13.3 Procedures for Personnel Remaining On-Site

No EEG or subcontractor personnel will remain on-site to operate critical site emergency operations.

13.4 Procedures to Account for Site Personnel

The EEG and subcontractor work force will be small enough so that accounting for site personnel will not be a problem. The EEG field leader and SSHO will ensure that the whereabouts of all personnel are known.

13.5 Rescue and Medical Duties

Only those persons who have been trained by the American Red Cross or equivalent will be permitted to perform first aid and/or CPR treatment. Outside emergency services and medical facilities will be the primary providers of such services. At least one person who is currently certified in first aid and CPR will be on-site at all times during field activities. An ANSI-approved first aid kit, an ANSI-approved eye wash station with 15 minutes of free-flowing fresh water, and a Class ABC fire extinguisher will be readily available on-site.

Any EEG employee who shows signs or symptoms of overexposure must immediately be examined by a licensed physician. Subcontractor personnel who show signs or symptoms of overexposure will be encouraged to visit a licensed physician as well. Figure 13-1 describes the directions to the nearest medical facility

13.6 Emergency Communication Procedures, Contacts, and Phone Numbers

Persons who observe an emergency situation must immediately notify the EEG field leader and/or SSHO. The field leader or SSHO will then immediately assess the emergency and appoint

someone to telephone appropriate outside emergency services and will coordinate site evacuation. Emergency telephone numbers and directions to the nearest medical facility are included as Table 13-1, a copy of which will be posted at the nearest telephone. In addition, Figure 13-1 illustrates the directions to the nearest medical facility.

13.7 Accident / Incident Follow-Up and Reporting

Upon receiving a report of an accident/incident, the SSHO shall immediately investigate the circumstances and shall make appropriate recommendations to prevent recurrence. The HSD shall also be immediately notified by telephone of a serious accident or incident. The HSD, at his or her individual discretion, may also participate in the investigation.

Details of the incident shall be documented on the Accident/Incident/Near Miss Investigation form (Section 14.1) within 24 hours of the incident and shall be distributed to the PM and HSD.

14.0 Documentation and Equipment

This section summarizes the documentation and equipment needs for the project as specified in the HASP. Its purpose is to serve as a partial checklist to help ensure that all of the necessary resources are available to carry out the requirements of the HASP.

14.1 Documentation and Forms

The following documents are presented at the end of this document for use during site operations:

- Site Safety Briefing Form
- HASP Compliance Agreement Form
- HASP Amendments Form
- Accident/Incident/Near Miss Investigation Form
- Medical Data Sheet
- Daily Equipment Calibration Log
- Air Monitoring Log

In addition, the following documentation will be present on-site during site operations:

- Approved HASP (signed copy)
- OSHA poster
- MSDSs

14.2 Emergency, Health, and Safety Equipment

- First aid kit
- Eye wash
- Inner latex or vinyl gloves
- Outer nitrile gloves (disposable and 11 mil thick)
- Boot covers
- Hard hats and safety glasses
- Tyvek™ suits
- PVC and/or Saranex™ suits (with hoods)
- Ear plugs or muffs
- Decontamination kit
- Fire extinguisher
- Fall protection devices (body harness and lanyard)
- Duct tape
- LEL/O_2 meter
- PID

The site supervisor and/or SSHO shall be responsible for maintaining first aid kits and fire extinguishers at each site where field activities are taking place. The location of first aid kits and fire extinguishers will be discussed during each daily health and safety meeting

15.0 References

Federal Acquisition Regulation, FAR Clause 52.236-13: Accident Prevention

NIOSH/OSHA/USCG/EPA, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," October 1985. (DHHS (NIOSH) Publication No. 85-115); EPA "Standard Operating Safety Guides," June 1992. (NTIS Publication No. 9285.1-03).

Occupational Safety and Health Administration (OSHA) General Industry Standards, 29 CFR 1910, and Construction Industry Standards, 29 CFR 1926; especially 29 CFR 1910.120/29 CFR 1926.65, "Hazardous Waste Site Operations and Emergency Response."

U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH), Pocket Guide to Chemical Hazards, June 1994.

Figures

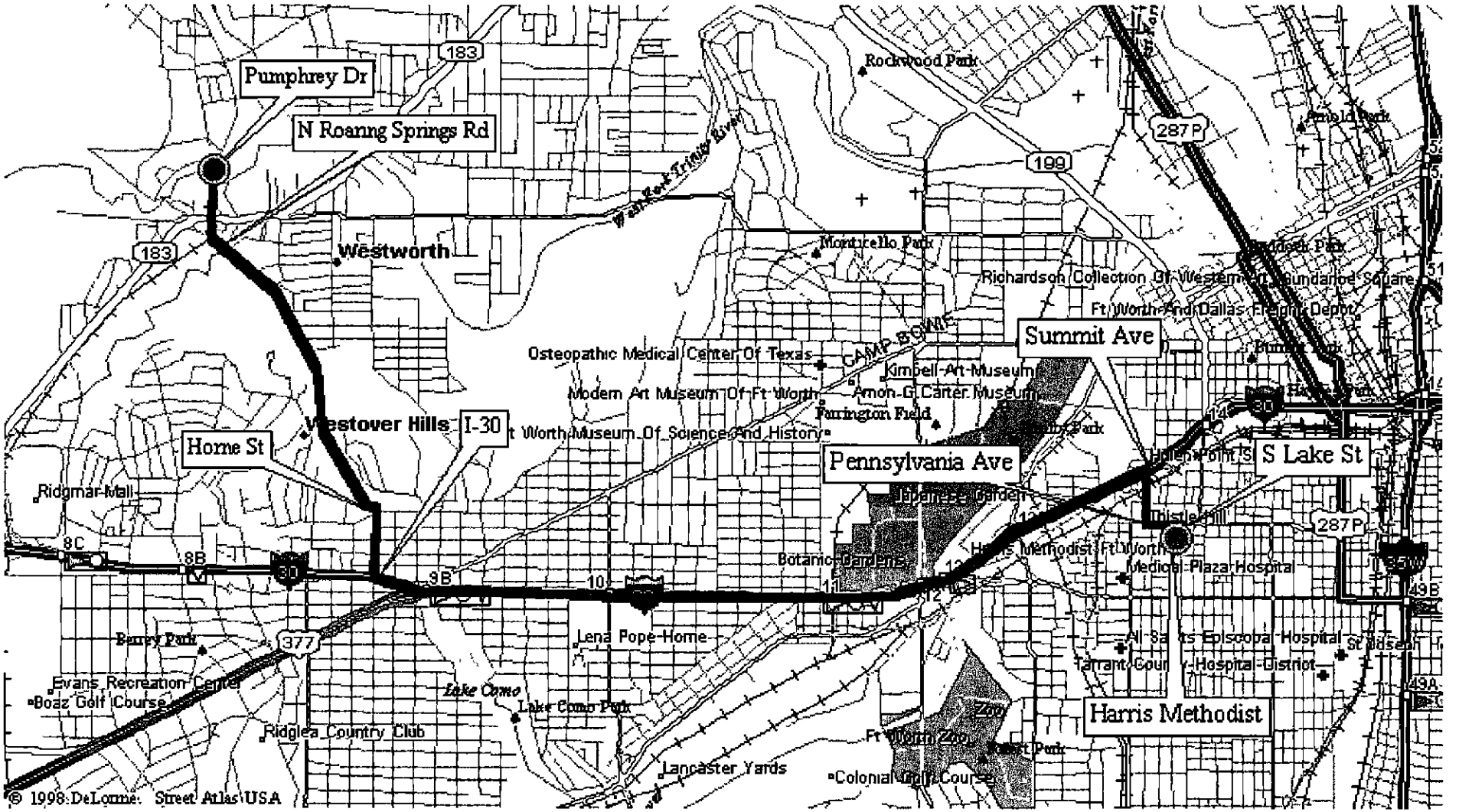


Figure: 13-1

Hospital Route Map

ELLIS ENVIRONMENTAL GROUP, LC

NAS Fort Worth JRB, Texas

Client: U.S. Air Force Center Environmental Excellence

706 172

Tables

Table 4-1
Exposure Limits and Recognition Qualities

Compound	Permissible Exposure Limit (PEL)[a]	IDLH Level[b]	Recognition Qualities			Odor Warning Concentration (ppm)	LEL[c] (%)	UEL[d] (%)	Ionization Potential (eV)
			Color	Odor	State				
Arsenic Compounds	0 010 mg/m^3	5 mg/m^3[e]	silver gray to tin-white	odorless	solid	NA	NA	NA	NA
Lead	0 050 mg/m^3	100 mg/m^3	gray	odorless	solid	NA	NA	NA	NA
Mercury	0 100 mg/m^3	10 mg/m^3	silver-white	odorless	liquid	NA	NA	NA	NA
Nitric Acid	2 ppm	25 ppm	colorless, red or yellow	acrid, suffocating	liquid	NA	NA	NA	11 95
Hydrochloric Acid	C 5 ppm	50 ppm	colorless to light yellow	irritating	gas	NA	NA	NA	12 74
Methanol	200 ppm	6000 ppm	colorless	pungent	liquid	100	6 0	36 0	10 84
Hexane	500 ppm	1100 ppm	colorless	gasoline-like	liquid	NA	1.1	7 5	10 18
Benzene	1 0 ppm[f]	500 ppm[e]	colorless to light yellow	aromatic	liquid	1 5 - 5 0	1 2	7 8	9 24
Toluene	200 ppm	500 ppm	colorless	aromatic	liquid	0 17 - 40	1 1	7 1	8 82
Ethylbenzene	100 ppm	800 ppm	colorless	aromatic	liquid	4.7 - 5 0	0.8	6 7	8 76
Total Xylene	100 ppm	900 ppm	colorless	aromatic	liquid	1 0 - 1 5	1 1	7 0	8 56
Trichloroethylene	100 ppm[f]	1000 ppm[e]	colorless	chloroform-like	liquid	28 0	8.0	10 5	9 45

Compound	Permissible Exposure Limit (PEL)[a]	IDLH Level[b]	Recognition Qualities			Odor Warning Concentration (ppm)	LEL[c] (%)	UEL[d] (%)	Ionization Potential (eV)
			Color	Odor	State				
Tetrachloroethylene	100 ppm[f]	150 ppm[e]	colorless	chloroform-like	liquid	27 0	NA	NA	9 32
Vinyl Chloride	1 ppm	Unknown [e]	colorless	pleasant	liquid or gas	3,000	3 6	33	9 99
Chloroethane	1000 ppm	3800 ppm	colorless	ether-like	liquid or gas	NA	3 8	15 4	10 97
1,1-Dichloroethane	100 ppm	3000 ppm	colorless	chloroform-like	liquid	NA	5.4	11 4	11 06
bis-(2-ethylhexyl)phthalate	5 mg/m^3	5000 mg/m^3	colorless	slight	liquid	NA	0 3	NA	NA
1,2-Dichloroethene	200 ppm	1000 ppm	colorless	slightly acrid, chloroform-like	liquid	17 0	5 6	12 8	9 65

a = OSHA Permissible Exposure Limit or the American Conference of Governmental Industrial Hygienists' Threshold Limit Value (both 8-hour time weighted averages)
b = Immediately Dangerous to Life or Health
c = Lower explosive limit
d = Upper explosive limit
e = To be treated as a carcinogen
f = The value presented is the OSHA PEL, which is not necessarily the more conservative of the available exposure limits The air monitoring screening levels in Table 6 1 are based upon the more conservative values
C = Ceiling value, a 15-minute Time Weighted Average that shall not be exceeded at any time during the work day
NA = Not Applicable

Table 4-2
Acute and Chronic Effects
Symptoms of Overexposure and First Aid Treatment

Compound	Symptoms of Overexposure	First Aid Treatment	
Arsenic	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy; respiratory irritation; hyperpigmentation of skin, carcinogen	Eye. Skin· Inhalation Ingestion·	Irrigate immediately (15 min) Soap wash immediately Not a inhalation hazard Medial attention immediately
Lead	Weakness, lassitude, insomnia, facial pallor, pal eye, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line, tremors, paralysis of wrist and ankles, encephalaopathy, nephropathy, irritation to eyes, hypotension	Eye Skin Inhalation Ingestion.	Irrigate immediately Soap wash promptly Respiratory support Medical attention immediately
Mercury	Cough, chest pain, dyspnea, bronchitis pneumonitis, tremors, insomnia, irritability, indecision; headache, fatigue, weak, stomatitis, salivation, gastrointestinal disturbance, anorexia, weight loss, proteinuria, irritation of the eyes, skin	Eye. Skin Inhalation Ingestion·	Irrigate immediately Soap wash promptly Respiratory support Medical attention immediately
Benzene	Irritation to eyes, nose, respiratory systems; giddiness, headache, nausea, staggered gait, fatigue, anorexia, lassitude; dermatitis, bone marrow depressant/depression, carcinogenic	Eye Skin· Inhalation Ingestion	Irrigate immediately Soap wash promptly Artificial respiration Medical attention immediately DO NOT INDUCE VOMITING
Toluene	Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, paresis, dermatitis	Eye· Skin. Inhalation Ingestion·	Irrigate immediately Soap wash promptly Move to fresh air Medical attention immediately; DO NOT INDUCE VOMITING
Ethylbenzene	Irritation to eyes, mucous membranes; headache, dermatitis, narcosis, coma	Eye Skin. Inhalation Ingestion	Irrigate immediately Soap wash promptly Artificial respiration Medical attention immediately

Compound	Symptoms of Overexposure	First Aid Treatment
Xylene	Dizziness, excitement, drowsiness, incoordination, staggering gait, irritation of eyes, nose, throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Move to fresh air Ingestion: Medical attention immediately, DO NOT INDUCE VOMITING
Trichloroethylene	Headache, vertigo; visual disturbance, tremors, somnolence, nausea, vomiting, irritation of the eyes, dermatitis, cardia arrhythmias, paresthesia, carcinogen	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Respiratory support Ingestion: Medical attention immediately
Tetrachloroethylene	Irritation of the eyes, nose, throat; nausea; flush face, neck, vertigo, dizziness, incoordination, headache, somnolence, skin erythema, liver damage, carcinogen	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Respiratory support Ingestion: Medical attention immediately
Vinyl Chloride	Weakness, abdominal pain, gastrointestinal bleeding, hepatomegaly, pallor or cyanosis of extremities; carcinogen	Inhalation: Respiratory support
Chloroethane	Incoordination, inebriate, abdominal cramps, cardiac arrhythmias, cardiac arrest, liver and kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Inhalation: Respiratory support Ingestion: Medical attention immediately
1,1-Dichloroethane	Central nervous system depressant, skin irritant, liver and kidney damage	Eye: Irrigate immediately Skin: Soap flush promptly Inhalation: Respiratory support Ingestion: Medical attention immediately
1,2-Dichloroethene	Irritation of eyes and respiratory system, central nervous system depressant/depression	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Respiratory support Ingestion: Medical attention immediately

Compound	Symptoms of Overexposure	First Aid Treatment
bis-(2-ethylhexyl)phthalate	Irritation of eyes, mucous membranes, carcinogen	Eye Irrigate immediately Skin Not a dermal hazard Inhalation Respiratory support Ingestion Medical attention immediately
Nitric Acid	Irritation of eyes, mucous membranes, and skin; delayed pulmonary edema, pneuitis, bronchitis, dental erosion	Eye. Irrigate immediately Skin Water flush immediately Inhalation· Respiratory support Ingestion: Medical attention immediately
Hydrochloric Acid	Inflammation of the nose, throat, laryngeal, cough, burns throat, choking; burns eyes, skin, dermatitis	Eye Irrigate immediately Skin· Water flush immediately Inhalation Respiratory support Ingestion. Medical attention immediately
Methanol	Eye irritant, headache, drowsiness, lightheadedness, nausea, vomiting, visual disturbances, blindness	Eye Irrigate immediately Skin Water flush immediately Inhalation Respiratory support Ingestion Medical attention immediately
Hexane	Light-headedness, nausea, headaches, numbness in extremities, weak muscles, eye irritation, nose irritation, dermatitis, chemical pneumonia, giddiness	Eye. Irrigate immediately Skin. Soap, wash immediately Inhalation. Respiratory support Ingestion· Medical attention immediately

Table 4-3
Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature[1]	Normal Work Ensenmble[2]	Impermeable Ensemble
90°F or above	After each 45 minutes of work	After each 15 minutes of work
87.5° - 90°F	After each 60 minutes of work	After each 30 minutes of work
82.5° - 87.5°F	After each 90 minutes of work	After each 60 minutes of work
77.5° - 82.5°F	After each 120 minutes of work	After each 90 minutes of work
72.5° - 77.5°F	After each 150 minutes of work	After each 120 minutes of work

1 = Calculate the adjusted air temperature (T_{aj}) by using the equation T_{aj} (°F) = T (°F) + (13 x % sunshine) Measure air temperature (T) 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)

2 = A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants

Source: NIOSH/OSHA/USCG/EPA, 1985

Table 6-1
Hazard Monitoring Methods, Action Levels, and Protection Measures

Hazard	Monitoring Method	Action Level	Protective Measures	Monitoring Schedule
Toxic Vapors (as identified in Table 4 1)	PID	0 0 to <0 5 ppm above background based on judgement of SSHO	Level D (see Table 7 1)	-continue with regular monitoring of breathing zone
		0 5 ppm above background based on judgement of SSHO	Level D (see Table 7 1)	-confirm/deny reading with vinyl chloride and benzene colorimetric tubes -if confirmed as vinyl chloride and/or benzene, then see vinyl chloride/benzene hazard identified below -if denied as vinyl chloride and benzene, then continue with regular monitoring of breathing zone
		≥0.5 ppm to <25 ppm above background based on judgement of SSHO (if denied as vinyl chloride and benzene)	Level D (see Table 7 1)	-confirm/deny reading with vinyl chloride and benzene colorimetric tubes -if confirmed as vinyl chloride and/or benzene, then see vinyl chloride/benzene hazard identified below. -if denied as vinyl chloride and benzene, then continue with regular monitoring of breathing zone -confirm/deny reading with tetrachloroethylene and TCE colorimetric tubes -if confirmed , then see hazard identified below -if denied as tetrachloroethylene or TCE, then continue with regular monitoring of breathing zone
		≥25 to <250 ppm above background based on judgement of SSHO (if denied as vinyl chloride, benzene, and tetrachloroethylene)	Level C (see Table 7 1)	-continue with regular monitoring of breathing zone - contact HSD and Project Manager - continue use of tubes, attempt to identify unknown air contaminants

Hazard	Monitoring Method	Action Level	Protective Measures	Monitoring Schedule
Vinyl Chloride	Colorimetric Tubes	confirmed 1 0 ppm to 10 ppm above background based on judgement of SSHO	Level C (See Table 7 1)	-continue regular monitoring of breathing zone
Benzene	Colorimetric Tubes	confirmed 0 5 ppm to 5 ppm above background based on judgement of SSHO.	Level C (See Table 7 1)	-continue regular monitoring of breathing zone
Tetrachloroethylene	Colorimetric Tubes	confirmed 25 ppm to 250 ppm above background based on judgement of SSHO.	Level C (See Table 7.1)	-continue regular monitoring of breathing zone
Trichloroethylene	Colorimetric Tubes	confirmed 50 ppm to 500 ppm above background based on judgement of SSHO.	Level C (See Table 7 1)	-continue regular monitoring of breathing zone
Flammable/Explosive Gases and/or Vapors	LEL/O_2 and Methane Detector	0 0 to 5 0 percent LEL	-notify sampling team of readings	-prior to and during sampling activities, monitor all areas suspected of containing flammable/explosive gases and/or vapors. -continue with regular monitoring of breathing zone.
		5 0 to <10 0 percent LEL	-use spark proof equipment/tools	-continue with regular monitoring of breathing zone - notify HSD and Project Manager
		>10 0 percent LEL	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires HASP amendments unless readings subside
Toxic Vapors (as identified in Table 4.1) (Cont)	PID	≥250 above background based on judgement of SSHO (if denied as all chemicals listed above)	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires identification of new chemical hazard and HASP amendments

Hazard	Monitoring Method	Action Level	Protective Measures	Monitoring Schedule
Vinyl Chloride	Colorimetric Tubes	confirmed 10 ppm or greater above background based on judgement of SSHO.	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	- requires HASP amendments
Benzene	Colorimetric Tubes	confirmed 5 ppm or greater above background based on judgement of SSHO	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires HASP amendments
Tetrachloroethylene	Colorimetric Tubes	confirmed 250 ppm or greater above background based on judgement of SSHO	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires HASP amendments
Trichloroethylene	Colorimetric Tubes	confirmed 500 ppm or greater above background based on judgement of SSHO	STOP WORK, EVACUATE AREA, NOTIFY PM	- requires HASP amendments

Table 7-1
Protective Equipment for On-site Activities

Activity	Level	Protective Equipment
Excavating Surface Soil Sampling Subsurface Soil Sampling	D	• Street clothes or coveralls (long sleeves) • Impermeable safety boots/shoes (steel toed) • Safety glasses/goggles (if hazard to eyes exists) • Hard hat (if hazard to head exists) • Gloves (leather) • Ear plugs/muffs (if hazard exists)
	D (modified)	• Rubber boots; chemically-resistant with steel toe • Gloves (nitrile, neoprene) • Tape for sealing ankle and wrist openings • Hard hat (if hazard to head exists) • Safety glasses/goggles (if hazard to eyes exists) • Uncoated tyvek or equivalent • Ear plugs/muffs (if hazard exists)
	C	• Coated tyvek or equivalent • Rubber boots; chemically-resistant with steel toe • Rubber boot covers • Latex inner gloves • Tape for sealing ankle and wrist openings • Chemical resistant outer gloves (nitrile, neoprene) • Full-face respirator (organic vapor cartridges) • Additional items may be required (site-specific) • Ear plugs/muffs (if hazard exists)

Table 8-1
Six Stages for Decontamination for Modified Level D Protection

Stage	Procedure
Stage 1: Segregated Equipment Drop	Deposit equipment used on site on plastic drop cloths or in assigned containers with plastic liners.
Stage 2: Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decontamination solution, and rinse with water.
Stage 3: Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.
Stage 4: Remove boots, gloves, and disposable clothing	Deposit in appropriate plastic-lined container. Discard disposable clothing.
Stage 5: Field wash	Wash hands and face with soap and water.
Stage 6: Redress	Put on clean clothes

Table 8-2
18 Stages for Decontamination in Level C Protection

Stage	Procedure
Stage 1: Segregated Equipment Drop	Deposit equipment used on site on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.
Stage 2: Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decon solution of detergent and water.
Stage 3: Boot Cover and Glove Rinse	Rinse off decon solution from Stage 2 using copious amounts of water.
Stage 4: Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.
Stage 5: Boot Cover Removal	Remove boot covers and deposit in container with plastic liner.
Stage 6: Outer Glove Removal	Remove outer gloves and deposit in container with plastic liner.
Stage 7: Suit, Glove, and Boot Wash	Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.
Stage 8: Suit, Glove and Boot Rinse	Rinse off decon solution using water. Repeat as many times as necessary.
Stage 9: Canister or Mask Change	Perform last step in the decontamination procedure (if worker is leaving exclusion zone to change canister or mask). Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped; worker returns to duty.
Stage 10: Safety Boot Removal	Remove safety boots and deposit in container with plastic liner.
Stage 11: Splash Suit Removal	Remove splash suit with assistance of helper. Deposit in container with plastic liner.
Stage 12: Inner Glove Wash	Wash inner gloves with decon solution.
Stage 13: Inner Glove Rinse	Rinse inner gloves with water.

Stage	Procedure
Stage 14 Face Piece Removal	Remove face piece. Deposit in container with plastic liner Avoid touching face with fingers Note: Certain parts of contaminated respirators, such as the harness assembly and leather or cloth components are difficult to decontaminate. If grossly contaminated, they may need to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. Use a final rinse of water and allow to air dry before using again. Inspect the respirator for damage and wear before and after each use.
Stage 15: Inner Glove Removal	Remove inner gloves and deposit in lined container.
Stage 16: Inner Clothing Removal	Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off site since there is a possibility that small amounts of contaminants might have been transferred when removing the disposal coveralls.
Stage 17: Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Stage 18: Redress	Put on clean clothes.

Table 13-1
Emergency Telephone Numbers, Contacts, and Directions to Nearest Medical Facility

Key Personnel	Number
Rick Levin - Project Manager	(352) 332-3888
Jason Shannon - Health and Safety Officer	(352) 332-3888
Mike Dodyk, PE - Base Point of Contact	(817) 782-7167
Don Ficklen, PG - AFCEE/ERD Contracting Officer's Representative	(210) 536-5290
Emergency Phones Numbers	
Ambulance -	911 or (817) 922-3150
Fire Department -	911 or (817) 246-1741
Poison Control	911 or (800) 441-0040
Hospital - Harris Methodist - Fort Worth 1301 Pennsylvania Avenue	911 or (817) 882-2000
Directions to Nearest Medical Facility (Figure 13-1)	
Exit NAS Fort Worth JRB south toward the East-West Freeway (Interstate 30). Follow signs for I-30 East Follow I-30 for approximately 7 miles to the exit for Henderson Street. At Henderson Street turn left (south) Follow to Pennsylvania Avenue and turn right (west). Follow one block and turn left (south) onto Fifth Avenue. Emergency entrance is located on the right	

Forms

SITE SAFETY BRIEFING FORM

Project _____

Date _____ Time _____ Job No. _____

Location _____

Type of Work _____

_____

_____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

_____

Chemical Hazards _____

_____

Physical Hazards _____

_____

Emergency Procedures _____

_____

Hospital/Clinic _____ Phone _____

Hospital Address _____

Special Equipment _____

_____

Other _____

_____

_____

_____

ATTENDEES

Name (Printed)	Signature

Meeting Conducted by: _____

Site Safety and Health Officer: _____

HEALTH AND SAFETY PLAN

COMPLIANCE AGREEMENT FORM

PROJECT: Interim Remedial Actions

CLIENT: U.S. Air Force Center for Environmental Excellence

LOCATION: NAS Fort Worth JRB, Texas

I, _____, have received a copy of the Health and Safety Plan for the above-referenced project. I have read the plan, understand it, and agree to comply with all its provisions. I understand that I can be prohibited from working on the project for violating any of the safety requirements specified in the plan.

_____

Signature Company Date

HEALTH AND SAFETY PLAN AMENDMENTS FORM

Change in field activities or hazards: _____

Proposed Amendments: _____

Proposed by: _____ Date: _

Approved by: _____

Accented: _____ Declined: _____ Date: _____

Amendment Number:

Amendment Effective Date:

Ellis Environmental Group, LC
Accident/Incident/Near Miss Investigation Form

Employee's Name:_____
Address:_____
SS#_____
Job Title:_____ Supervisor's Name:_____
Office Location:_____
Location at Time of Incident:_____
Date/Time of Incident:_____

Describe clearly how the accident occurred:_____

Was incident: Physical_____ Chemical_____
Parts of body affected _____ Exposure: _____
right left Inhalation
Ingestion

Witnesses: 1)_____ 2)_____

Conditions/acts contributing to this incident_____

Managers must complete this section:
Explain specifically the corrective action you have taken to prevent a recurrence:_____

Did injured go to doctor:_____ Where:_____
When:
Did injured go to hospital:_____ Where:_____
When:

Signatures:

_____
Employee Reporting Manager Health & Safety Director

_____
Date Date Date

Accidents must be reported immediately; this form must be completed and **returned to the Health and Safety Director within 24 hours.**

MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all onsite personnel and will be kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next of Kin _____

Drug or other Allergies _____

Particular Sensitivities_____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals.

_____

_____

What medications are you presently using?__

_____

_____

Do you have any medical restrictions? _____

_____

_____

Name, Address, and Phone Number of personal physician: _____

_____

_____

_____

_____

_____

I am the individual described above. I have read and understand this HASP:

_____

_____

Signature Date

DAILY EQUIPMENT CALIBRATION LOG

Project Name:

Project No:

DATE/TIME	INITIALS	INSTRUMENT	CALIBRATION SOLUTION OR GAS CONCENTRATION	ADJUSTMENTS REQUIRED/ COMMENTS

AIR MONITORING LOG

Date: _____ Logged by: _____

Weather: _____
Field Tasks: _____
_____

EEG Personnel (or subs) working on the site (name and affiliation):

EEG Personnel (or subs) working in restricted zone:

EEG Site Visitors:

Air Quality Monitoring Measurements:

Time	Instrument	Parameter	Concentration	Locations

Background:

Exclusion zone:

Level of PPE:

Comments:

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE