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FINAL RCRA FACILITY INVESTIGATION OFFSITE WEAPONS STORAGE AREA PART 1

NAS FORT WORTH TX

7/1/1999

THE ENVIRONMENTAL COMPANY

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NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
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FINAL
RCRA Facility Investigation of the Offsite Weapons Storage Area at Naval Air Station Fort Worth Joint Reserve Base Carswell Field, Texas

July 1999

Air Force Materiel Command
Headquarters Human Systems Center PKVCC
3207 North Road
Brooks AFB, Texas 78235-5353

Contract No. F41624-95-D-8002
Delivery Order 0009

The Environmental Company, Inc.

FINAL REPORT

RCRA FACILITY INVESTIGATION OF THE OFFSITE WEAPONS STORAGE AREA

AT

NAVAL AIR STATION FORT WORTH
JOINT RESERVE BASE (JRB)
CARSWELL FIELD, TEXAS

Contract No. F41624-95-D-8002
Delivery Order 0009

July 1999

Prepared for:

Air Force Materiel Command
Headquarters Human Systems Center PKVCC
3207 North Road
Brooks AFB, Texas 78235-5353

Prepared by:

The Environmental Company, Inc.
710 NW Juniper Street, Suite 208
Issaquah, WA 98027

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REVIEW COMMENTS AND RESPONSES TO REVIEW COMMENTS

The following tables contain the technical review comments on the draft report for the RCRA Facility Investigation of the Offsite Weapons Storage Area at Naval Air Station (NAS) Fort Worth, Joint Reserve Base, Carswell Field. Comments received and summarized in the tables include the following:

- AFCEE February 1998 Review Comments on the Draft RCRA Facility Investigation of the Offsite Weapons Storage Area
- AFCEE (UNITEC) February 1998 Review Comments on the Draft RCRA Facility Investigation of the Offsite Weapons Storage Area
- USEPA March 1998 Review Comments on the RCRA Facility Investigation of the Offsite Weapons Storage Area

The Environmental Company, Inc.'s (TEC's) responses to those comments are also provided on the tables. Additional revisions include those related to sampling conducted after submittal of the draft report. These sampling efforts include:

- leach field sampling;
- surface water sampling; and
- final verification and extent of contamination sampling.

In order to facilitate review of this document, with one exception, revisions are identified with bold text. The exception is Section 6 where significant revisions and new text has been added.

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RESPONSE TO AFCEE FEBRUARY 1998 REVIEW COMMENTS ON THE
DRAFT RCRA FACILITY INVESTIGATION OF THE
OFFSITE WEAPONS STORAGE AREA
NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE
CARSWELL FIELD, TEXAS

Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
1.	N/A	I have reviewed only the risk assessment (Chapters 5 and 6) sections. Overall, the human health risk assessment is thorough and very well documented. I did not independently verify values used in calculations. The ecological portion of the risk assessment is incomplete because water sampling has not been accomplished. I would recommend removing the ecological risk assessment from this document, and making it a stand-alone document. When the water sampling is completed and HQs and HIs can be calculated for all media, the ecological risk assessment can be submitted at that point. Furthermore, if any remedial actions are going to be accomplished based on human health risk, ecological risks may not be an issue.	In the interest of time and to integrate the human health and ecological risk evaluations, the ecological evaluation was revised and included in the Final RFI report. The surface water sampling was completed in Spring 1998 and the results are incorporated into the Final RFI. The results of the RFI demonstrate that surface water at the Offsite WSA is not a threat to human health or the environment.
2.	N/A	The TNRCC is currently using 20 parts per million as a residential remedial cleanup level (see attached memo from Dan Pearson, Executive Director of TNRCC). The contractor should address how this may change any conclusions reached.	The soil ingestion cleanup level for human health exposure to arsenic was modified to 20 ppm in the Final RFI.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
3.	5-15/5.2.2	NSA should be NAS.	Text modified.
4.	5-16 - 5-17/2.2.2.2	Scientific nomenclature for domestic animals and wildlife (similar to that employed in section 5.2.2.1) should be included. The list of birds seems a little short. I would have expected robins and mockingbirds to be on the list.	Latin names were excluded from the main RFI report text (Sections 4.3.2 and 5.2.2.1) and the reader is referred in Appendix D of the Final RFI for the latin names of all species mentioned. Although the report does not contain an exhaustive list of migratory or seasonal birds, it includes the major species expected to occur at the site. The American Robin and Northern Mockingbird were added to the species list as potentially present at the site as migratory birds.
5.	5-17/5.2.2.3	Were State threatened and endangered species considered in addition to State-listed rare species?	An inquiry to the Texas Parks and Wildlife Department (TPWD) specifically addressed state threatened and endangered species. The TPWD letter responding to the inquiry is included in the Draft RFI Appendix R (Appendix Q of the Final RFI Report). TPWD uses "rare" as a general term encompassing these designations. As noted in Draft RFI Table 5-23, the three federally-listed bird species recorded as incidental sightings in the WSA area are also state-listed (Table 5-12 in Final RFI).

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
7. (cont.)	5-20/5.2.3		Paragraph 4 of Section 5.2.3 in the Draft RFI was rewritten. The sentence concerning the endpoint species selected for evaluation was modified as follows: "Endpoint species selected are the short-tailed shrew, cottontail rabbit, red-tailed hawk, and coyote." Reference to excluding insectivores in the evaluation was deleted.
8.	5-22/5.2.4.1	First Paragraph: "Why is the short-tailed shrew considered a surrogate species for the desert shrew? Are desert shrews found at the site? Appendix Q lists the least shrew only.	The fifth paragraph of Section 5.2.4.1 was modified to include the southern short-tailed shrew as an endpoint species because it is potentially present onsite. It can be considered a surrogate for the least shrew. Desert shrews are not found in the vicinity of the site. The southern short-tailed shrew was added to Appendix P of the Final RFI.
9.	5-23/5.2.4.1	Last paragraph: COPCs could also be eliminated based on their classification as "essential nutrients."	No modification made. Although this is true, some chemicals that are essential nutrients at low levels (for example, zinc) may cause ecological effects at higher levels. Therefore, this criterion was not used to eliminate COPCs for the ecological risk assessment.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
6.	5-19/5.2.3	The brief description of bioaccumulation and biomagnification is good. Bioconcentration should also be briefly discussed; defined by Suter as "The net accumulation of a chemical directly from aqueous solution by an aquatic organism." (Suter, et al., 1993, Ecological Risk Assessment).	Concur. Suter's (1993) definition of bioconcentration is paraphrased in the Final RFI as follows: "Bioconcentration occurs in aquatic organisms as the result of net accumulation of contaminants directly from the water (Suter, 1993)."
7.	5-20/5.2.3	If the short-tailed shrew and white-footed mouse are to be considered "endpoint species," then they should be listed in Section 5.2.2.2 as being found, or potentially found, at the site. The statement that "insectivores...were not included" in the screening assessment is not entirely true, in that the short-tailed shrews are considered insectivores. First sentence of page 5-24 identifies the desert shrew as an insectivore.	Appendix Q of the Draft RFI lists the white-footed mouse and the least shrew as potentially occurring at the site. The southern short-tailed shrew may also potentially occur at the site. All three species have been added to the Final RFI, Section 5.2.2.2 and Appendix P. The ecological risk assessment has been rewritten to evaluate the short-tailed shrew as an insectivore. The shrew was assumed to consume earthworms, representing invertebrates living in contaminated soil. Earthworms were assumed to have the same contaminant concentrations as soil, which they consume directly. The hazard quotients for shrews in the Draft RFI Table 5-25 have been recalculated using the soil concentrations, rather than the plant concentrations, as the exposure concentration, and the text and conclusions changed where necessary (Table 5-13 in Final RFI)

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Specific Technical Comments			
Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
1.	i/Executive Summary	Last paragraph, sentence 2: It is recommended that the contractor better define the adjective "elevated" as it is used to describe constituent concentrations. For example, are the inorganic concentrations "elevated" with respect to established background concentrations, previous sampling event values, or established regulatory agency values?	See response to General Comment 1.
2.	ii/Executive Summary	First paragraph, sentence 2: It is recommended the contractor provide additional text that explains why semivolatile constituents are not considered to be contaminants of potential concern.	As discussed in Draft RFI Sections 2.2.1.4 EOD Range and 2.2.1.5 Bunker Floor Drain Outlets, the analytes for these areas were limited to those associated with the specific activities performed in these areas. No potential point sources of PAHs were identified in these areas. This reasoning also pertains to the transformers, although a statement indicating this was not included in Section 2.2.1.8. The Executive Summary and the transformer text were modified in the Final RFI.
3.	1-14/1.3.1	Section entitled "Low-Level Radiation Area Within Bunker 8531," paragraph 1, last sentence: A description of the general radiation surveys associated with the buildings has been included, as well as a statement that there is no historical information associated with the sources of the radiation. Further, descriptions associated with the limited remediation activities that have occurred have been included.	No action proposed. Nothing remains in the building and the contamination was determined to be surficial. Therefore, it is reasonable to assume that the source is no longer present. The previous studies were exhaustive in their attempts to characterize the contamination. Additional studies are not warranted.

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General Comments			
Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
1.	N/A	Throughout the text of the report, the contractor uses a number of adjectives to qualify the concentrations of constituents found in various environmental media throughout the site. In some instances these qualifiers are subjective in nature and should be better defined. See specific comment 1 for an example.	The descriptive terms used in the report were used with respect to background levels as indicated in the sentence directly preceding the one specified in the comment. More specifically, in Section 3-2, the text states that the background levels were developed for comparing to site data. The use of such qualifying terms were reviewed to ensure consistency.
2.	N/A	A copy of Volume II of the report was not available at the time this review was completed. It is recommended that a copy be provided so that a more thorough review can be completed.	Volume II is provided with the Final RFI.
3.	N/A	Sections 3.3.5 through 3.3.9 do not include specific analytical results as part of the text as was included in Sections 3.3.1 through 3.3.4. It is recommended that the contractor provide an explanation for the format change or change the text to ensure that the same format is used throughout the section.	The formats of Sections 3.3.5 through 3.3.7 are consistent with the previous sections in that only results greater than background levels and attributable to the site were specifically discussed. No results associated with these sections met this criteria. A statement regarding this was included in each section of the Draft RFI (e.g., see Section 3.3.5). Details of contaminants exceeding background were added to Sections 3.3.8 and 3.3.9 of the Final RFI.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
3. (cont'd)		It is recommended the contractor address the source of the radiation contamination to reflect whether or not additional studies are required to ensure the source(s) have been removed and no longer pose a threat to the site.	
4.	1-14/1.3.1	Section entitled "SWMU 60," paragraph 1, sentence 3: The sentence is incomplete. It is recommended the contractor complete or delete the sentence.	Sentence deleted in Final RFI.
5.	1-16/1.3.2.3	Paragraph 2: To clarify the paragraph, it is recommended that the contractor consider reorganizing the paragraph text into bullets, with each bullet item representing a different category. Each building or area could then be listed as part of each category.	The paragraph was modified.
6.	1-17/1.3.2.3	Last paragraph, first sentence: It is unknown when the transformers were retrofitted or replaced with polychlorinated biphenol (PCB)-free materials. To ensure that the transformers are PCB free, it may be prudent to require further testing of the oil currently contained in the transformers.	No action proposed. Two levels of documentation are available regarding the transformers, the labels on the transformers and the EBS report. This level of documentation should be sufficient.
7.	2-5/2.2.1.2	Section entitled "Field Activities," paragraph 2, sentence 3: Insert "ft" after "7."	Inserted in Final RFI Report.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
8.	2-12/2.2.3	First paragraph, last sentence: Sufficient rain events should have occurred since the submission of the draft report to have enabled surface water sample collection and analysis. The contractor should complete this section and resubmit the report for a complete review, or provide a schedule that estimates when this section of the report will be completed.	Surface water was collected in Spring 1998. A summary of field activities and the analytical results are incorporated into the Final RFI Report.
9.	2-13/2.2.4	Section entitled "Field Activities," paragraph 3, sentence 9: It is unclear whether or not the groundwater samples were collected immediately following purging using the same equipment. Since it is generally not acceptable to utilize the same equipment to purge and sample, the contractor should clarify the report text accordingly.	No action proposed. Utilizing the same equipment to purge and sample under the "low flow" sampling technique is acceptable and is currently EPA's preferred method of groundwater sampling. The methods employed are accurately described in the report.
10.	2-14/2.2.5	Last paragraph, last sentence: The material referenced as being contained in Appendix H is actually contained in Appendix G. It is recommended the contractor change the text accordingly.	Reference was changed.
11.	2-16/2.2.5.1	Section entitled "Survey Area," paragraph 1, sentence 2: According to the text, Building 8552 was inaccessible and was not surveyed for asbestos-containing material (ACM). The contractor should either reschedule the ACM survey associated with this building or provide a justification for not including this information in the final report.	Justification is provided in the Final RFI Report.

Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
15.	2-22/2.2.8.2	Section entitled "Trip Blanks," paragraph 2: The text indicates that one trip blank contained methylene chloride; however, the report text does not provide an explanation for its origin. Since methylene chloride is a common laboratory contaminant, and trip blanks are prepared in the laboratory prior to subjecting the sample to field conditions, it is possible that laboratory contamination is the source. It is recommended the contractor change the report text accordingly.	Text was added to the Final RFI Report.
16.	2-23/2.2.8.2	Section entitled "Field Duplicates": It is recommended that the contractor include the field duplicate data, as well as a discussion of the relevance of the results, as part of the final version of the document.	A sentence was added to this section indicating that the field duplicate data are compared in the data validation and data review reports (Volume II of the Final RFI Report).
17.	2-24/2.3.1	Paragraph 3, sentence 1: Grain size analyses are included in Appendix J of the report, not Appendix L as stated in the text. It is recommended that the contractor change the text accordingly.	Text was modified.
18.	2-25/2.3.3	Paragraph 2, sentence 1: It is recommended that the contractor include a summary of the laboratory QA/QC samples in Appendix L as part of the final version of the document.	Concur.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
12.	2-16/2.2.5.2	Section entitled "Survey Area," paragraph 1, sentence 3: According to the text, Building 8552 was inaccessible and was not surveyed for lead-based paint (LBP). The contractor should either reschedule the LBP survey associated with this building or provide a justification for not including this information in the final report.	Justification is provided in Final RFI Report.
13.	2-19/2.2.6	Section entitled "Investigation-derived Waste Characterization," paragraph 1, last sentence: It is recommended the contractor include the proposed waste classification associated with any waste, as well as the name and location of the waste disposal facility. Further, copies of all manifests, bills of lading, or shipping documents should be included as part of the final report.	No action proposed. It is recommended that the IDW final action be addressed under separate cover.
14.	2-22/2.2.8.2	Section entitled "Equipment Blanks," first paragraph: Although the text provides a list of constituents that appeared in the equipment blank samples, no explanation is provided for their origin, nor any corrective actions to prevent future occurrences. It is recommended the contractor provide these explanations as part of the text.	Possible explanation is provided along with any necessary corrective action in the Final RFI Report.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
23.	2-27/2.4.2	Paragraph 3, sentences 3 and 4: A plausible explanation for the presence of bis (2-ethylhexyl) phthalate is included as part of the text; however, the contractor should consider adding text that explains that the analytical results are not impacted, or that the results are qualified accordingly.	Concur. Text added.
24.	3-1/3.0	Paragraph 2, section note: See Specific Comment 8.	See response to Specific Comment 8.
25.	3-1/3.0	Paragraph 3, last sentence: See General Comment 2.	See response to Specific Comment 2.
26.	3-2/3.1.1	Paragraph 2, last sentence: It is recommended that the contractor include possible explanations for the presence of toluene in the analytical samples since toluene is not considered to be a laboratory contaminant.	Explanation included in Final RFI Report.
27.	3-6/3.2	Paragraph 2, sentence 1: The text indicates that for a number of parameters, the detection limit was greater than background concentration values. Since the analytical results equal non-detect, it is unknown whether the concentrations are actually above established background concentrations, and should therefore be included as part of the statistical study. It is recommended that the contractor include an explanation for the discrepancy.	No proposed action. The method used provides the lowest practical detection limit attainable. This limitation is taken into account in TNRCC's RRSN2 procedures. These procedures were followed in this report.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
19.	2-25/2.3.4	Paragraph 2, last sentence: The referenced laboratory audit is not included as part of Appendix M, nor as part of any appendix, as stated in the text. It is recommended that the contractor provide a copy as part of the final version of the document.	Report is provided in the Final RFI Report.
20.	2-25/2.3.5	Paragraph 1: Although the text describes the laboratory problems encountered with wipe samples collected from various buildings, the text does not include an explanation of how the problems were corrected. It is recommended that the contractor include an explanation of any corrective actions taken as part of the text.	Text describing the corrective action was included in the Final RFI Report
21.	2-26/2.4.1	Last paragraph, section note: See General Comment 2.	See response to General Comment 2.
22.	2-27/2.4.2	Paragraph 2, last sentence: Since methylene chloride is a common laboratory contaminant, the explanation provided appears plausible; however, the contractor should consider adding text that explains that the analytical results are not impacted, or that the results are qualified accordingly.	Concur. Text added.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
34.	5-4/5.1.2	Paragraph 1, sentence 1: The human exposure pathway evaluation is not complete. See Specific Comment 8.	See response to Specific Comment 8.
35.	5-4/5.1.2	Paragraph 3, sentence 1: See Specific Comment 32.	Text is modified. The section referred to in the final report is Section 1.2.4.4 Demographics
36.	5-21/5.2.4.1	Paragraph 3, last sentence: See Specific Comment 8.	See response to Specific Comment 8.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
28.	3-7/3.2.1	Section entitled "Inorganics," paragraph 1: The contractor provides comparisons between maximum reported values and background concentrations; however, it is recommended that the contractor provide a conclusion for the comparison between the individual constituents. For example, what is the relevance of cadmium and antimony values to the nickel values?	No proposed action. A comparative analysis is provided in paragraph 2 and Figure 3-2 of the Draft RFI Report (paragraph 3 and Figure 3-1 of the Final RFI Report).
29.	3-11/3.2.5	Section entitled "Explosives": It is recommended that the contractor clarify the relevance of the data reported by including conclusions drawn from the data provided in the text.	Additional text was included in the Final RFI Report.
30.	3-18/3.3.5	Paragraph 3, sentence 4: Toluene is reported as having been present in two upgradient monitor wells. It is recommended that the contractor consider including potential sources as part of the report text.	Toluene is not believed to be attributable to the site. Additional text supporting this assumption was provided in the final RFI text. Upgradient sources were not considered.
31.	3-20/3.4	Paragraph 1, section note: See Specific Comment 8.	See response to Specific Comment 8.
32.	4-9/4.3.1	Paragraph 2, last sentence: Section 1.2.3.4 is not contained in the report text as referenced. It is recommended that the contractor change the report accordingly.	Text is modified. The section referred to in the final report is Section 1.2.4.4 Demographics.
33.	5-1/5.1.1	Paragraph 1, sentence 4: The identification of chemicals of potential concern is not complete. See Specific Comment 8.	See response to Specific Comment 8.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
3.	1-20/1.4.3	The comment at the end of this paragraph, concerning future use of this area indicates that some type of deed restriction may be needed to restrict future land uses. Is this supported by the analytical data? Since this area is currently being used as a grazing pasture for a local rancher this needs to be clarified and if necessary access to the site should be restricted.	Restriction mentioned in this section is related to a physical hazard of undetonated ordnance, not a chemical hazard. EOD personnel verified that no hazard exists at the range and no restrictions are necessary (USAF, 1993b). The statement was modified in the Final RFI to: "The clearance report indicated that no restrictions due to physical hazards (i.e., undetonated ordnance) should be placed on future use of the land."
4.	2-1/2.1	Did any of the buildings have floor drains? Are there oil/water separators on-site? Since there is no mention of a sewer system, how were waste handled at the facilities?	Only Bldg. 8503 and 8505 had floor drains, which discharged to the outside. These discharge points were characterized during the RFI field investigation (Sample locations DW3-001 and DW1-009). There are no historical records that indicate oil/water separators were present at the Offsite WSA. Bldg 8503 is the only building onsite served by sewer and water. Photographs taken by Air Force personnel show that a sewer leachfield is located south of the main secured area. TEC collected samples from the leachfield in May 1998 to characterize the soil in this location. The May 1998 analytical results for these samples and results from the verification sampling indicated no significant contamination or environmental impact.
5.	6-1/6.0	Although elevated levels of some metals exceed Risk Reduction Standard 2 Levels, the concentrations are not such that a final decision on cleanup can be made. I understand from the presentation you made at the February BRAC Cleanup Team meeting that additional Synthetic Precipitation Leaching Procedure (SPLP)	SPLP were performed on several samples. The results were incorporated into the human health risk evaluation and used to develop cleanup levels for metals (Section 5.1.3). Also, the ecological risk assessment was revised to consider additional trophic levels and organisms with wider home ranges, per the guidance in Section 3.3 (Level C Screening Assessment: Reducing

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
1.	1-8/1.2.4.1	Lake Worth is used as a source of drinking water for the City of Fort Worth.	Sentence added to indicate that Lake Worth is used as a drinking water source.
2.	1-14/1.3.2.2	The discussion on SWMU 60, the former low level Radioactive Waste Burial Site, indicates that plutonium-contaminated swipe samples, rubber gloves, paper bags, and uranium oxide may have been disposed of at this site. During a review of the Final Technical Report for this site the only waste described was luminous dials. This current RFI also identified low level radiation detected in one of the bunkers. Should samples at the low level radioactive waste burial site have been analyzed for the same radio nuclides as the bunker?	The bunker analyses completed by the USAF Armstrong Laboratory (AFMC) included field screening using a hand held meter and laboratory analyses of swipe samples for alpha, beta and gamma radiation. As part of the waste characterization performed during the 1996 study of SWMU 60 (Low Level Radioactive Waste Burial Site), soil samples were screened in the field for gamma radiation and analyzed in a laboratory for radium-226. Additional radiological health and safety (H&S) screening was performed According to Metcalf & Eddy personnel, the H&S monitoring included alpha and beta soil radiation The soil at the SWMU 60 was therefore screened for the same radionuclides as the bunker.

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Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
		sometimes utilized site-specific parameters such as acreage of sites, site-specific dermal exposures, differing exposure point concentrations (surface soil concentrations versus combined surface soil and subsurface soil concentrations) etc. At the very least, the media-specific screening values (or CULs) generated in this effort may not be useable for all sites since some values may be unit-specific values. There are numerous specific questions or issues that impact the screening levels (risk-based comparison values), proposed cleanup levels, and eventual conclusions. One of these is that the risk evaluation for the groundwater pathway only considered the currently available data from the Paluxy formation and not the shallow aquifer (which is planned to be sampled in the future), the conclusion for this pathway can only be interpreted to be of current not potential future conditions. Other specific comments are listed below.	exposure pathways defined or referenced in this section, the person must evaluate other exposure pathways at or near the facility...by which human populations...are likely to be exposed to contaminants." In addition, RRSN2 medium-specific concentration algorithms in TNRCC (1993) for some pathways did not reflect the latest scientific knowledge embodied in more recent U.S. EPA guidance documents and other scientific literature (e.g., inhalation of particulates, volatiles). The updated RRSN2 medium-specific concentrations provided in the 1998 guidance, however, reflect newly promulgated standards, current toxicity factors, current inhalation emission factor methodologies, and the dermal absorption pathway. Therefore, these concentrations were used as the primary cleanup levels in the risk evaluation, along with the SPLP results and background concentrations. Seep water was sampled during the surface water investigation conducted in Spring 1998. Field activities and analytical results are discussed in the Final RFI Report.
8.	N/A	The conclusions presented in this report are unclear especially the ones dealing with the ecological issues. It would be more beneficial to provide recommendations for follow-up actions such as additional investigations, source removals etc. These recommendations should be followed from narrative interpretation summaries of the quantitative information. At this time, the report does not present concise summaries nor recommendations. It is extremely unclear what Carswell intends to do subsequent to this effort.	Conclusions and recommendations are provided in the Final RFI Report. Section 6.0, where these elements were discussed, has been revised to reflect data that have been collected since the Draft RFI Report and changes in the risk evaluation.

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RESPONSE TO USEPA MARCH 1998 REVIEW COMMENTS ON THE RCRA FACILITY INVESTIGATION OF THE OFFSITE WEAPONS STORAGE AREA AT NAS FORT WORTH, JOINT RESERVE BASE, CARSWELL FIELD, TEXAS

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		analysis will be conducted. Depending upon a review of these results the potential cleanup area could be reduced to the Residential direct contact area as shown in Figure V-2. However, this may require additional modification to the Ecological Tier 2 Levels based upon risk management consideration or additional site-specific analyses under a Tier 3 ecological assessment. The concentration of metals outside the bunker drains may need to be investigated to ensure that the extent of the contamination has been identified. The same is true of sample location A3-006, where the concentration of mercury was 10.9 mg/kg.	the Hazard Quotient) and Section 4 (Tier 3: Quantitative Ecological Risk Assessment) of McBee et al. (1996). The conclusions were modified appropriately based on these analyses. Additional sampling to verify previously reported detects and to delineate extent of contamination was performed at the bunker drains and in the vicinity of A3-006 during Fall 1998 and January 1999.
6.	6-5/6.2.3	Is there a planned remedy for these buildings?	No remedy is planned. Action (such as building decontamination) would only have been undertaken at the less than 90-day storage shed (SWMU 59) if samples contained levels above background in accordance with RCRA closure requirements. The levels in the shed were below background. The dust in other buildings with inorganic levels above background do not posing a threat to the environment. However the information is useful as a guide for later air monitoring during possible building demolition to ensure the dust generated is properly controlled.
7.	N/A	The risk evaluation (or risk assessment screening) typically conducted under TNRCC's Risk Reduction 2 does not generally entail such a detailed process. The evaluation under a Standard 2 normally assumes default assumptions not site-specific exposure parameters. This evaluation is more of a hybrid between a Standard 2 evaluation and a Standard 3 risk assessment since it	The risk evaluation was revised to reflect the July 1998 TNRCC guidance on implementing the existing risk reduction rule. The intent of the draft risk evaluation was to perform a RRSN2 evaluation, while incorporating pathways considered important for the site that are not addressed by TNRCC (1993) (e.g., dermal contact, volatilization from groundwater). This is consistent with the RRSN2, Section 335.556(b), which states "In addition to the

RESPONSE TO USEPA MARCH 1998 REVIEW COMMENTS ON THE RCRA FACILITY INVESTIGATION OF THE OFFSITE WEAPONS STORAGE AREA AT NAS FORT WORTH, JOINT RESERVE BASE, CARSWELL FIELD, TEXAS

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9.	2-26/2.4.1	Data validation or formal evaluation of the data used in this report has reportedly not been conducted. The reason stated in the report is because the data were used only for screening purposes. The data were used to make preliminary conclusions about the conditions of the site. It would not appear prudent to use data that may not be valid to make these determinations. Please clarify this information.	The statement in this section that indicates several soil and water samples were collected for screening purposes is misleading and was modified. With the exception of field measurements, all other data were collected for definitive purposes. Data validation on all definitive data is complete and has been incorporated into the Final RFI Report.
10.	2-28	Frequency of detection for selection of a chemical as a chemical concern should also consider the following: 1) number of samples (typically consider a minimum of 10 samples per media matrix per site), 2) relative concentration and toxicity (i.e., detection may be indicative of a "hot spot" or source area), 3) number of samples, 4) presence/absence in other media, 5) associated degradation products, 6) exceedances of ARARs, 7) persistence, mobility, and bioaccumulation, 8) historical evidence and 9) concentration gradient or distance nearest adjacent sample location. TNRCCs Subchapter S, Risk Reduction Standards, Chapter 335 is dated 1993 not 1996 as is referenced in the report. Please clarify.	These elements were considered when selecting COPCs. Reference modified.
11.	Figure	It is unclear what this food web represents. Are the species presented in the food web the potential	Figures 4-10 and 4-11 show generalized representative food web relationships that could occur at the site. The word

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	4-10	receptors present in the aquatic system or are they to be interpreted to be representative receptor/endpoint species? As was mentioned on page 4-11, section 4.3.2, the screening assessment should best include representative receptors or endpoint species rather than species that could potentially occur at the Offsite WSA. Additionally, the representative receptors or endpoint species should be demonstrated sensitive species in order to be protective of the majority of species within the specific feeding guild or trophic level. Please clarify. Additionally, some trophic levels do not have a receptor species associated with them. Does this mean that these were not considered? Please clarify.	"representative" has been added to the title of each figure for clarity. The specific receptors and pathways evaluated are discussed in Section 5.2. Figure 4-11 has been modified to show that herbivorous mammals, for example, the cottontail, could be consumed by omnivorous mammals, i.e., the coyote. It is not clear what other trophic levels the commentor felt should be included in Figures 4-10 and 4-11. With respect to the selection of endpoint species, the factors considered were representation of various trophic levels, potential presence at the Offsite WSA, and readily available toxicological data.
12.	Figure 4-11	See comments to Figure 4-10.	See above.
13.	5-11	It should be noted that the TNRCC Risk Reduction Rules allow for the use of the 95% Upper Confidence Limit (UCL) for representing the concentration term (or exposure concentration) to show attainment of Risk Reduction Standard 2 not to select chemicals of concern.	A sentence was added to the risk evaluation to indicate that the 95% UCL is used for comparing to CULs and not for screening for chemicals of concern. The 95% UCLs are also used in the Tier 2, Level C ecological screening evaluation, per TNRCC ecological risk assessment guidance (TNRCC 1996).
14.	5-17/5.2.2.4	The report identifies additional areas that may be considered either wetland habitat or even potential jurisdictional wetlands. The last jurisdictional wetland determination by the U.S. Army Corps of Engineers is reportedly dated 1987. It is recommended that the U.S.	Wetlands were identified by TEC personnel using both information collected during a site visit and National Wetland Inventory maps assembled by the U.S. Fish and Wildlife Service. The 1987 date is that of the Corps of Engineers wetland delineation manual, not that of the wetland identification at the WSA.

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		Army Corps of Engineers be contacted to determine if a reevaluation of the jurisdictional wetlands needs to be conducted.	
15.	5-20/5.2.3	The tier 1 ecological screen only considered herbivores. The reasons cited in the report were variable diet and large home range. These factors are not a good reason to drop these trophic levels. Subsequent tiers can aid in semi-quantitatively evaluation the impact of these factors to the estimated potential risks. In summary, since every tier builds upon the ecological risk assessment process and the risk management decisions, it is not prudent to exclude relevant trophic levels of consideration.	As discussed in the response to Comment 5, the ecological risk assessment was rewritten to consider additional trophic levels, including birds, insectivorous mammals, and organisms with wider home ranges, following the guidance in Section 3.3 (Level C Screening Assessment: Reducing the Hazard Quotient) and Section 4 (Tier 3: Quantitative Ecological Risk Assessment) of McBee et al. (1996).
16.	5.2.4.1	The soil screening benchmarks presented in TNRCC 1996 document are not final benchmarks. Surface water was not evaluated since data are not currently available. TRVs for wildlife were DOE benchmarks. Carswell should insure that all values used are observed No Observed Effect Levels. Why were avian species not evaluated? Potential risk to upper vertebrate trophic levels (i.e., from ingestion of prey) should have been evaluated. Benchmarks and representative species are not fully representative of the ecosystem in question and	Concur. However, soil screening benchmarks are useful for risk assessment purposes and the source document (ORNL, 1996) is readily available for citation. Surface water data have been collected and incorporated into the Final RFI Report. Sample et al.'s (1996) TRVs for wildlife are NOAELs, as stated in the text. The source document is available from ORNL's World Wide Web site at www.ornl.gov. See responses to Comments 5 and 15. Although no ecological risk assessment can be fully representative of an ecosystem, Carswell AFB is confident that the assessment is sufficiently conservative to protect ecological receptors.

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RESPONSE TO USEPA MARCH 1998 REVIEW COMMENTS ON THE RCRA FACILITY INVESTIGATION OF THE OFFSITE WEAPONS STORAGE AREA AT NAS FORT WORTH, JOINT RESERVE BASE, CARSWELL FIELD, TEXAS

Item	Draft RFI Page/Section	Comment	Response and/or Action Taken
		therefore the conclusions may only present a partial picture of potential impacts.	
17.	Table 5-6	The table utilizes a footnote "d" but there is no explanation at the end of the table for this footnote. Please provide an explanation on how the associated values to this footnote were obtained.	This table has been deleted from the Final RFI Report because the July 1998 RRSN2 values incorporate dermal exposure.
18.	Table 5-11	The dermal absorption factor mentioned in this table is cited as chemical-specific and Table 5-6 is referenced for details. Table 5-6 does not list dermal absorption factors. Please clarify. The toxicity value to determine ingestion exposure should not be modified with an absorption fraction unless the absorption fraction was used to derive the toxicity value for that chemical or there is chemical-specific literature data to support the use of the fraction. The chemical-specific literature data should be cited and provided as support. Otherwise, the absorption fraction should be assumed to be 1.0.	This table has been deleted from the Final RFI Report because the July 1998 RRSN2 values were used as the cleanup levels. No risk based concentrations were separately calculated. See response to Comment 7.
19.	Appendix O	Table 0-1 lists the residential groundwater cleanup levels. The values listed reportedly consider the ingestion, inhalation, and dermal route of exposure. However the values may not truly encompass the three exposure routes since footnote 2 states that inhalation of organic chemicals with Henry's Law Constants and inhalation toxicity factor only (i.e., TCE) was considered. Please clarify if this is the case. Tables 0-2, 0-3, and 0-4, list residential groundwater	This appendix has been deleted from the Final RFI Report. See response to Comment 7.

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		protection cleanup levels presumably addressing the groundwater ingestion, inhalation, and dermal exposure routes. However, the values do not reflect that these routes of exposure were actually considered in the calculation. Please clarify.	

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
The Environmental Company, Inc.
1230 Cedars Court, Suite 100
Post Office Box 5127
Charlottesville, Virginia 22905

8. PERFORMING ORGANIZATION REPORT NUMBER
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
HQ AFCEE/ERB
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This Final RFI Report provides a summary of investigative activities conducted at the Offsite Weapons Storage Facility (WSA) located at NAS Fort Worth, Texas. The investigation was completed in support of closure of Solid Waste Management Unit Number 59, the Waste Accumulation Area for the site. Additional areas at the site were investigated in support of the Air Force's property reuse and disposal efforts. These areas included outdoor material storage areas, an expolsive ordnance deposition range, former underground storage tank locations, and other areas associated with potential contaminant sources. Asbestos, lead-based paint and surfical contamination surverys were also conducted on site facilities. The final report includes a description of the methods used in these investigations and surveys, and presents the results. Included in the report is an evaluation of the risk posed by contamination found during the investigation.

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PREFACE

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of the Offsite Weapons Storage Area (WSA) at Naval Air Station (NAS) Fort Worth, Joint Reserve Base, Carswell Field, Texas (identified as Project No. 96-8117), was conducted to determine whether hazardous constituents have been released into the environment.

This Final RFI Report was prepared by The Environmental Company, Inc. (TEC) under contract No. F41624-95-D-8002, Delivery Order 0009. This technical report has been prepared for Project No. 96-8117.

This report provides a summary of existing information, describes the methods used, and provides a summary of the results, including a risk evaluation and conclusions of the investigation.

This report was written under the direction of Mr. Bob Duffner, P.E., TEC Project Manager.

The Contracting Officer's Representative for this project is Mr. Charles Pringle, Air Force Center for Environmental Excellence (AFCEE), Environmental Restoration Branch (ERB), Brooks Air Force Base (AFB), Texas.

Approved By: Date:

Bob Duffner 7/21/99

Bob Duffner, P.E.
Project Manager
The Environmental Company, Inc.

Approved By: Date:

Jack E. Wilson 7/15/99

Jack E. Wilson, P.E.
Project Director
The Environmental Company, Inc.

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NOTICE

This report has been prepared for the United States Air Force (USAF) by The Environmental Company, Inc. (TEC) for the purpose of aiding in the implementation of a final remedial action plan under the Air Force Installation Restoration Program (IRP).

Although the area of study is being investigated in accordance with IRP guidance, the area has not been identified as an IRP site. NAS Fort Worth (formerly Carswell Air Force Base) is undergoing property disposal/reuse pursuant to the Defense Base Closure and Realignment Act of 1990 and Round II of the Base Closure Commission deliberations. The area of study is being considered for property disposal or reuse and the Air Force Base Conversion Agency (AFBCA) desires to investigate the area to confirm or deny the presence of contamination.

As the report relates to actual or possible releases of potentially hazardous substances, its release prior to a USAF final decision on remedial action may be in the public's interest. The limited objectives of this report and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this report because subsequent facts may become known that may make this report premature or inaccurate.

Acceptance of this report in performance of the contract under which it is prepared does not mean that the Air Force adopts the conclusions, recommendations, or other views expressed herein, which are those of the contractor only and do not necessarily reflect the official position of the USAF.

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EXECUTIVE SUMMARY

Environmental media investigations (soil, sediment, and groundwater) and the facility surveys (asbestos, lead-based paint, and surface contamination) were completed as part of the Offsite Weapons Storage Area (WSA) study. One of the areas included in the environmental media investigation was the Waste Accumulation Area. This area and its associated surroundings have been identified as Solid Waste Management Unit No. 59 (SWMU 59) by the Texas Natural Resource Conservation Commission (TNRCC). This study constitutes the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for SWMU 59. Incorporated in this RFI is the investigation of other areas at the Offsite WSA and the facility surveys that were completed in support of ongoing Air Force property reuse and disposal efforts.

Nine separate potential source areas were investigated during the RFI. These source areas included:

- outdoor materiel storage and maintenance areas (A-1, A-2);
- unpaved perimeter of the Waste Accumulation Area and Bldg. 8503 (A-3) (SWMU 59);
- disturbed surface area southwest of the Control Fence (A-5);
- EOD Range;
- bunker floor drain outlets;
- removed UST locations;
- vehicle fueling area (A-4);
- areas beneath transformers; and
- leach field.

In addition to these potential source areas, samples were collected to directly characterize two potential contaminant migration pathways. To accomplish this task, samples were collected from the following media:

- drainageways;
- seeps; and
- Paluxy Aquifer groundwater.

A total of 464 soil, sediment, surface water, groundwater, and quality control samples were initially collected to characterize these areas. Of the samples, 30 were collected to establish site-specific background conditions. An additional 200 soil samples were collected after the initial characterization effort to verify anomalous detects and delineate the extent of contamination identified in selected areas.

As part of the initial data assessment under the TNRCC Risk Reduction Standards, site sample results were compared to inorganic background levels as determined using the Tolerance Interval method (EPA, 1989c, 1992a). Nearly all of the inorganic analytes exceeded the background $UTL_{95,95}$ in at least one sample. With the exception of the removed underground storage tank (UST) locations, vehicle fueling area, and transformer locations, all areas investigated contained inorganics detected above

background. In a number of cases, what appeared to be high concentrations may be natural variability in background conditions that were not represented in the background level determination.

Background was assumed to be undetected for organic compounds. Frequently detected organics not associated with field sampling or laboratory contamination were limited to polycyclic aromatic hydrocarbon (PAH) compounds, which were detected in several areas including A-1, A-3, A-4; removed UST areas; drainageways DW-1, DW-3, and DW-4; and the leach field. With the exception of DW-3 and the removed UST locations, however, where the PAHs are associated with known sources, the surficial and ubiquitous low-level nature of the PAH detects suggests that these compounds are from anthropogenic sources rather than an unauthorized discharge as defined by TNRCC Industrial Solid Waste and Municipal Hazardous Waste (TAC Chapter 335) regulations. Analytical results show that PAH concentrations decrease to nondetect as samples are collected progressively further from the roadways and pavement. The results also demonstrate that PAHs are limited to surface soil located within approximately 15 feet of roadways and parking areas. Samples collected 30 feet from the edge of the pavement had no detectable levels of PAHs. Samples with the highest reported PAH concentrations are adjacent to areas assumed to have been used for parking and as loading/unloading zones. Based on these results, it is assumed that PAHs detected at A-1, A-3, and the drainageways except DW-3 are associated with nonpoint source discharges from vehicles that are subsequently entrained in roadway runoff.

Although sample results indicated the presence of contamination within source areas, contaminants do not appear to have migrated vertically, with the exception of volatiles. Inorganic and semivolatile compounds are most prevalent in surface samples and typically decrease to either background levels or to below detection limits after 2.5 feet below ground surface (bgs). Only low-level volatiles at Area A-3 and semivolatiles at former UST locations were repeatedly found at deeper subsurface samples (directly above bedrock between 2.5 and 10.0 feet bgs). Drainageway sample results support the conclusion that contamination is not migrating. When inorganic and semivolatile contamination was present, it was confined to the adjacent source area or to upgradient samples within the drainageway.

Groundwater samples collected from the Paluxy Aquifer also support the conclusion that neither off site nor vertical contaminant migration is occurring. Inorganic analytes detected above background all were less than one order of magnitude greater than background. No organic compounds were detected in groundwater. Because the investigation did not indicate that inorganic contaminants have migrated deeper than 2.5 feet bgs and because a 26- to 30-foot aquitard underlies the site, it is assumed that the analytes detected in groundwater samples are not site-related.

The Risk Evaluation included assessments of both risk to human health and ecological receptors via development of clean-up levels (CULs). Both efforts involved a

EXECUTIVE SUMMARY (CONTINUED)

conservative screening process that eliminated several analytes detected above background from further consideration. TNRCC human health Risk Reduction Standards No. 2 (RRSN2) and Petroleum Storage Tank Division (PSTD) target concentrations were developed as CULs for the remaining contaminants of potential concern (COPCs) and compared to exposure point concentrations (EPCs).

The COPCs with EPCs exceeding RRSN2 and PSTD human health CULs include metals (iron, mercury, cadmium, and copper) and carcinogenic PAHs in soil and sediment. These exceedances occur in Area A-3, three of the 11 bunker drains, three of the five USTs, and one of the nine drainageways. In many cases, the exceedances were limited to single sample locations, where data outliers or anomalous detects were reported. The majority of area-wide EPCs were below human health CULs. Area-wide EPCs that exceeded CULs were limited to those corresponding to carcinogenic PAHs detected in the surface and subsurface soil of Drainageway DW-3. The exceedances of the inorganic COPC CULs and carcinogenic PAH CULs in other areas occur at single-sample locations.

The COPCs identified for the Ecological Evaluation were limited to inorganic compounds in soil and sediment. Although the evaluation presented soil concentrations protective of ecological receptors (Tier 2 Level C values [$T_{2\text{-}c}$Ls]) that were above EPCs, many of these concentrations are either below the background levels established for the site or are associated with COPCs that are being addressed because of potential human health concerns. The $T_{2\text{-}c}$Ls above background are limited to those for plants and invertebrates potentially exposed to cadmium, copper, lead, mercury, nickel, and zinc at the bunker drains and drainageway locations.

The total acreage of the impacted drainageways and bunker drains is approximately 0.4 acres, which is 3 percent of the total source area acreage (approximately 11 acres) and 0.2 percent of the total Offsite WSA acreage (247 acres). Because exceedances of ecological $T_{2\text{-}c}$Ls are confined to this nominal acreage and the potentially impacted species are not known to be ecologically critical to the region, the presence of the inorganic COPCs in these areas is expected to have minimal impact on the local ecosystem.

Compounds detected in drainageway and seep surface water, groundwater, and seep sediment were either below background levels or CULs. Therefore, the Risk Assessment identified no human health or ecological COPCs needing further action in these media.

An assessment of asbestos materials was completed as part of the facility surveys. Ninety-nine suspect asbestos-containing material (ACM) samples were collected in 23 buildings; 32 samples from eight of the 23 buildings tested positive. One homogeneous area at a ninth building was assumed to be asbestos. None of the ceiling tiles at the Offsite WSA tested positive for asbestos. Additionally, no asbestos was found in any of the Offsite WSA storage bunkers. Pipe insulation varied from building to building. Generally, the performed thermal system insulation (TSI) and the aircell TSI were found to be positive; the fitting TSI was negative. Nine-inch by nine-inch floor tiles all tested positive; the 12-inch by 12-inch floor tiles varied. Asbestos-containing roofing materials also varied. On the smaller buildings, the roofing felt contains asbestos. On the larger buildings, only the sealant around vents contain asbestos.

EXECUTIVE SUMMARY (CONTINUED)

The lead-based paint (LBP) survey was conducted at 24 Offsite WSA facilities. Ninety-five paint samples were collected. Forty-two samples from 19 of the 24 facilities surveyed tested positive for LBP. The majority of metal exterior building components such as

Handrails, doors, door frames, and window frames are coated with LBP. Most interior steel support beams also are coated with LBP. It was rare to find paint on other interior components that is LBP, with the exception of the floor molding in Bldg. 8507. Some interior wall paint in Bldg. 8514 was found to be positive. The tan exterior wall paint, which is typical of most Offsite WSA buildings, was only found to be positive on Bldgs. 8500 and 8505. Finally, yellow safety paint that was used on ramps and stairs was also determined to be LBP.

A facility surface contamination survey was conducted at 13 Offsite WSA buildings as part of this RFI, to determine the extent of contamination from dust and particles associated with ordnance on the surfaces of various Offsite WSA buildings. Contamination was found on the walls and floors in 12 of the 13 buildings. Bldg. 8512 (SWMU 59) was the only building in which no surface residue contamination was detected. Both the walls and the floors were determined to have inorganic contaminants above background levels in eight of the 12 buildings. The remaining four buildings only have contamination present on their floors. Generally, the floors seemed to have higher levels of contamination and more types of analytes detected on them. Contamination on the floors appeared to be a result of the previous room/building use and the fact that inorganic materials settle better onto a floors than on walls and ceilings.

Based on the sampling results and subsequent evaluation discussed above, appropriate actions have been identified for each of the areas (or locations) which when implemented will allow for closure. These actions are identified in Table ES-1 on the following page.

Documentation of closure requirements, including removal actions, and demonstration of RRSN1 or RRSN2 attainment will be provided in a site closure report. The closure report will be completed following completion of all closure activities at the Offsite WSA.

EXECUTIVE SUMMARY (CONTINUED)

Table ES-1. Summary of Areas of Concern, Basis for Closure, and Actions Required

Area/Location	Basis for Closure	Actions Required Prior to Closure
Area A-1	RRSN1	No Action Required
Area A-2	RRSN1	No Action Required
Area A-3 (SWMU 59 and Bldg. 8503) and Drainageway DW-1	RRSN2	Soil Removal/Deed Certification
Area A-4	No Action per PSTD Requirements	No Action Required
Area A-5	RRSN1	No Action Required
EOD Range	RRSN1	No Action Required
Bunker Drains	RRSN2	Soil Removal/Deed Certification
Electrical Transformer Areas	RRSN1	No Action Required
Leach Field	RRSN2	Dismantle Downgradient Wall/Deed Certification
Removed UST at Bldg. 8500	RRSN2	Soil Removal/Deed Certification
Removed UST at Bldg. 8503	RRSN1	No Action Required
Removed UST at Bldg. 8505	No Action per PSTD Requirements	No Action Required
Removed UST at Bldg. 8507	RRSN2	Soil Removal/Deed Certification
Removed UST at Bldg. 8514	PSTD Closure Requirements	No Action Required
Drainageway DW-3	RRSN2	Soil Removal/Deed Certification
Drainageways DW-2, DW-4, DW-5, DW-6, DW-7, DW-8, and DW-9	RRSN1	No Action Required
Seep Locations	RRSN1	No Action Required
Groundwater	RRSN1	No Action Required

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LIST OF ACRONYMS AND ABBREVIATIONS

AA	Atomic Absorption
ACC	Air Combat Command
ACBM	Asbestos Containing Building Material
ACM	Asbestos-Containing Materials
AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AFCEE	Air Force Center for Environmental Excellence
AGI	American Geological Institute
AHERA	Asbestos Hazard Emergency Response Act
AHU	Air Handling Unit
AL/OEBZ	Armstrong Laboratory Health Physics Branch
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	Benzene, Toluene, Ethyl-Benzene, Xylenes
Bv	Soil-to-Plant Element Transfer Coefficient
CAA	Clean Air Act
CAAA	Clean Air Act Amendment
CERFA	Community Environmental Response Facilitation Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm2	square centimeters
cm/sec	centimeters per second

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

COPC	Chemical of Potential Concern
Cs	Contaminant Concentration in Root Zone of the Soil
CSF	Carcinogenic Slope Factor
CULs	Cleanup Levels
Cv	Element Concentrations in the Vegetative Portion of the Plant
DBCRA	Defense Base Closure and Realignment Act
DCE	Dichloroethene
DDE	Dichlorodiphenyltrichoroethane
DDT	1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
DOT	Department of Transportation
DQO	Data Quality Objective
EBS	Environmental Baseline Survey
EC	Electrical Conductivity
EDQ	Environmental Data Quality
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
°F	Degrees Fahrenheit
FSP	Field Sampling Plan
GC	Galson Corporation
HQ	Hazard Quotient
HSP	Health and Safety Plan

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

HUD	Housing and Urban Development
HVAC	Heating Ventilation and Air Conditioning
ICP	Inductively Coupled Plasma
IDW	Investigation Derived Waste
ing	ingestion
inhal	inhalation
IRP	Installation Restoration Program
IRPIMS	Installation Restoration Program Information Management System
IRW	Ingestion Rate for Wildlife
JRB	Joint Reserve Base
L	Liters
LBP	Lead-Based Paint
LCS	Laboratory Control Samples
LDR	Land Disposal Requirements
LLRWBS	Low-Level Radioactive Waste Burial Site
LPST	Leaking Petroleum Storage Tank
m	meter
MCL	Maximum Contaminant Levels
MCLG	Maximum Contaminant Levels Goals
MDL	Method Detection Limit
M & E	Metcalf & Eddy
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSD	Matrix Spike Duplicates
mm	millimeters

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

MS	Matrix Spike
MSC	Medium-Specific Concentration
msl	mean sea level
NA	Not Applicable
NAS	Naval Air Station
NCP	National Contingency Plan
ND	Non-Detectable
NOAEL	No Observed Adverse Effect Level
NPDWR	National Primary Drinking Water Regulations
NPDWS	National Primary Drinking Water Standards
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
O & M	Operations & Maintenance
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	tetrachloroethene
pCi/L	microcuries per liter
PE	Performance Evaluation
PEL	Permissible Exposure Limit
PEMA	Palustrine, Emergent, Temporarily Flooded
PEMAX	Palustrine, Emergent, Temporarily Flooded, Excavated
PFO1A	Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded
PID	Photo-ionization Detector
ppb	parts per billion

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PPE	Personal Protective Equipment
ppm	parts per million
PQL	Practical Quantitation Limits
PR	Preliminary Review
PST	Petroleum Storage Tank
PSTD's	Petroleum Storage Tank Division's
PUBHh	Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked Impoundment
PUBHx	Palustrine, Unconsolidated Bottom, Permanently Flooded, Excavation
PUSCh	Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked Impoundment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
R2UBH	Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded
RBCA	Risk-Based Corrective Action
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RE	Risk Evaluation
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROI	Region of Influence
RRSN	Risk Reduction Standard Number

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

SAC	Strategic Air Command
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
sf	square feet
SFM	Surfacing Material
SOP	Standard Operating Procedure
SOW	Statement of Work
SPLP	Synthetic Precipitation Leachate Procedure
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
$T_{2\text{-}c}Ls$	Tier 2-C Levels
TAC	Texas Administrative Code
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leachate Procedure
TEC	The Environmental Company, Inc.
TEPH	Total Extractable Petroleum Hydrocarbon
TNRCC	Texas Natural Resources Conservation Commission
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TPWD	Texas Parks and Wildlife Department
TRPH	Total Recoverable Petroleum Hydrocarbon
TRVs	Toxicity Reference Values
TSCA	Toxic Substances Control Act
TSI	Thermal System Insulation
TxDOT	Texas Department of Transportation

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

µg/g	micrograms per gram
µg/kg	micrograms per kilogram
UCL	Upper Confidence Limit
USACE	United States Army Corps Of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USNRC	United States Nuclear Regulatory Commission
UST	Underground Storage Tank
UTL	Upper Tolerance Limit
$UTL_{95,95}$	Upper Tolerance Limit with 95 Percent Coverage
VSI	Visual Site Inspection
VOC	Volatile Organic Compound
WP	Work Plan
WSA	Weapons Storage Area

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TAB

1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) report was prepared by The Environmental Company, Inc. (TEC) under U.S. Air Force Center for Environmental Excellence (AFCEE) Contract No. F41624-95-D-8002, Delivery Order 0009, project number 96-8117. This RFI report summarizes the results of an investigative effort at the Offsite Weapons Storage Area (WSA) at Naval Air Station (NAS) Fort Worth, Joint Reserve Base, Carswell Field, Texas.

All efforts were completed in accordance with guidelines provided in the Headquarters AFCEE *Handbook for the Installation Restoration Program (IRP) Remedial Investigations and Feasibility Studies (RI/FS)*, dated September 1993 (hereafter referred to as the *Handbook*). In addition, all work for this project incorporated those requirements and guidelines provided in the U.S. Environmental Protection Agency (USEPA) *Interim Final RCRA Facility Investigation Guidance* dated May 1989 and applicable provisions in the Texas Administrative Code (TAC) 30, Chapter 335, Subchapters A, R, and S.

This investigation was conducted in part to fulfill a directive issued by the Texas Natural Resources Conservation Commission (TNRCC). A letter from the TNRCC to the Air Force Base Conversion Agency (AFBCA) dated February 16, 1995, summarized Solid Waste Management Units (SWMUs) requiring RFIs. One of the SWMUs identified was No. 59, the Offsite WSA Waste Accumulation Area located adjacent to Bldg. 8503.

In addition to determining potential environmental impacts associated with SWMU 59, the investigative activities described in this RFI report were conducted to support the future disposal/reuse of Offsite WSA property. NAS Fort Worth (formerly Carswell Air Force Base [AFB]) is undergoing property disposal/reuse pursuant to the Defense Base Closure and Realignment Act of 1990 and Round II of the Base Closure Commission deliberations. An assessment has therefore been made of the entire Offsite WSA, to determine if potential contaminants have entered the environment or if they pose a risk to human health or the environment, in fulfillment of the Community Environmental Response Facilitation Act (CERFA) requirements.

1.1 DESCRIPTION OF THE AIR FORCE INSTALLATION RESTORATION PROGRAM

The objectives of the U.S. Air Force (USAF) IRP are to assess past hazardous waste disposal and spill sites at USAF installations and to develop remedial actions consistent with the National Contingency Plan (NCP) for those sites that pose a threat to human health and welfare or to the environment.

RCRA, enacted in 1976, governs the disposal of hazardous wastes. RCRA Sections 6001 and 6003 require Federal agencies to comply with local and state environmental regulations and to provide information to the USEPA concerning past disposal practices at Federal sites.

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

To ensure compliance with Executive Order 12580, the DoD developed the IRP under the Defense Environmental Restoration Program to identify potentially contaminated sites, investigate these sites, and evaluate and select remedial actions for contaminated sites. The DoD issued Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6 dated June 1980, regarding the IRP program. The DoD formally revised and expanded IRP directives, and amplified all previous directives and memoranda concerning the IRP, through DEQPPM 81-5, dated 11 December 1981. The memorandum was implemented by a USAF message dated 21 January 1982.

IRP requirements have been developed to ensure DoD compliance with Federal laws such as RCRA, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Superfund Amendments and Reauthorization Act (SARA). In November 1986, in response to SARA and other USEPA interim guidance, the USAF modified the IRP to provide for an RI/FS program. The IRP was modified so that RI/FS studies could be conducted as parallel activities instead of serial activities. The IRP now encompasses applicable or relevant and appropriate requirements (ARAR) determinations, identification and screening of remedial technologies, and the development of remedial alternatives. A project conducted under the IRP may include field activities and studies prior to a detailed final analysis of remedial alternatives.

1.2 INSTALLATION DESCRIPTION

A description of the Offsite WSA is provided below. This section includes a description of the site location, a history of NAS Fort Worth and the Offsite WSA, the environmental setting of the region, and the local environmental setting.

1.2.1 Installation Location

The Offsite WSA was an off-base facility supporting Carswell AFB, which has since been realigned as NAS Fort Worth. NAS Fort Worth is located in north-central Texas in Tarrant County, approximately 8 miles west of Fort Worth, Texas (see Figure 1-1).

NAS Fort Worth property totals 2,555 acres and consists of a main station and two noncontiguous land parcels. The area surrounding NAS Fort Worth is predominantly suburban, and includes the residential areas of Fort Worth, Westworth Village, and White Settlement.

The Offsite WSA is located on a 247-acre off-site parcel under the ownership and control of the AFBCA. This parcel is surrounded by an additional 264 acres of easements controlled by the AFBCA. The Offsite WSA is located at approximately 32 degrees north latitude and 97 degrees west longitude, in north-central Texas. It lies approximately 4 miles west of NAS Fort Worth, just north of White Settlement Road (see Figure 1-2). The 70-acre Offsite WSA facility was built in 1956 and is enclosed within a security fence. An aerial photograph of the site taken in 1984 is provided in Figure 1-3, and a detailed map of the site facilities is provided in Figure 1-4. Both of these figures show the fenced area of the WSA surrounded by the outer ring of Air Force property. The Offsite WSA is primarily bordered by rural land, with some ranches and farms located nearby. A residential development is located south of White Settlement Road.

Facilities at the Offsite WSA include 2 munitions inspection shops, 16 ordnance storage buildings (including 11 bunkers), 1 entry control building, a less-than-90-day

hazardous waste storage area (SWMU 59), and an emergency power plant. During its operational period, the Offsite WSA also maintained an Explosive Ordnance Disposal (EOD) Range, a small radioactive waste burial site (SWMU 60), a water storage tank, and two nonpotable water wells. The radioactive waste burial site has been closed and remediated since the Offsite WSA operations were terminated, and the EOD Range has been physically cleared of explosives and metals. Table 1-1 lists the buildings constructed at the Offsite WSA and their primary uses. The locations of Offsite WSA buildings are shown on Figure 1-4. A discussion of these historic investigative and remedial activities is provided in Sections 1.3 and 1.4, respectively.

1.2.2 Installation History

1.2.2.1 NAS Fort Worth History

Prior to 1941, the area that is now NAS Fort Worth consisted of woods and pasture in an area called White Settlement. NAS Fort Worth started as an earthen runway constructed to service an aircraft manufacturing facility. When established in 1942, the installation was referred to as the Tarrant Field Airdome and was under the jurisdiction of the Gulf Coast Army Air Field Training Command. The installation's mission was to provide transition training for B-24 bomber pilots.

The Strategic Air Command (SAC) assumed control of Tarrant Field Airdome in 1946 and the installation served as the HQ for the Eighth Air Force and as a heavy bomber base. The installation was renamed Carswell AFB in 1948 in honor of Major Horace S. Carswell, a native of Fort Worth. HQ 19th Air Division was located at Carswell AFB in 1951 and the installation became a home base for B-52s and KC-135s in 1956. The Air Combat Command (ACC) assumed control of Carswell AFB in 1992 concurrent with the dissolution of the SAC.

Carswell AFB was selected for closure and associated property disposal/reuse during Round II of Base Closure Commission deliberations pursuant to the Defense Base Closure and Realignment Act (DBCRA) of 1990. The planning process for closure and property disposal/reuse at Carswell AFB was initiated in 1992 and Carswell AFB officially closed on 30 September 1993. The U.S. Navy assumed control of the majority of the former Carswell AFB on 1 October 1994 and renamed the installation NAS Fort Worth, Joint Reserve Base, Carswell Field. Those portions of the former base, including the Offsite WSA, which were not assumed by the Navy remained USAF property under the control of the AFBCA.

1.2.2.2 Offsite WSA History

The Offsite WSA was built in 1956 and was officially closed with the rest of Carswell AFB on 30 September 1993. Activities that took place at the site included the storage and maintenance of munitions, disposal of ordnance and, to a limited degree, the storage of low-level radioactive waste. A discussion of previous environmental investigations conducted at the WSA facilities is provided in Section 1.3.

Maintenance was conducted within buildings and in the open outdoors. The majority of the indoor maintenance of the ordnance took place inside Bldg. 8503. In support of these activities, paint booths were installed in Bldg. 8503. Air Force personnel reported that painting and sanding of practice bombs also occurred outdoors (Long, 1996). The

majority of outdoor maintenance reportedly took place around the perimeter of Bldg. 8503; north of Bldgs. 8554, 8556, 8558, 8560 and 8852; and between Bldgs. 8503 and 8531 (Figure 1-4).

Ordnance and spent engine cartridge disposal was conducted at an EOD Range, which was constructed in 1971. This disposal area consisted of 3 acres of land located directly west of the main complex (see Figure 1-4). As discussed in Section 1.3, the EOD Range is no longer used and was cleared of explosives in February of 1993.

The Low-level Radioactive Waste Burial Site (LLRWBS), identified as SWMU 60 by the TNRCC, was located 400 feet west of Bldg. 8503 (see Figure 1-4). The LLRWBS was used between 1957 and 1969. The burial site consisted of three dry wells constructed from 12-inch diameter cast iron pipes encased in 2.25 inches of grout. These pipes were vertically embedded 18 feet into the ground. The pipes were permanently capped in 1969 and were finally removed in November of 1996. A more detailed discussion of the remediation work at this SWMU is presented in Section 1.4.

1.2.3 Regional Environmental Setting

1.2.3.1 Physical Geography

The region surrounding NAS Fort Worth is situated in the Grand Prairie Section of the Central Lowlands Physiographic Province (Frenneman, 1931). The area is characterized by gently sloping broad terraces that incline to the east and are separated by west-facing escarpments. The surface is typically grass covered with isolated stands of timber on some of the uplands.

Surface drainage in the region follows a dendritic pattern, interrupted by numerous large man-made lakes and farm ponds. The major surface water features in this region are the large lakes created along forks of the Trinity River (see Figure 1-1). Lake Worth, which forms the northern border of NAS Fort Worth, was produced by damming the West Fork Trinity River, and Benbrook Reservoir by damming the Clear Fork Trinity River. Additional large lakes and reservoirs are scattered throughout the Dallas/Fort Worth metropolitan area. The same pattern of water impoundment is present on a local scale, as many streams in the region have been dammed to produce farm ponds. Figure 1-5 shows the dendritic drainage pattern and the prevalence of farm ponds in the local area surrounding the WSA.

The entire Fort Worth area is within the Trinity River drainage system. Streams around NAS Fort Worth and the WSA drain directly into Lake Worth or into the West Fork Trinity River. Due to the relatively dry climate, most of the smaller drainages in the area contain intermittent streams. Water flows in these drainages during rainy seasons and briefly after heavy rainfall.

1.2.3.2 Geology and Hydrogeology

Regional Geology

The geology of west-central Tarrant County consists of Early Cretaceous marine sedimentary rocks, with thin, unconsolidated Quaternary alluvial deposits along major stream and river valleys. During much of the Paleozoic era, this region was beneath a shallow sea. Late in the Paleozoic era, however, the area was uplifted, resulting in

extensive erosion. During the early Cretaceous Period, marine sediments were deposited on top of this erosional surface as the sea once again flooded the region. These marine sediments now form a wedge thickening to the southeast. As the sea withdrew during the late Cretaceous Period through the Tertiary Period, streams eroded the land surface. During the Quaternary period, streams have deposited successive stages of alluvial material, with older terrace deposits being cut by present-day streams.

The Cretaceous marine units form a portion of the stable Texas shelf. Bedding is essentially horizontal, with regional dips of approximately 35 to 40 feet per mile to the east-southeast. No major fracture zones or faults have been mapped in the proximity of NAS Fort Worth. The nearest major structural features are the Mexia-Talco fault system approximately 80 miles to the east, the leading edge of the Ouachita thrust system approximately 30 miles to the east, and the south end of the axis of the Fort Worth basin approximately 5 miles east of the WSA.

Figure 1-6 presents a generalized stratigraphic section for the region around NAS Fort Worth and the Offsite WSA. Brief descriptions of each unit are given below. Thicknesses given for the various units have been measured in the area of NAS Fort Worth and the Offsite WSA, as the Cretaceous marine units generally thicken to the southeast.

The Quaternary material in this region comprises two major types of deposits. Fill deposits consist of clay, silt, sand, gravel, and organic material. They are usually generated during farming or construction activities. In some parts of the NAS Fort Worth area, fill material constitutes 85 to 100 percent of the immediate subsurface. Alluvial deposits, the second category of Quaternary material, consist of sand, silt, clay, and gravel. These deposits not only fill present-day stream and river valleys, but also underlie ancient floodplains and river channels. The alluvial deposits are of varying thicknesses and lateral extents. Much of the area surrounding NAS Fort Worth is underlain by Quaternary deposits, primarily alluvium deposited by the West Fork Trinity River. Elsewhere, particularly at the WSA, Quaternary deposits are thin to absent, and a thin layer of organic soil caps near-surface bedrock. The thickness of 30 feet for the Quaternary units shown on Figure 1-6 represents an average.

The Goodland Limestone formation is the youngest Cretaceous unit exposed in the NAS Fort Worth area. It consists of chalky white, fossiliferous, dense, thinly to massively bedded limestone interbedded with gray to yellow-brown stiff clay and marl (Hargis + Associates, 1989). Extensive jointing is common in weathered portions of the formation; however, cores reveal that joints are rare in the unweathered Goodland Limestone (Jacobs, 1997a). The thickness of this formation is variable due to erosion, as it was exposed for a long period before any overlying alluvium was deposited. In Tarrant County, the formation thickness ranges from 0 to 130 feet. In the NAS Fort Worth/WSA region, the Goodland Limestone has an average thickness of 30 feet and reaches a maximum of 47 feet near Plant 4 on the western side of the base.

The underlying Walnut Formation consists of iron-stained shell-agglomerate limestone interbedded with brown sandy clay, thinly bedded fossiliferous clay, and fissile shale (Leggat, 1957). The limestone is usually fractured and contains considerable jointing and flaking. In eastern Texas, the Walnut Formation averages 300 feet in thickness. In the NAS Fort Worth area, the formation thickness is fairly constant between 25 and 35 feet; however, erosional channels have been delineated in the subsurface, where the

thickness of the Walnut Formation has been reduced to less than 3 feet. A disconformity separates the base of the Walnut Formation from the top of the Paluxy Formation below.

The Paluxy Formation consists predominantly of sandstones separated by thin, discontinuous shale and claystone layers, as well as lesser amounts of lignite. The sandstones consist of fine- to coarse-grained, well sorted, poorly consolidated, cross-bedded white quartz sand. Much of the sandstones are poorly cemented and friable, although some are slightly indurated due to a calcite cement. The lower portion of the Paluxy Formation is generally coarser grained than the upper portion. The Paluxy Formation ranges in thickness from 140 feet to 190 feet in Tarrant County (Leggat, 1957).

Cretaceous units older than the Paluxy do not crop out in the NAS Fort Worth/WSA area; however, they are important hydrogeologically. Beneath the Paluxy Formation is the Glen Rose Formation, which consists of fine-grained limestone, shale, marl, sandstone, and minor anhydrite. In the NAS Fort Worth area, this formation varies from 250 to 450 feet thick. The relatively impermeable limestones in the Glen Rose Formation act as an aquitard, separating the Paluxy Formation aquifer from aquifers below. Underlying the Glen Rose Formation is the Twin Mountains Formation, which contains a major aquifer in this area of Texas. This formation grades upward from a basal chert and quartz pebble conglomerate to a fine- to coarse-grained sandstone interbedded with shale and clay. It is approximately 250 feet thick in the vicinity of Lake Worth.

Regional Hydrogeology

The principal hydrogeologic units underlying the region surrounding NAS Fort Worth include the terrace alluvial aquifer within the Quaternary deposits, the Walnut Formation aquitard, and the Paluxy Aquifer. Of additional importance are the Glen Rose Formation aquitard and the Two Mountains Aquifer.

The uppermost aquifer in the area occurs in the near-surface unconsolidated materials. These materials include fill, alluvium, and the more highly weathered upper portions of the Goodland Limestone. The unconfined, discontinuous zones of groundwater within these deposits is collectively known as the terrace alluvial aquifer (Rivers *et al*, 1996). This aquifer is only partially saturated and is not used as a source of drinking water. Recharge of the aquifer is from precipitation and leaking water supply lines, sewer lines, and storm drains. Discharge seeps into small streams as well as the West Fork Trinity River. Flow directions are generally controlled by the bedrock topography of the Goodland Limestone. The unweathered portions of the Goodland Limestone serve as an aquitard, preventing discharge from the upper aquifer into the Paluxy aquifer below.

The Walnut Formation is typically dry and is not a source of groundwater in the area. Previous investigations have reported groundwater at the interface between weathered and unweathered rock of the Walnut Formation, and small amounts of groundwater may also occur along bedding planes and fractures (Hargis + Associates, 1985). For the most part, though, the limestones and shales of this formation act as an aquitard, hydraulically separating the overlying terrace alluvial aquifer from the Paluxy Aquifer. Soil borings at NAS Fort Worth, however, have penetrated zones where the Goodland Limestone has been completely eroded and the Walnut Formation is only 3 feet thick

(A.T. Kearney, 1989). In areas of similar extensive erosion, water may flow freely between the upper terrace alluvial aquifer and the deeper Paluxy Aquifer.

The Paluxy Aquifer is hosted by fine- to medium-grained sandstones within the Paluxy Formation. Well yields and water quality from this aquifer are good, and the aquifer has therefore been an important source of potable water for the Fort Worth area, including the community of White Settlement. Groundwater from the Paluxy Aquifer is used for agricultural and livestock purposes by many of the farms and ranches surrounding the WSA. Extensive development of this aquifer has led to a significant decline in water levels, leading to development of deeper aquifers (Nordstrom, 1982). Recharge to the Paluxy Aquifer occurs where the formation crops out west of NAS Fort Worth. In addition, the formation crops out in the bed of Lake Worth and receives significant recharge from the lake. Small amounts of recharge may also be derived from the terrace alluvial aquifer. Regional groundwater flow within the Paluxy Aquifer is eastward, except in the area directly beneath NAS Fort Worth. Groundwater flow in this area is to the southeast, due to a potentiometric high at Lake Worth and a potentiometric low in the White Settlement area.

The Glen Rose Formation occurs beneath the Paluxy Formation and generally acts as an aquitard. Sands in the Glen Rose Formation yield small amounts of water to wells in Fort Worth and western Tarrant County. In general, though, the relatively impermeable limestone in the formation restricts water movement between the overlying Paluxy Aquifer and the underlying Twin Mountains aquifer.

The Twin Mountains Formation contains one of the major aquifers in Tarrant County. The water is hosted in the fine- to coarse-grained sands above the formation's basal conglomerate. The formation yields large quantities of water for municipal and industrial uses. Intensive use of the aquifer has resulted in declining water levels, with a 250-foot drop in the potentiometric surface of the aquifer between 1955 and 1976 (A.T. Kearney, 1989). Recharge to the aquifer occurs west of NAS Fort Worth, where the formation crops out, and groundwater flow is eastward.

1.2.4 Local Environmental Setting

1.2.4.1 Physical Geography

The Offsite WSA land area is characterized by broad, gently to moderately sloping terraces of sedimentary rock mantled by a variable thickness of light brown to black loamy soil. The WSA is situated on a ridge between Live Oak Creek and one of its tributaries to the north. Topography within the fenced area of the Offsite WSA consists of a gently sloping surface with elevations ranging from approximately 770 feet above mean sea level (msl) along the western boundary fence to approximately 730 feet above msl near the east fence (see Figure 1-4). The plateau's gentle slopes end abruptly at the drainages, which feed into Live Oak Creek and its tributaries to the south, east, and north of the WSA. Gradients become much steeper in these drainages, with up to 30 feet of vertical drop per hundred feet of horizontal distance (see Figure 1-5).

The primary surface water features in the vicinity of the Offsite WSA are Live Oak Creek, located approximately 400 feet south of the Offsite WSA boundary, and an unnamed ephemeral tributary to Live Oak Creek, located immediately north of the fenced WSA property (see Figure 1-5). A series of drainageways and ditches transmit surface

water directly off the site. The WSA drainageways flow into the major drainages to the south, east, and north. All surface water associated with the site is therefore eventually discharged into Live Oak Creek or its northern tributary.

Live Oak Creek flows northeast from the Offsite WSA and enters Lake Worth approximately 3 miles east of the site. Lake Worth and Live Oak Creek are primarily used for recreational purposes and fishing. **Lake Worth is used as a source of drinking water for the City of Fort Worth.**

1.2.4.2 Geology and Hydrogeology

Soils

The Soil Survey of Tarrant County (Ressel, 1981) shows eight distinct soil units in and around the WSA. All of these soils are moderately alkaline, reflecting the limestone bedrock of the region, and most are shallow. Drilling at the WSA during the RFI confirmed that the soil layer is thin at the WSA, with depth to bedrock exceeding 6 feet only in scattered locations. Alluvial materials are found only along stream channels of Live Oak Creek and its northern tributary. General descriptions of the soils in the WSA area are given below. Figure 1-7 is a soil map for the WSA area.

- Aledo gravelly clay loam, 1 to 8 percent slopes (soil survey map designation 1)—This shallow to very shallow soil occurs on ridgetops underlain by fractured limestone. The surface layer of the soil is brown gravelly clay loam. The subsoil is brown, very gravelly clay loam that is approximately 60 percent limestone fragments. Beneath the subsoil is fractured limestone. Aledo gravelly clay loam soils were common at the EOD Range of the WSA.
- Aledo-Urban land complex, 1 to 8 percent slopes (soil survey map designation 4)—This soil is 50 to 65 percent Aledo soil, as described above, 15 to 40 percent Urban land, and less than 20 percent closely similar soils. Urban land is the classification assigned to areas where 85 to 100 percent of the ground surface has been altered by construction activities. The soil types have been so obscured that they cannot be classified. Aledo-Urban land complex soils were common at Areas A-1 and A-2 and in bunker drain boreholes.
- Bolar clay loam, 3 to 5 percent slopes (soil survey map designation 15)—This moderately deep soil occurs on convex ridges and upland slopes. The calcium carbonate content of this soil is high. The surface layer of the soil is dark grayish-brown clay loam. The subsoil is brownish clay loam with common limestone fragments. Beneath the subsoil is fractured limestone interbedded with light yellowish-brown calcareous clay. Bolar clay loam soils are mapped in the area to the south of the EOD Range and were not encountered during the RFI field work.
- Bolar-Urban land complex, 1 to 5 percent slopes (soil survey map designation 16)—This soil is 30 to 70 percent Bolar soil, 15 to 50 percent Urban land, and less than 20 percent other soils. Both the Bolar clay loam soils and the Urban land designation have been described above. Bolar-Urban land complex soils were common at Area A-3.
- Brackett clay loam, 3 to 8 percent slopes (soil survey map designation 17)—This shallow soil occurs on convex ridges and side slopes. The

concentration of calcium carbonate is high in this soil. The surface layer is light brownish-gray clay loam. The subsoil is light gray clay loam. Beneath the subsoil is interbedded pale yellow calcareous silty clay and soft weathered chalk. Brackett clay loam soils were found at Area A-5.

- Maloterre, Aledo, and Brackett soils, 3 to 20 percent slopes (soil survey map designation 46)—These very shallow to shallow soils occur on slopes along drainageways. They consist of approximately 35 percent Maloterre soil, 30 percent Aledo soil, 20 percent Brackett soil, and 15 percent other soils and rock outcrops. The Aledo and Brackett soils are described above. The surface layer of the Maloterre soil is brown gravelly clay loam with roughly 20 percent limestone and shell fragments. Beneath this thin layer is indurated limestone. This soil association was common outside the fenced WSA area, in the drainage of Live Oak Creek and its tributaries.
- Purves clay, 0 to 3 percent slopes (soil survey map designation 61)—This shallow soil occurs on nearly level to gently sloping ridgetops and plateaus. The surface layer is dark grayish-brown clay. The subsoil is brown clay. Beneath the subsoil is fractured limestone interbedded with calcareous clay. Purves clay soils are mapped to the northwest of the WSA and were encountered in several background boreholes.
- Sanger clay, 3 to 5 percent slopes (soil survey map designation 66)—This deep soil occurs in valley fill areas and on sideslopes of ridges below limestone outcrops. Calcium chloride concentrations are high. Generally, this soil consists of almost 4 feet of calcareous clay, ranging in color from very dark to light grayish-brown. Beneath this grayish-brown clay is yellowish to brownish shaly clay. The lower portion of the soil has common masses of calcium carbonate and limestone fragments. The Sanger clay soil was common on the northern slopes of the EOD Range.
- Sanger-Urban land complex, 1 to 5 percent slopes (soil survey map designation 67)—This complex is 45 to 70 percent Sanger soil, 15 to 35 percent Urban land, and less than 25 percent similar soils. Both the Sanger soil type and the Urban land designation are described above. Sanger-Urban land complex soils were found at Area A-4 and in some boreholes beneath transformers.

Bedrock Geology

The stratigraphy of the area surrounding the Offsite WSA consists of, from youngest to oldest, the Goodland Limestone, the Walnut Formation, the Paluxy Formation, and the Glen Rose Formation (see Figures 1-6 and 1-8).

Cretaceous bedrock is exposed both in and near the WSA. Goodland Limestone crops out west of the Offsite WSA property boundary and is the uppermost unit in the background wells installed by Jacobs Engineering (see Figures 1-4 and 1-8). Erosion and the drop in elevation from the area of the background wells to the WSA has eliminated the Goodland Limestone from the surface at the Offsite WSA. Weathered Walnut Formation crops out over most of the area inside the fenced Offsite WSA (Barnes, 1972). This formation was found to be 25 to 30 feet thick in the two background wells. Outcrops of this formation within the offsite WSA consist of weathered fossiliferous limestone. Underlying the Walnut Formation is the Paluxy Formation. This formation is not

exposed within the fenced Offsite WSA facility, but only in the steeper drainages along Live Oak Creek and its northern tributary, as well as in a quarry south of the Offsite WSA. The more resistant Walnut Formation limestone acts as a cap on the poorly cemented sandstones of the Paluxy, allowing weathering and erosion to produce steeper slopes in the Paluxy Formation. This formation was found to be 170 to 190 feet thick in the Offsite WSA background wells, which were drilled to the Paluxy/Glen Rose Formation contact (Jacobs, 1997b). In the Offsite WSA area, the Paluxy Formation consists of fine- to coarse-grained sandy material with varying degrees of cementation and varying amounts of shale. The Glen Rose Formation does not crop out in the area surrounding the WSA, but is an important hydrologic unit.

Local Hydrogeology

The important hydrogeologic units beneath the Offsite WSA are:

- surficial overburden;
- Walnut Formation aquitard;
- Paluxy Aquifer; and
- Glen Rose Formation aquitard.

Previous investigations have identified shallow groundwater at a depth of 5 feet below ground surface (bgs) (Radian, 1989). This water is contained within the surficial overburden at the site. Results of drilling done during the RFI indicate that this water occurs sporadically across the site and consists of saturated soil in areas where surface waters have migrated downward and are moving along the bedrock/soil interface. It is assumed that this shallow groundwater, like the surface water at the WSA, follows the topography and radiates out from the site to the south, east, and north. This shallow groundwater would then discharge to the numerous ravines around the site perimeter that feed tributaries of Live Oak Creek.

Although the Walnut Formation can contain groundwater in shallow weathered zones, it generally functions as a aquitard. Observations made during the WSA Background Study (Jacobs, 1997b) indicated that water was found in weathered zones of the formation only after heavy rains via surface infiltration. Previous studies of competent Walnut Formation produced a hydraulic conductivity value of 7.0×10^{-10} cm/sec (Jacobs, 1997a). This information indicates that downward flow of groundwater through the Walnut Formation is limited.

The Paluxy Aquifer is the principal source of groundwater in the vicinity of the Offsite WSA. The Paluxy is believed to exist under unconfined or semiconfined conditions, depending on depth of encounter and the local stratigraphic sequence. Most of the water wells in the area are completed in the lower, coarser-grained and more permeable section of the Paluxy Aquifer. Geotechnical results from samples collected in background well WJEPX925 confirm that the lower portions of the Paluxy Formation are more porous and have a higher conductivity (Jacobs, 1997b). A sample collected from 161 to 162 feet bgs in the well showed an effective porosity of 1.6 percent and an average hydraulic conductivity of 9.1×10^{-8} cm/sec. In contrast, samples collected from 195 to 196 and 249 to 250 feet bgs had effective porosities of 28.66 and 28.91 percent and average hydraulic conductivities of 2.29×10^{-3} and 3.47×10^{-3} cm/sec, respectively. It

should also be noted that even the upper portions of the Paluxy Formation have significantly higher hydraulic conductivities than the overlying Walnut Formation.

Most recharge to the Paluxy Aquifer occurs where the formation crops out west and north of the Offsite WSA and in the lake bed of Lake Worth. The amount of recharge via outcrops along Live Oak Creek is unknown.

There are two wells located on the Offsite WSA property, both screened in the Paluxy Aquifer (see Figure 1-4). The main water supply well, XU3212-902, and the back-up well, XU3212-901, were installed using cable tool drilling methods (Johnson, 1997). Both holes were drilled to 300 feet bgs, then allowed to collapse to 186.6 and 184 feet bgs, respectively. Steel casing was placed to the final total depth and perforated to produce the well screen. These wells reportedly delivered nonpotable water to the site for toilet flushing and other noncontact uses. As there was no potable water source at the site, bottled water was provided instead.

Previous studies in the region have determined that groundwater flow direction in the Paluxy Aquifer is to the east (A.T. Kearney, 1989). Measurements made during the WSA background study (Jacobs, 1997b) and during this RFI confirm a strong eastward component of flow in the Paluxy Aquifer. Due to the configuration of the wells at the site, however, the exact direction of groundwater flow could not be determined. Assuming an easterly direction, a hydraulic gradient of 1.85 to 1.96 feet per 100 feet was calculated from measurements made during the RFI.

The Glen Rose Formation lies beneath the Paluxy Formation and is composed of fine-grained limestone, shale, marl, and sandstone beds. This formation does not crop out at the WSA, but was encountered in the Jacobs Engineering background wells (see Figure 1-8). Although sands in the Glen Rose Formation yield small amounts of water to wells in Fort Worth and western Tarrant County, the formation generally serves as an aquitard, separating the groundwater in the Paluxy Aquifer from groundwater in the deeper Twin Mountains Aquifer.

1.2.4.3 Climate

The climate at the Offsite WSA is typified by humid, hot summers and cool, relatively dry winters. The average annual precipitation is 31.5 inches, with the majority of precipitation falling between the months of April and October. The average annual relative humidity is 63 percent. The average annual air temperature is 66 degrees Fahrenheit (°F). July is the warmest month, with an average monthly air temperature of 86°F, and January is the coldest month, with an average monthly air temperature of 45°F. Temperatures can change rapidly in the region, often 20°F to 30°F in a matter of hours (Ressel, 1981).

Prevailing winds are southerly from March to November and northerly from December to February. The average wind speed is 8 knots. Thunderstorms with wind speeds in excess of 65 knots, as well as hail storms, are common in the region. Climate conditions in the summer make tornado formations possible (Ressel, 1981).

1.2.4.4 Demographics

The Offsite WSA is located in Tarrant County in north-central Texas, adjacent to the most western side of the City of Fort Worth city limits. The areas to the south and east of the site are within city limits, while the areas north and west are considered county, Fort Worth extraterritorial jurisdiction (City of Fort Worth, 1991) (see Figure 1-2). The closest established city other than Fort Worth is White Settlement, located approximately 3 miles east of the site.

Current population and demographic information for the area in the vicinity of the site and surrounding areas is based on the 1990 U.S. Census. The site lies within census tract 484391142.02, which in 1990 had an estimated population of 5,402 persons. The majority of the population was 6 to 65 years of age (U.S. Census Bureau, 1990). Figure 1-9 depicts the census tracts that lie in the vicinity of the site and surrounding area. For purposes of the human health assessment, the 1990 population characteristic of the area within a 2-mile radius was reviewed (see Figure 1-9). This entire area lies within portions of three census tracts, representing a total of 11,771 persons.

Trends suggest that the population in the area surrounding the site is expected to increase over the next several years. Census block group data for the area encompassing neighborhoods to the southeast of the site and immediately south of White Settlement Road indicate a 78 percent increase in the number of residents between 1990 (1,314 persons) and 1997 (2,343 persons) (City of Fort Worth, 1997). White Settlement's population increased 14.5 percent between 1980 and 1990 (TNRIS, 1997). The north-central region of Texas, where the site is located, is currently the most populous part of the state, with 24 percent of the state's population. From 1980 to 1990, the population in the region grew 31 percent. By 2050, the population is projected to increase 119 percent (TWDB, 1997).

1.2.4.5 Ecology

The Offsite WSA is located on the border between the Western Cross Timbers and Grand Prairie vegetation zones of north-central Texas (Bailey, 1980). The late seral forest and woodland plant communities that originally dominated these vegetation zones were the Post Oak-Blackjack Oak Series *(Quercus stellata-Quercus marilandica)* and the Pecan-Southern Hackberry Series (*Carva illinoinensis-Celtis laevigata*), respectively. The post Oak-Blackjack Oak Series consists of open deciduous woodlands with components of tallgrass grasslands in the understory. The Pecan-Southern Hackberry Series is a deciduous woodland or forest that occupies floodplain. In drier floodplains along smaller streams such as Live Oak Creek, the Plateau Live Oak-Netleaf Hackberry Series (*Quercus fusiformis-Celtis reticulata*) may also be present (Bailey, 1980).

1.3 SITE INVENTORY

The Offsite WSA contains a number of sites and/or locations of environmental concern that were historically investigated and/or have been investigated within this RFI. These sites and/or locations include:

- the less-than-90-day Waste Accumulation Area (SWMU 59);
- outdoor maintenance and material storage areas;
- an explosive ordnance deposition range;

- former underground storage tank (UST) areas;
- a former waste dump;
- low-level radiation areas within Bunker 8531;
- a former low-level radioactive waste burial site (SWMU 60); and
- miscellaneous buildings and site structural features.

Each of these sites and/or locations are described below. Following these descriptions, previous investigative activities and past removal activities are summarized in Sections 1.3.2 and 1.4, respectively.

1.3.1 Site Descriptions

Less-than-90-day Waste Accumulation Area (SWMU 59)

The less-than-90-day Waste Accumulation Area (SWMU 59) consists of a 4 foot by 5 foot metal enclosure. The 8 foot high enclosure has a metal roof that overhangs openings along the upper side walls. (see Appendix A, Photographs SA-a and SA-b). Entry to the enclosure is provided by a lockable gate-type door. The enclosure is located along the western edge of the concrete pad that surrounds Bldg, 8503 and is elevated approximately 6 inches above the pad on a concrete floor (see Figure 1-4) There is no lip or berm around the edge of the floor.

Environmental media potentially impacted by an SWMU is typically considered a part of the unit. Since the accumulation area is positioned directly along the edge of the concrete pad, soils along the pad and in a drainage ditch directly west of the accumulation area may be considered part of SWMU 59 if contaminated as a result of associated activities (see Figure 1-4).

Based on reported activities at the site, waste types stored in the accumulation area are assumed to included metal-related materials, solvents, and paints (Long, 1996). The accumulation area enclosure is currently locked and empty, and is no longer used. Investigations associated with the SWMU are discussed below in Section 1.3.2.

Outdoor Maintenance and Material Storage Areas

Addition maintenance and material storage activities reportedly occurred outdoors. Maintenance activities, including the painting and sanding of ordnance casings and practice bombs, took place around the perimeter of Bldg. 8503; north of Bldgs. 8554, 8556, 8558, 8560 and 8852; and between Bldgs. 8503 and 8531 (see Figure 1-4) (Long, 1996). There have been no past investigations of these areas.

Explosive Ordnance Deposition Range

Ordnance and spent engine cartridge disposal was conducted at the EOD Range. The EOD Range was constructed in 1971. It consists of 3 acres of land located directly west of the fenced Offsite WSA main complex (see Figure 1-4). As discussed below, the EOD Range is no longer used and was cleared of explosives in February 1993.

Former Underground Storage Tanks Areas

Five USTs were also installed and later removed at the Offsite WSA. These reportedly contained fuel oil and diesel and were used for power generation, heating, and vehicle fueling (A.T. Kearney, 1989). Tank sizes and reported contents are listed in Table 1-2. The table also lists those buildings associated with each UST. The building locations are shown on Figure 1-4. Diagrams for the USTs are provided in Appendix B. Investigative reports or documentation of the UST removal activities are not currently available and are therefore not discussed below.

Former Waste Dump

The former waste dump was located in an arroyo formed by a 10-foot-high limestone ledge across an intermittently flowing tributary to Live Oak Creek. The former waste dump was within the Air Force property boundary, approximately 250 feet north of the fenced Offsite WSA (see Figure 1-4). The debris found in the dump site included nonhazardous material such as wooden pallets, used bomb crates, scrap metal, newspapers, loose sand, and other materials (M&E, 1993). This former dump site has been investigated and remediated as described below.

Low-level Radiation Area Within Bunker 8531

A general radiation survey of all buildings was conducted in 1995 (USAF, 1996a). During the survey, three small, localized areas of low-level radioactive contamination were detected in Offsite WSA Bunker 8531. The areas covered approximately 8 square feet. There is no historical information associated with the source of the low-level radiation detected. Descriptions of the radiation surveys are provided below.

Former Low-level Radioactive Waste Burial Site (SWMU 60)

The LLRWBS was located 400 feet west of Bldg. 8503 within the Offsite WSA fenced area (see Figure 1-4). The LLRWBS, which was used between 1957 and 1969, was identified as SWMU 60 by the TNRCC. The burial site consisted of three dry wells constructed from 12-inch-diameter cast iron pipes encased in 2.25 inches of grout. These pipes are vertically embedded 18 feet into the ground. The pipes were permanently capped in 1969. As discussed below, these pipes were removed along with surrounding soil in November 1996.

Miscellaneous Building and Site Structural Features

In addition to those specific sites and locations described above, various building and site structural features have associated environmental concerns. These include:

- electrical transformers that historically may have contained insulating fluids with polychlorinated biphenyls (PCBs);
- building materials potentially containing asbestos;
- building surfaces potentially covered with lead-based paint; and
- building surfaces potentially covered with contaminated residue.

Past investigative activities have included surveys of electrical transformers and potential asbestos-containing materials (ACM). These activities are described below. Previous investigative activities have not included assessments of building surfaces.

1.3.2 Previous Investigative Activities and Documentation

A number of environmental investigations and studies have been conducted to identify sources of possible contamination and to assess the extent and magnitude of contamination and its potential impacts on human health and the environment. A chronological summary of investigative activities performed at the Offsite WSA is presented in Table 1-3. These studies are discussed in more detail below.

1.3.2.1 RI/FS for Carswell AFB

An RI/FS Stage II investigation was conducted at NAS Fort Worth, including the Offsite WSA (Radian, 1989). The RI/FS noted reports of the disposal of small quantities of waste cleaners and solvents west of Bldg. 8503 in the shallow ditch adjacent to the less-than-90-day Waste Accumulation Area (see Figure 1-4). The report estimated the disposal rate to be 5 to 10 gallons per year. Eight hand-augered holes were drilled in the ditch. Holes were augered to bedrock refusal at depths ranging from 1 foot to 4 feet bgs. Groundwater was not encountered in the hand-augered borings. A total of 12 soil samples were collected from the hand-augered borings and were submitted for laboratory analysis of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs).

Low levels of trichloroethylene (TCE) (nondetectable (ND) to 0.0619 milligrams per kilogram [mg/kg]) were reported in soil samples collected from the ditch west of Bldg. 8503. Toluene was detected in several soil samples at concentrations ranging from 0.0028 mg/kg to 0.049 mg/kg.

A baseline risk screening was also performed to determine potential carcinogenic risks associated with the Carswell AFB IRP sites. The Offsite WSA was reported to present a low risk to human health. In a ranking of 1 to 7, with 1 indicating the greatest need for remedial action, the Offsite WSA was ranked 4. Category 4 is defined to include areas where storage, release, disposal, and/or migration of hazardous substances or petroleum products has occurred, and all remedial actions necessary to protect human health and the environment have been taken.

According to Air Force IRP requirements, each site is further categorized based on overall status within the program. Category 1 defines sites where no further action is required, Category 2 defines sites where additional effort is needed to determine health risks of contaminants and remedial alternatives, and Category 3 defines sites where a feasibility study process has been completed. The Offsite WSA was placed as a Category 2. It was recommended that additional work be performed, including detailed evaluation and selection of remedial alternatives to address TCE contamination in soil.

1.3.2.2 RCRA Facility Assessment PR/VSI

In 1989, A.T. Kearney conducted a Preliminary Review (PR) and Visual Site Inspection (VSI) for the Carswell AFB to evaluate SWMUs and other areas of concern for releases to

soil and groundwater (A.T. Kearney, 1989). The RCRA Facility Assessment (RFA) made a broad assessment of release pathways at all SWMUs located at Carswell.

The assessment identified the Offsite WSA Waste Accumulation Area (SWMU 59), located directly west of the southern end of Bldg. 8503 along the edge of the concrete pad as described above (see Figure 1-4). The RFA also stated that paint thinners and TCE had been discharged into a ditch west of Bldg. 8503. Based on the results of the previous RI/FS investigation (Radian 1989), the past and ongoing potential for release of TCE to soil and groundwater was considered high. The RFA recommended initiating an RFI for this unit due to the presence of TCE in the soil. It should be noted that the RFA incorrectly identified the ditch area as SWMU 65, separate from the Waste Accumulation Area. The ditch is associated with the accumulation area activities and therefore should be considered a part of SWMU 59.

The RFA also recognized the former LLRWBS (SWMU 60), as described above. The RFA indicated that the wells may have contained plutonium-contaminated swipe samples, rubber gloves, paper bags, and uranium oxide. **However, during the interim removal action in 1996, only luminous dials were identified (see Section 1.4.2).** No documented history of radioactive releases for this site was cited. Past groundwater sampling data indicated, however, that the nonpotable water supply well contained total radium (8.5 picocuries per liter [pCi/L]) in excess of Federal drinking water standards (5 pCi/L). The RFA was not able to determine if the detected radium was representative of background conditions or in some way associated with the burial site.

1.3.2.3 Basewide Environmental Baseline Survey for Carswell AFB

An Environmental Baseline Survey (EBS) of Carswell AFB was conducted by the Air Force in 1993 (USAF, 1993a). The EBS reviewed facility environmental features such as the potential for contamination, storage tanks, oil/water separators, pesticides, biohazardous wastes, ordnance, asbestos-containing building material (ACBM), lead-based paint, and PCB-containing materials.

Based on these characteristics, the EBS placed the areas of the Offsite WSA property into one of seven categories. **Only Categories 2, 3, 6, and 7 were used for this site.**

- **Category 2: areas where only storage of hazardous substances or petroleum products has occurred, but no release, disposal, or migration from adjacent areas has occurred.**
- **Category 3: areas where storage, release, disposal, and/or migration of hazardous substances or petroleum products has occurred, but at concentrations that do not require removal or remedial action.**
- **Category 6: areas where storage, release, disposal, and/or migration of hazardous substances or petroleum products has occurred, but required response actions have not yet been implemented.**
- **Category 7: areas that are unevaluated or that require additional evaluation.**

The following list summarizes how the property was categorized:

- **Category 2: The majority of the Offsite WSA.**
- **Category 3: Part of the southwest portion of the fenced area that includes Bldgs. 8504, 8505, 8506, and 8507 (based on the presence of USTs and ACMs and the potential for lead-based paint).**
- **Category 6:**
  - **Bldgs. 8500 and 8502 (based on the presence of USTs and ACMs and the potential for lead-based paint).**
  - **Bldg. 8503 (based on the presence of hazardous materials and wastes, the presence of USTs and ACBMs, and the potential for lead-based paint).**
  - **The Waste Accumulation Area (SWMU 59, Bldg. 8512) (based on the presence of hazardous wastes).**
- **Category 7: The EOD Range.**

The asbestos survey identified ACMs in six buildings at the Offsite WSA (Bldgs. 8500, 8502, 8503, 8505, 8506, and 8514). ACMs identified during the survey included sheet rock, pipe fittings, floor tiles, asphalt and gravel, piping, pipe insulation, and roof materials. Sampling was limited during the survey, so the results are not considered comprehensive.

The EBS reported that all transformers with 50 parts per million (ppm) or more PCBs were replaced or retrofitted at an unknown date with PCB-free materials. All transformers at the Offsite WSA are currently labeled as being PCB-free.

1.3.2.4 Explosive Ordnance Disposal Range Investigations

An initial survey of the 3-acre range was conducted by Air Force personnel from Ogden Aerial Logistics Center, Hill AFB, Utah, to determine if unexploded ordnance was present and to estimate the project-associated remediation costs (USAF, 1993b). Air Force personnel swept the area within a radius of 900 feet from the demolition point with an ordnance locator. Small arms, actuators, and starter cartridges were observed in two EOD burial pits. The survey team was unable to determine the size of the pits. Additional survey of the area was recommended.

1.3.2.5 Soil and Debris Characterization

Metcalf & Eddy (M&E) was retained to remove debris located in a waste dump associated with the Offsite WSA (M&E, 1993). The investigation of the site took place in two phases:

- an initial characterization of the debris (July 20, 1993); and
- debris removal and confirmatory sampling (September 30, 1993).

In the initial characterization performed by M&E, three soil samples and four associated quality control (QC) samples were taken. To quantify potential contaminants associated with the dump debris, soil samples were taken upgradient of the dump, downgradient of the dump, and within the dump. The samples were analyzed for VOCs, SVOCs, benzene, toluene, ethylbenzene, xylene (BTEX), total petroleum hydrocarbons (TPH),

radionuclides (including gross alpha and gross beta particles), and metals. The report indicated that most of the analytical results were below the method detection limits and were below regulatory levels. Based upon these results, the debris was characterized as nonhazardous waste. Details of the debris removal effort are presented below in Section 1.4.

1.3.2.6 Offsite WSA Radiological Site Assessment

Weapons Storage Area Site Assessment (USAF, 1995)

As part of an area wide survey of the Offsite WSA, the Armstrong Laboratory's Health Physics Branch (AL/OEBZ) identified three localized areas of low-level radioactive contamination in Bunker 8531. The areas cover approximately 8 square feet. Three swipe samples were taken from the contaminated areas. Swipe sample results indicated a small amount of localized contamination (see Table 1-4). The report indicated that the levels were potentially above the Uranium-235/Uranium-238 and Plutonium-239 public use release limits as published by the *United States Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86*. The AL/OEBZ recommended that additional swipe samples be collected to determine which alpha-emitting isotope is present and to identify applicable release limit criteria.

Consultative Letter: Radiological Evaluation of Suspected Hot Spots in Bunker 8531 (USAF, 1996a)

As a follow-up to the initial AL/OEBZ survey of Bunker 8531, an additional survey and sampling was conducted at the area of concern. The additional sampling activities performed were:

- removable alpha and beta radiation characterized by swipe sampling from five hot spots;
- fixed alpha and beta radiation assessed using a radiation detector;
- fixed gamma-ray exposure rate measured from the surface of the hot spots; and
- background alpha, beta, and gamma radiation levels measured inside and outside the bunker.

Results of the hot spot sampling are summarized in Table 1-5. The radiological evaluation concluded that the entire elevated area is below release criteria in accordance with *USNRC Regulatory Guide 1.86* and should be considered releasable for public use.

Consultative Letter: Final Status Decommissioning Survey of WSA (USAF, 1996a)

The final letter documented the decommissioning survey efforts. In addition to those efforts and results described above, the final letter summarized the results of the overall effort. This effort included fixed alpha/beta/gamma contamination surveys of all bunker using mobile floor monitors. Swipe samples were taken from predetermined floor and wall locations. Walls were checked for alpha/beta/gamma fixed contamination using hand-held monitors at the same locations where swipe samples were taken.

Levels of alpha, beta, and gamma radiation were below the respective reporting limits of 2 pCi/swipe, 2 pCi/swipe, and 50 pCi/swipe in all samples. These levels are less than

the USNRC standards for removable alpha/beta/gamma contamination. X-ray measurements did not significantly differ from ambient background levels. Based on these results as well as those described above, the final status report stated that the Offsite WSA meets the release criteria in accordance with *USNRC Regulatory Guide 1.86* and was therefore considered releasable for public use.

1.3.2.7 Background Study

A background study was completed at the Offsite WSA in 1997 (Jacobs, 1997b). The goal of the study was to establish background concentrations of radium and TPH in surface soils, subsurface soils, and groundwater, and to determine if concentrations previously detected on site were representative of these background concentrations.

A total of 21 surface soil, 21 subsurface soil, and 15 groundwater samples were collected to characterize these media for background concentrations. Two upgradient monitoring wells were installed in the Paluxy Aquifer during this study. In addition, two groundwater samples were collected from each of the on-site water supply wells.

Upper tolerance limits (UTLs) of background concentrations were determined for each parameter. The maximum detected value for TPH, radium-226, radium-228, and total radium from the two samples collected from the on-site water supply wells were compared to the background UTLs. The results of this effort concluded that the on-site values were consistent with background concentrations and do not indicate site-related contamination.

1.4 REMEDIAL ACTIONS

A number of remedial actions have been completed at the Offsite WSA. These include:

- soil and debris removal at the waste dump;
- removal of the dry well and other soil associated with the LLRWBS;
- clearance of the EOD Range; and
- removal of USTs.

1.4.1 Waste Dump Soil and Debris Removal

Following the waste dump soil and debris characterization described above, a removal action was initiated. Characterization of the debris indicated that it was a nonhazardous waste material. The debris was removed from the site and was transported to a local, nonhazardous landfill. Confirmation samples were taken from the removal area. These samples indicated that all parameters were below method detection limits or below regulatory levels with the exception of a trace concentration of TCE. The parameters tested included VOCs, SVOCs, BTEX, TPHs, gross alpha, gross beta, and metals. Based on the analytical results, the waste dump was considered remediated (M&E, 1993).

1.4.2 Low-level Radioactive Waste Burial Site (SWMU 60) Interim Remedial Action

The LLRWBS, which consisted of three burial tubes and soil adjacent to the tubes, was excavated in May 1996 (M&E, 1996). There was no reported evidence of any release of hazardous materials to the environment. Four soil borings were advanced at SWMU 60

to evaluate background concentrations of selected radionuclides. Each boring was advanced to a depth of 18 feet. Soil samples were continuously collected and field-screened for gamma radiation. Four samples were selected from each borehole and were submitted for laboratory analysis of selected radionuclides. The samples were collected from intervals of 0 to1 feet, 5 to 6 feet, 11 to 12 feet, and 17 to 18 feet bgs (M&E, 1996). **Additional alpha and beta screening was performed as part of the health and safety screening**.

According to the lab results performed on the soil samples, radium-226 was detected between 0.47 pCi/g and 1.27 pCi/g. The UTL of radium-226 was determined from background sampling to be 0.89 pCi/g. The clean-up criteria was defined to be three times the UTL (2.67 pCi/g). Therefore, the excavated soil was returned to the excavation as backfill (M&E, 1996).

1.4.3 Clearance of the EOD Range

The EOD Range clearance was conducted between 16 August 1995 and 15 September 1995. The EOD Range was swept using metal detectors to an approximate depth of 10 feet bgs during the clearance. All metallic items were excavated and removed. Based on the survey, the EOD Range was determined to be cleared of all detected explosive ordnance. The clearance report indicated that no restrictions **due to physical hazards (e.g., undetonated ordnance) should be placed on future use of the land**. The report indicated, however, that EOD personnel should be contacted if the land is to be used for a purpose other than livestock grazing or for other activities which would result in disturbing the ground below a depth of 1 foot. (USAF, 1996b).

1.4.4 Underground Storage Tank Removal

Five USTs were located on the Offsite WSA. The tanks reportedly contained diesel and fuel oil as summarized in Table 1-2. Facility diagrams of the tanks are provided in Appendix B. Although the tanks have been removed, there is no documentation of the effort (Long, 1996). The RFI field investigation efforts described in Section 3.0 of this report verify the reported removal effort.

Table 1-1. Offsite WSA Facilities

Facility No.	Use	Year Constructed	Square Footage
8500	Safety, Control & Identification	1956	932
8501	Water Tank Storage	1956	1219*
8502	Water Supply Facility	1956	78
8503	Surveillance Inspection Shipping	1956	6,959
8504	Water Supply Facility	1956	78
8505	Electric Power Station	1956	1,488
8506	Small Arms Ammunition Storage	1956	5,000
8507	Spares Storage	1956	2,500
8508	Pyrotechnic Storage	1956	351
8509	Segmented Magazine Storage	1956	540
8510	Low-level Radioactive Waste Burial Site (removed and remediated)	1989	385*
8511	Detonator Storage	1956	126
8512	Waste Accumulation Area (SWMU 59)	1991	86
8514	Conventional Munitions Shop	1956	2,600
8515	Vehicle Fuel Station (removed)	1956	4
8520	Explosive Ordnance Disposal Range (cleared)	1971	NA
8531	Munitions Storage Igloo	1956	1,576
8533	Munitions Storage Igloo	1956	1,266

Table 1-1. Offsite WSA Facilities (continued)

Facility No.	Use	Year Constructed	Square Footage
8535	Munitions Storage Igloo	1956	2,147
8537	Munitions Storage Igloo	1956	2,147
8539	Munitions Storage Igloo	1956	2,147
8541	Munitions Storage Igloo	1956	2,147
8552	Munitions Storage Igloo	1956	1,060
8554	Munitions Storage Igloo	1956	2,146
8556	Munitions Storage Igloo	1956	2,146
8558	Munitions Storage Igloo	1956	2,146
8560	Munitions Storage Igloo	1956	2,146

* Approximate square footage extrapolated from Jacobs Engineering Site Survey Drawing, 1996.

Table 1-2. Summary Of Former Underground Storage Tanks

Building Number	Tank Contents	Tank Size	Tank Dimensions	Function
8514	Diesel	1,000 gallons	10 feet by 6 feet	Vehicle Fueling
8507	Fuel Oil	1,000 gallons	10.6 feet by 4 feet	Heating
8505	Diesel	5,000 gallons	18 feet by 8 feet	Power
8500	Fuel Oil	750 gallons	8 feet by 4 feet	Heating
8503	Fuel Oil	2,000 gallons	12 feet by 6 feet	Heating

Table 1-3. Chronological Summary Of Environmental Reports (continued)

Date	Report Title	Scope	Contaminants Reported	Actions/Recommendations
1989	RI/FS Stage II Technical Report (Radian 1989)	Evaluated previously identified contamination, performed risk screening, and provide recommendations for 13 sites at Carswell AFB including one at Offsite WSA.	TCE and other indicator contaminants found in boreholes drilled in ditch west of Bldg. 8503/Waste Accumulation Area.	Indicated site posed low risk and recommended determination of TCE extent.
1989	RCRA Facility Assessment PR/VSI Report (A.T. Kearney 1989)	Evaluated SWMUs at Carswell AFB (including those at Offsite WSA) and provided preliminary determination of releases.	SWMU 59 - No reference of previous contamination reported. SWMU 60 - No contamination cited, except previously reported radium (8.5 pCi/L) in supply well.	SWMU 59 - RFI recommended. SWMU 60 - No further action recommended.
March 1993	EOD Range Survey (USAF 1993b)	Surveyed and swept EOD Range for ordnance and ordnance residue.	Ordnance found at range, small arms and actuators in one pit. Text referenced existence of radioactive burial pit and TCE previously found in soil near Bldg. 8503.	Ordnance clearing recommended.
June 1996	Report of Soil Debris Removal Activity at the Offsite Weapons Storage Area (M&E 1996)	Sampled soil around waste dump to determine potential contaminants and remove debris from waste dump.	No hazardous constituents found in the soil above background levels.	Debris in waste dump treated and transported as non-hazardous waste. Dump clean and closed.

Table 1-3. Chronological Summary Of Environmental Reports (continued)

Date	Report Title	Scope	Contaminants Reported	Actions/Recommendations
1993	Basewide Environmental Baseline Survey Carswell Air Force Base (USAF 1993a)	Conducted EBS to document physical condition of WSA. Included asbestos and PCB inventories.	Documented presence of LLRWBS at WSA and TCE previously found in soil near Bldg. 8503.	Most of WSA classified as Category 2, EOD Range as a Category 7, and LLRWBS and Bldg. 8503 as Category 6.
February 1995	Weapons Storage Area Site Assessment (USAF 1995)	Collected three swipe samples from Bunker 8531 for radiological characterization	Radionuclides were detected in the bunker.	Additional swipe samples needed to determine type of alpha-emitting isotope present
January 1996	Radiological Evaluation of Suspected Hot Spots in Bunker 8531 (USAF 1996b)	Collected five additional swipe samples Bunker 8531 to determine quantity of alpha/beta/gamma levels.	Alpha/beta/gamma radiation quantified as well as uranium and plutonium isotopes.	All levels below USNRC release for public use.
April 1996	Final Status Decommissioning Survey of WSA (USAF 1996c)	Measured background radiation levels in all munitions bunkers on the Offsite WSA.	Alpha/beta/gamma radiation measured in low levels in all bunkers.	All levels below USNRC release for public use.
April 1996	Certificate of Clearance (USAF 1996b)	Conducted clearance of EOD Range.	Ordnance and associated debris found throughout range.	Swept and cleared area of all metallic items.
June 1996	Interim Remedial Action Low-level Radioactive Waste Burial Site Report (M&E 1996)	Closed SWMU 60	Radium reported in soil samples at concentrations below clean-up criteria.	Removed three tubes and sampled soil from within the excavation and from four soil borings.

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Table 1-3. Chronological Summary Of Environmental Reports (continued)

Date	Report Title	Scope	Contaminants Reported	Actions/Recommendations
July 1997	Draft RCRA Facility Investigation for Parcel D and Background Study Report (Jacobs, 1997c)	Determined background concentrations of TPH and radium in soils and groundwater.	TPH and radium concentrations on site determined to be equivalent to those found in background samples.	No further action required.
Date Unknown	Unknown	Removed five USTs at the WSA	Tanks reported to contain fuel and diesel oil. There is no documentation as to possible contamination associated with tanks.	USTs were reportedly removed from the WSA; however, there is no documentation of removal action.

Table 1-4. Radiological Swipe Sample Results For Bldg. 8531

Sample Number	Gross Alpha	Uncertainty
WW945346	13 pCi/swipe	+/-1.1 pCi/swipe
WW945347	26 pCi/swipe	+/-1.6 pCi/swipe
WW945348	25 pCi/swipe	+/-1.6 pCi/swipe

Table 1-5. Hot Spot Swipe Sample Results of Bldg. 8531

		Radiation Levels (pCi/swipe)						
Area	No. of Samples	Alpha	Beta	Gamma	Pu-239	U-234	U-235	U-238
Bldg. 8531	1	48.5	30.3	NA	1	191.5	5	0.4
Bldg. 8531	1	8.9	9.7	NA	2.16	27.4	0.86	0.3
Bldg. 8531	1	8.1	8.9	NA	1.58	33.24	0.88	0.42
Bldg. 8531	1	28.2	15.6	NA	1.98	41.08	1.18	0.52
Bldg. 8531	1	13.7	29.8	NA	1.12	36.04	0.56	0.74

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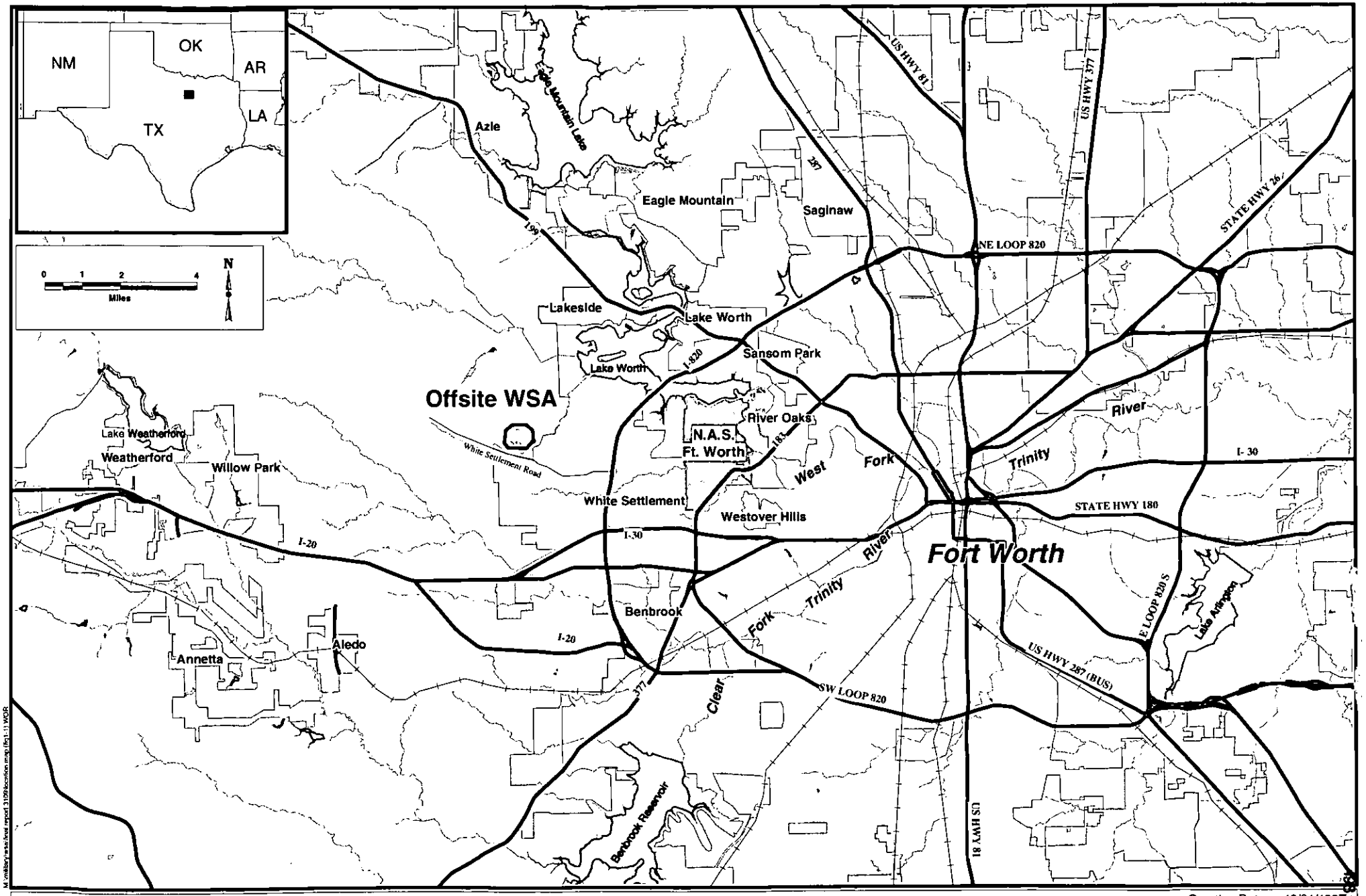

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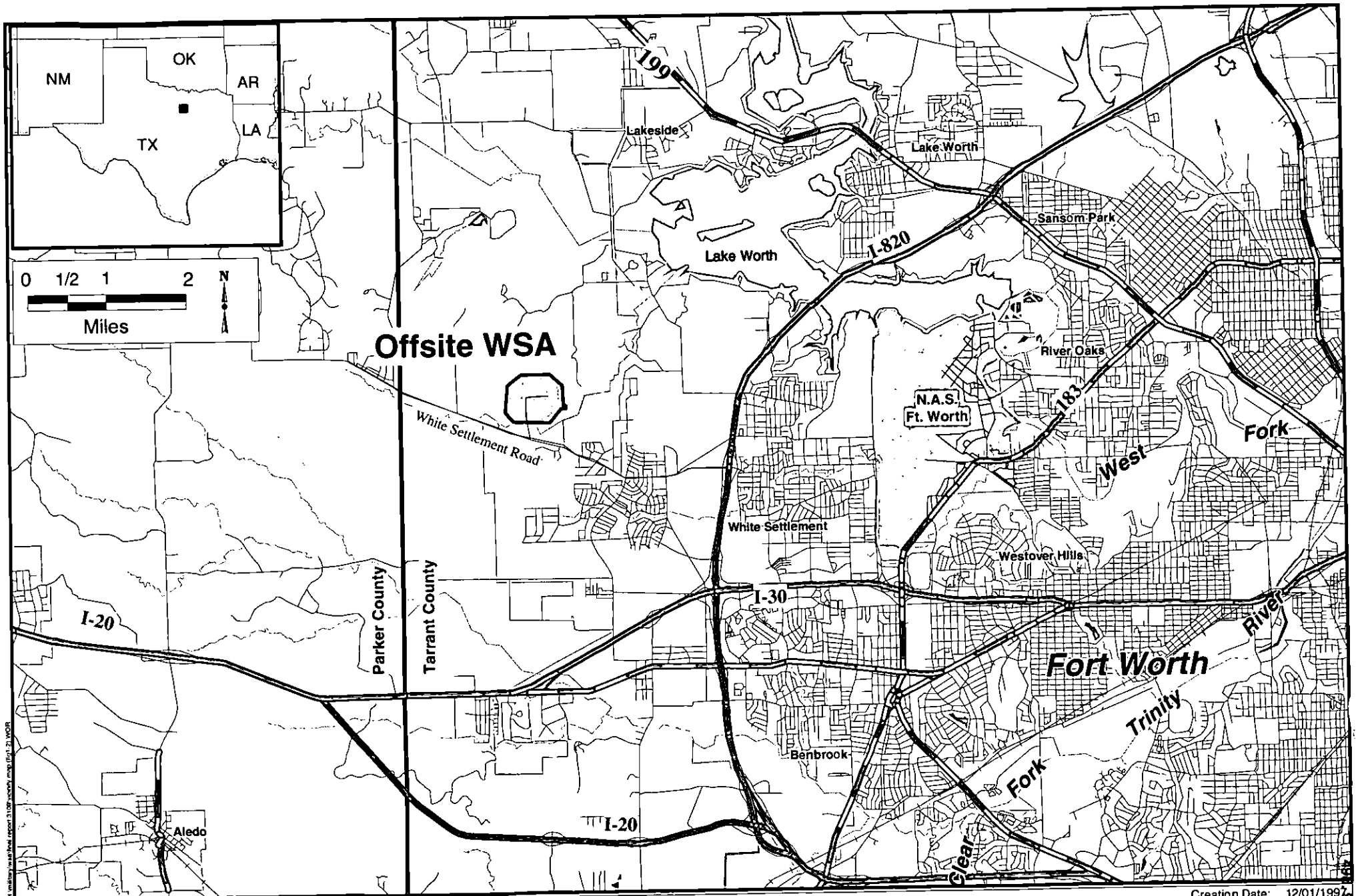
Figure 1-1 -- Location Map

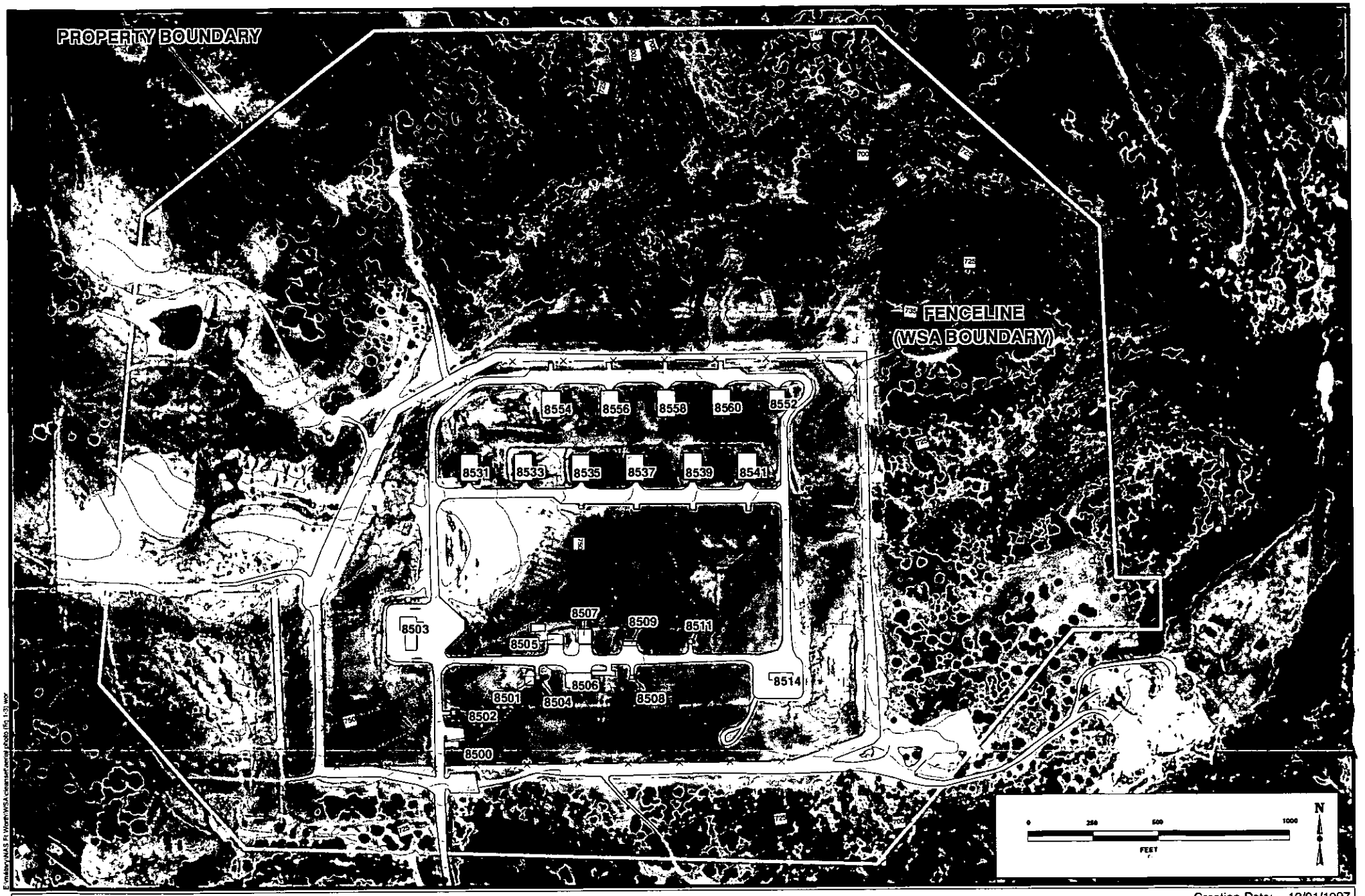
Creation Date: 12/01/1997
Rev. Date: 05/17/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109



The Environmental Company, Inc.

Figure 1-2 -- Vicinity Map

Creation Date: 12/01/1997
Rev. Date: 05/17/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109



The Environmental Company, Inc.

Figure 1-3 -- Aerial Photo Overlay

Creation Date:	12/01/1997
Rev. Date:	07/15/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109

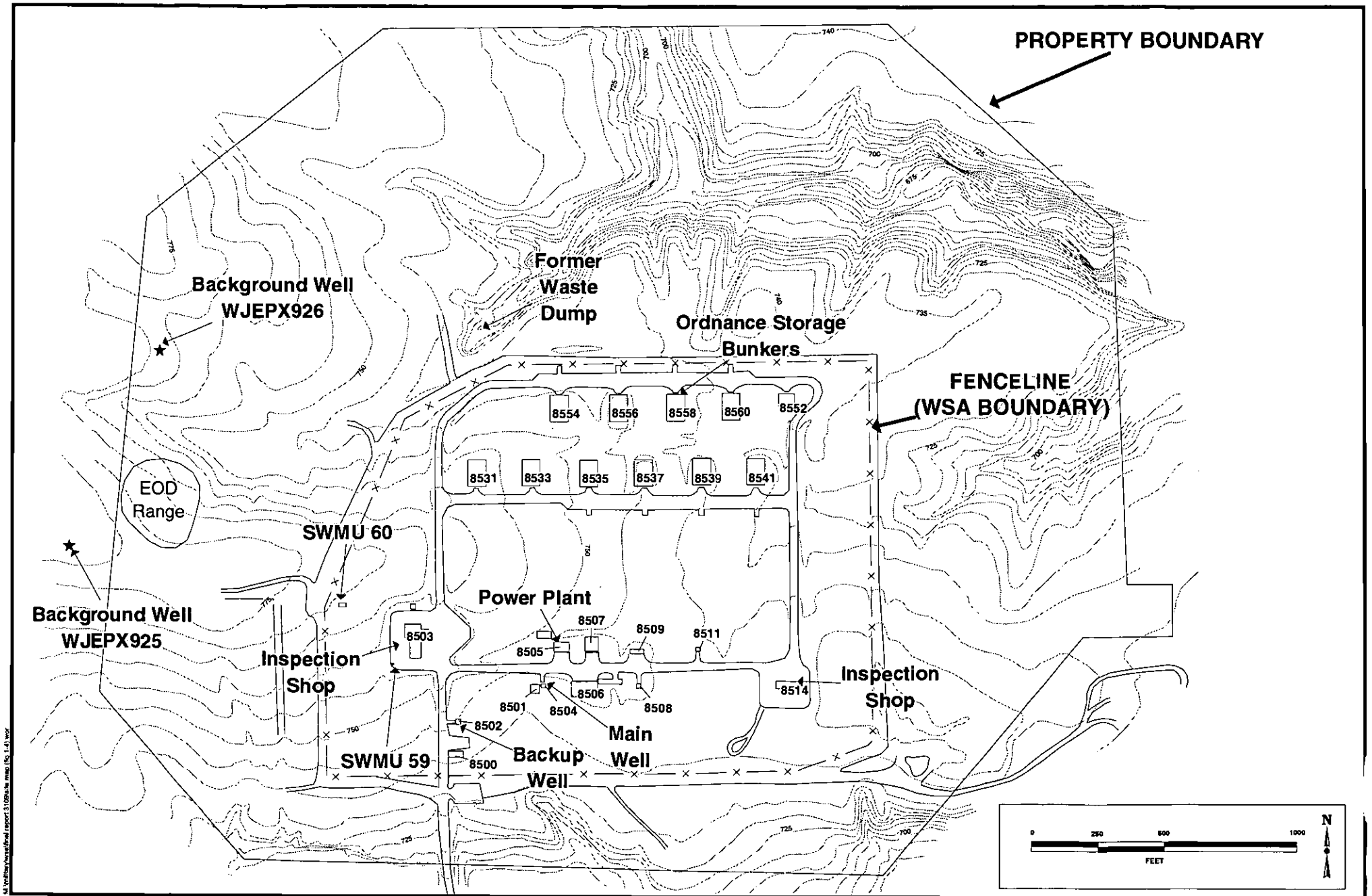


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Figure 1-4 -- Site Map

Creation Date: 12/01/1997
Rev. Date: 05/17/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

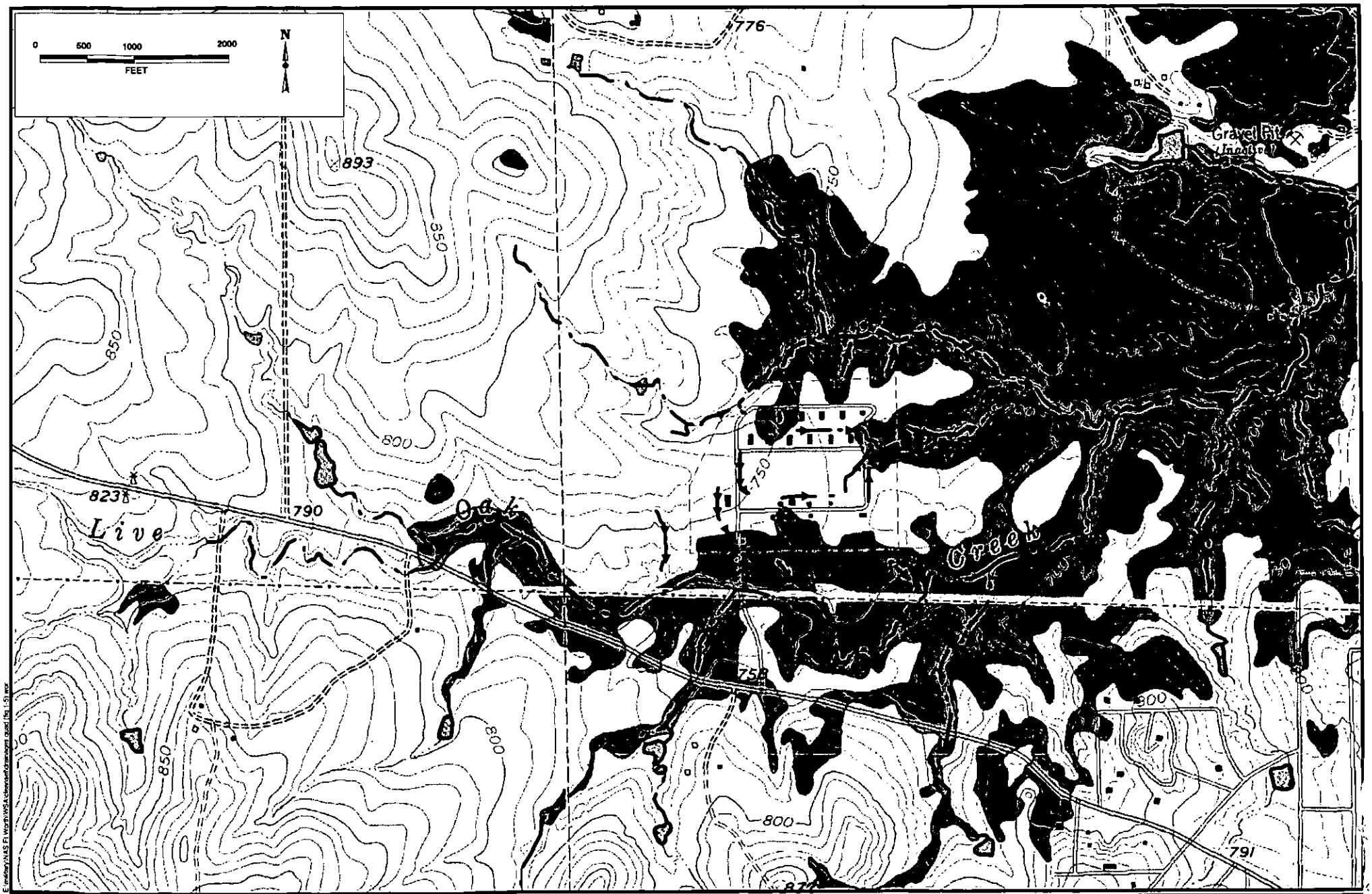

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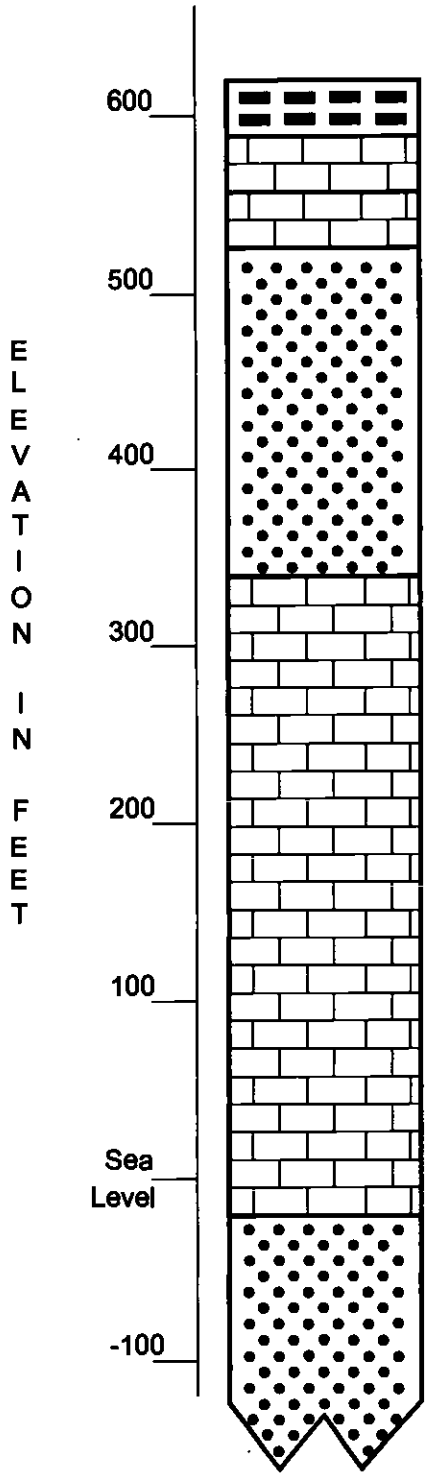
Figure 1-5 -- Drainages Near the Offsite Weapons Storage Area

Creation Date: 11/01/1997
Rev. Date: 07/15/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109



Unit Name	Description	Hydrogeology
Quaternary Materials	Fill, Alluvial deposits	Aquifer
Goodland Limestone	Fossiliferous limestone	Aquitard
Walnut Formation	Shell-agglomerate limestone	Aquitard
Paluxy Formation	Poorly cemented sandstone with interbeds of shale and claystone	Major aquifer
Glen Rose Formation	Fine-grained limestone with shale, marl, and sandstone	Aquitard
Twin Mountains Formation	Sandstone with interbedded shales	Major aquifer

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Figure 1-6 – Generalized Regional Stratigraphic Column

Date: March 1999
Project Manager: B. Duffner
Prepared By: LLM/DAL
Project No: 3109

498 100

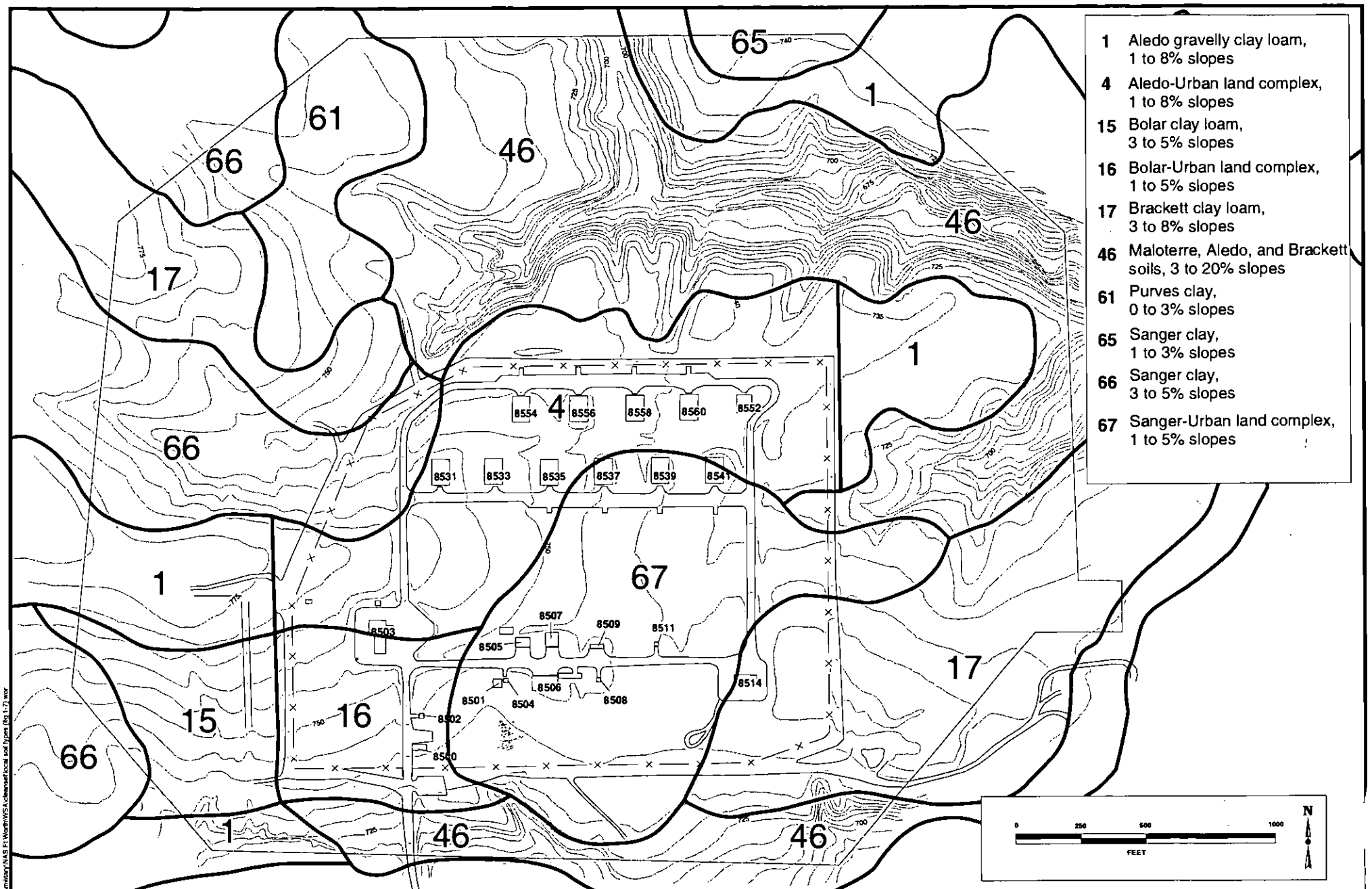

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Figure 1-7 -- Local Soil Types

Creation Date: 12/01/1997
Rev. Date: 07/15/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

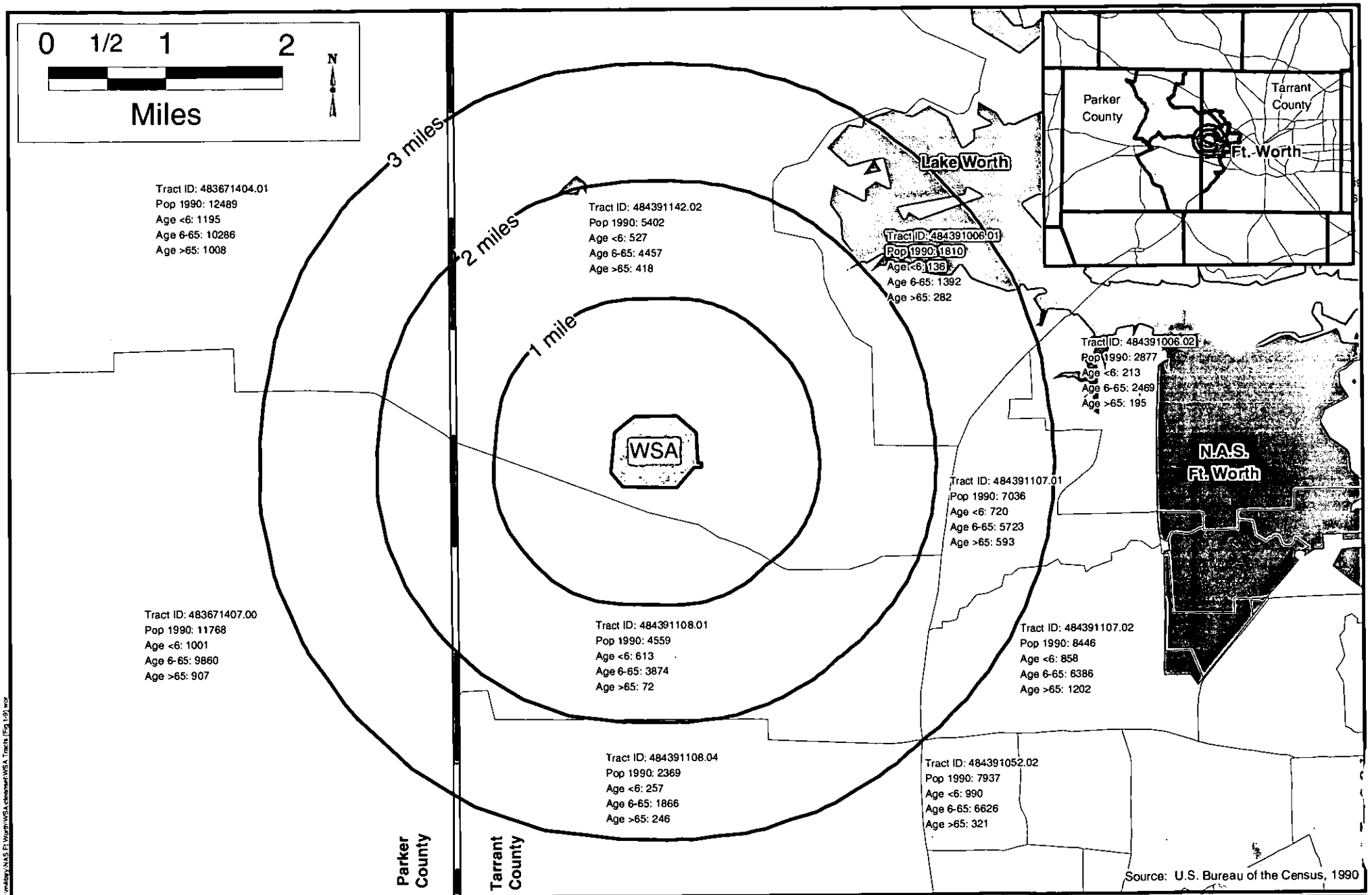

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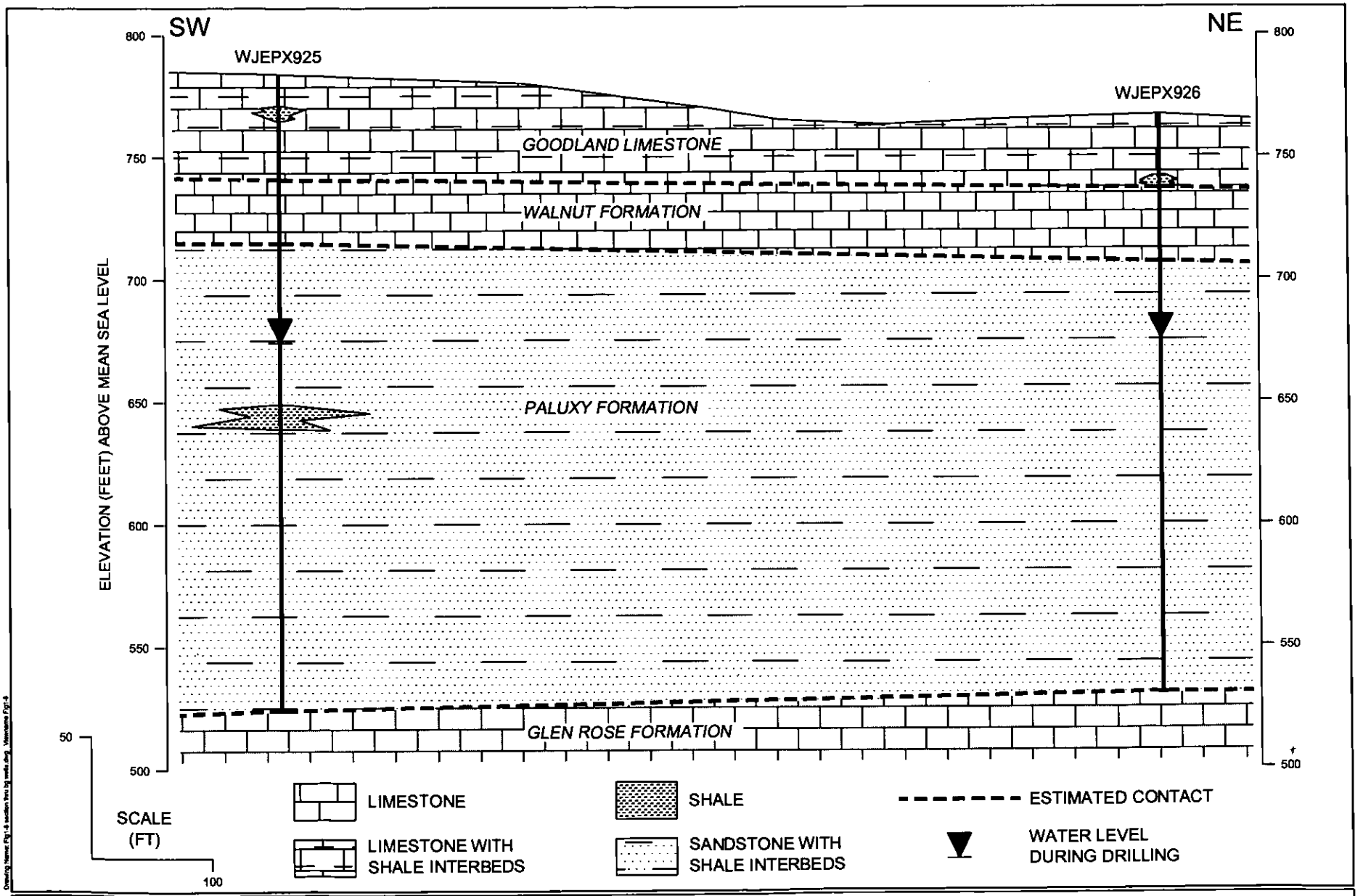
Figure 1-9 -- Census Demographics

Creation Date: 12/01/1997
Rev Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109



The Environmental Company, Inc.

Figure 1-8 -- Geologic Cross - Section Through Background Monitoring Wells

Date: March 1999
Project Manager: B. Duffner
Prepared By: L. Myers / A. Long
Project No: 3109

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TAB

2

2.0 PROJECT ACTIVITIES

This section provides a synopsis of the objectives, activities, and methods used in the investigation and surveying efforts conducted at the Offsite WSA RFI. The overall goal for the project is described, as are investigation specific objectives for each of the potential source areas examined in the field. Also provided is an overall summary of the project field activities, laboratory analytical program, and data evaluation activities and methods. Results of the investigations and surveys are described in Section 3.0.

2.1 PROJECT OBJECTIVES

The overall goal of this project is to characterize environmental conditions at the Offsite WSA in support of SWMU 59 closure and the disposal/reuse of the Offsite WSA property. Specific objectives needed to achieve this goal include:

- determination of the nature and extent of any potential equipment, structures and soil contamination associated with the Offsite WSA Waste Accumulation Area located adjacent to Bldg. 8503 (SWMU 59);
- assessment of the nature and extent of potential surface soil, subsurface soil, sediment, **surface water**, and groundwater contamination resulting from other activities and/or sources at the Offsite WSA;
- characterization of potential surface and subsurface soil contamination related to potential leaks from previously removed USTs and past UST fueling operations;
- identification and characterization of potential contaminants and/or hazardous constituents associated with buildings and structures;
- characterization of potential threats to human health and ecological receptors posed by any contamination identified; and
- development of data supporting the identification of corrective measures needed to control, minimize, or eliminate any contamination and/or hazardous constituents identified during the project.

The following section describes the field activity tasks completed in order to achieve these objectives. In doing so, the project objectives are restated in terms of area specific investigation needs.

2.2 FIELD ACTIVITIES

The RFI field tasks were completed in several consecutive stages. The preparatory stage included an initial land survey and utilities location. Environmental media field investigations began after mobilization of field equipment and personnel, and the establishment of a temporary on-site field office. Surveys of all buildings and structures (facilities) were conducted concurrently with the environmental media sampling. The environmental investigations, including those addressing surface and subsurface soils, drainageway **and seep** sediments, surface water, and groundwater sampling, are discussed in Sections 2.2.1, 2.2.2, 2.2.3, and 2.2.4 respectively. The facility surveys are discussed in Section 2.2.5.

To support the final RFI objectives, a supplemental field characterization was performed in fourth quarter of 1998 and in January 1999, following the main field investigation. The effort consisted of the following:

- **verifying reported results by resampling at previous locations and depths;**
- **further determining the extent of contamination as needed; and**
- **determining association of polycyclic aromatic hydrocarbons (PAHs) with roadway run-off.**

These tasks are described for each area in Sections 2.2.1 and 2.2.2. The scope of work for the final focused field characterization effort is documented in the *Final Characterization and Removal Action Work Plan* (TEC, 1998a).

Other field tasks were completed in support of the overall RFI. These tasks are discussed in Section 2.2.6 below. The chronology of the field activities is summarized in Section 2.2.7. A field data quality assessment was also performed, the results of which are given below in Section 2.2.8.

2.2.1 Surface and Subsurface Soil Investigations

The surface and subsurface soil sampling efforts focused on characterizing the areas of concern as identified in Section 1.3 of this report and background conditions. Areas associated with potential soil contamination are identified in Figure 2-1 and include:

- outdoor materiel storage and maintenance areas (A-1, A-2);
- unpaved perimeter of the Waste Accumulation Area and Bldg. 8503 (A-3);
- disturbed surface area southwest of the Control Fence (A-5);
- EOD Range;
- bunker floor drain outlets;
- . removed UST locations;
- vehicle fueling area (A-4);
- areas beneath transformers; and
- **leach field**.

Surface and subsurface soil sample locations, **including the supplemental verification and extent of contamination sample locations**, are shown in Figure 2-2. Background soil sample locations are shown in Figure 2-3. Surveyed sample location coordinates and elevations are listed in Appendix C. Table 2-1 provides a summary of the sample locations and the number of samples collected during the RFI. Table 2-2 is a summary of the analyses performed on these samples.

Surface and subsurface soil sampling was typically conducted in the same manner in all areas sampled. Minor modifications were incorporated in some areas due to field conditions or types of contaminants suspected. Figure 2-4 demonstrates the general scenarios for soil sample collection.

Surface samples were collected between 0 and 0.5 feet bgs. Field personnel used stainless steel shovels, bowls, and spoons to collect the surface soil. No hand augers were used during the sampling. All equipment was decontaminated according to procedures listed in the Field Sampling Plan (FSP) (TEC, 1996a).

Subsurface soil samples were collected using direct-push techniques. Standard 2-foot-long split spoons were emplaced in the ground using the hydraulic unit of a Simco 2400 Earth Probe mounted on a flatbed truck (see Photographs SA-a and SA-b in Appendix A). Each split spoon was fitted with four 6-inch brass liners before emplacement. Subsurface samples were collected and logged continuously in the boreholes. In addition to geologic logging, all samples were screened for volatile organic vapors. Screening was completed by measuring the vapors from exposed soil between two brass liners using a photo-ionization detector (PID).

A maximum of two subsurface soil samples from each borehole was collected for chemical characterization. The first subsurface soil sample for chemical characterization was collected directly below the surface sample, in the interval of 0.5 to 2.5 feet bgs. In cases where the borehole could be extended below 2.5 feet, a second sample was collected directly above the bedrock surface (see Figure 2-4). In some areas, the borehole intersected the discontinuous water zone, and the second subsurface sample was collected directly above the water table.

Samples for VOC and BTEX analyses were prepared by sealing both ends of a completely filled brass liner with Teflon tape and plastic end caps (see Photograph SA-c in Appendix A). Soil from all other liners was composited in stainless steel bowls for inorganic, SVOC, explosive compound, and/or pesticide/PCB analyses, as needed (see Photograph SA-d in Appendix A). In some boreholes, the amount of soil recovered did not provide sufficient sample material. Additional material was generated by drilling a second borehole approximately 6 inches from the first. Headspace screening and lithologic descriptions were completed on all samples, as specified in the FSP. Borehole logs for all holes drilled at the Offsite WSA during this RFI are included in Appendix D of this report.

Chemical analyses for soil varied for each investigation area. VOC, SVOC, inorganic, pesticides/PCB, explosive compound, PAH, BTEX, and TPH analyses were selected to be performed on area samples based on area specific reported activities and material usage. Specific parameters associated with these different analytical groups are listed in Appendix E. Area specific rationale is discussed below in Sections 2.2.1.1 through 2.2.1.9.

In addition to source characteristics, chemical analyses for individual soil samples were also selected based on contaminant mobility and persistence characteristics. With the exception of the USTs, all potential sources at the Offsite WSA were above ground. Contaminants introduced from these areas would, to some extent, absorb to the soil or migrate vertically toward bedrock.

Inorganics, pesticides/PCBs, explosive compounds, and SVOCs are generally less mobile than VOCs and absorb to soil. If present, these compounds would be found in the upper soil horizons. As shown in Figure 2-4, inorganic, pesticides/PCB, explosive compound, and SVOC analyses were performed on the surface and first subsurface samples. Portions of the samples from the second subsurface sample (directly above bedrock) were extracted and archived by the laboratory until results from the upper soil horizons were available. Only if these less mobile contaminants were present in the surface or the first subsurface sample were they analyzed in the second subsurface soil sample.

VOCs, in contrast, could be removed from surface soils over time due to a combination of downward migration and surficial volatilization. Surface soil samples were therefore not analyzed for VOCs. At all locations, both subsurface soil samples were analyzed for VOCs.

The following sections provide detailed descriptions of the analyses performed on samples collected within each investigation area. Section 3.0 of this report presents a discussion of the analytical results for all samples collected during the RFI.

2.2.1.1 Outdoor Materiel Storage and Maintenance Areas (A-1, A-2)

Investigation Area

Investigations were conducted in those areas where materials storage and maintenance activities were either reported or suspected. The area between Bldg. 8503 and Munitions Storage Bunkers 8531, 8533, and 8535 (Area A-1) was reportedly used to temporarily store munition components and practice bombs. Maintenance activities such as sanding, painting, and general cleaning also have been performed in this area. A second area (A-2) potentially used for similar activities was located directly north of the road serving Munitions Storage Bunkers 8554, 8556, 8558, 8560, and 8552 (see Figure 2-1). Photographs A1-a, A1-b, and A2-a (see Appendix A) show different views of these two areas.

Task Objective

As these areas are unpaved, waste materials generated could have been deposited directly to the ground surface. The objective of this task was to identify whether contaminants were present in the surface and subsurface soils and to determine the extent of any potential contamination.

Field Activities

In order to meet this objective, surface and subsurface soil samples were collected from each area. Area A-1 encompasses approximately 156,200 square feet. Samples from 34 locations (A1-01 through A1-34) in Area A-1 were collected on an established grid pattern (see Figure 2-2). The grid lines were aligned parallel to the adjacent service roads, as it was assumed that the majority of activity had occurred next to the roads. The first grid lines adjacent to the roads were therefore placed approximately 5 feet from the edge of the pavement. The second set of grid lines was located 20 feet to the south and to the east of the first lines. All other grid lines were spaced 100 feet apart as shown in Figure 2-2. Six of the 34 locations (A1-29 through A1-34) were placed across the service roads to the west and northwest due to the presence of disturbed soil noted during the field reconnaissance effort.

Area A-2 encompasses approximately 31,000 square feet. The area is bounded by the service road to the south and the fence to the north. Service road extensions located directly across from each bunker divide the area. Assuming that activity in this area took place close to the roadside, eight sample locations (A2-001 through A2-008) were biased towards the edge of the northern service road and the road extensions as shown in Figure 2-2.

Surface and subsurface soil samples for Areas A-1 and A-2 were collected at each borehole location, as shown in Figure 2-2. Procedures outlined in Section 2.2.1 were used for sample collection. All 42 boreholes in these two areas terminated against bedrock at shallow depths.

The sanding, painting, and general cleaning activities performed in this area may have generated wastes with associated inorganic compounds, VOCs, and SVOCs. Analyses for these types of contaminants were therefore performed. The potential for explosive compound or pesticide/PCB contamination resulting from the activities performed in these areas was not expected. In order to completely characterize the investigation areas, however, samples from 10 percent of the locations were analyzed for explosive compounds and pesticides/PCBs. These

locations were evenly distributed across the investigation area. Analyses were performed on individual samples from each location as discussed in Section 2.2.1 and as shown in Figure 2-4.

Following the above initial characterization, 10 supplemental sample locations were established in the vicinity of A1-019 (four locations) and A1-028 (four locations) to verify previous anomalous detects and further define horizontal extent of the contamination. Two locations were established 20 feet north and south of A1-019 and two locations were placed 10 feet east of A1-019. Four sample locations were established 10 feet to the north, south, east, and west of A1-028 to delineate extent of contamination. Two locations were co-located at the original sample locations.

Verification and extent of contamination sample locations are shown in Figure 2-2. Samples collected in the vicinity of A1-019 were analyzed for semivolatiles. Samples collected in the vicinity of A1-028 were analyzed for metals.

2.2.1.2 Waste Accumulation Area and Bldg. 8503 (A-3)

Investigation Area

Bldg. 8503 was the primary maintenance and inspection facility at the Offsite WSA. Photographs A3-a, A3-b, and A3-c (see Appendix A) show the building and the surrounding area. Bldg. 8503 contains two open maintenance bays located on the north and south ends of the building, with each bay having two doors, one each on the east and west sides (Photograph A3-b). The southern bay contains two paint booths. Each bay also contains an overhead crane system that would allow for work on heavy equipment. The entire building is surrounded by a concrete surface. During the site reconnaissance, gaps were noted throughout the area between sections of the concrete pad. Grass has grown in these gaps, making them easily noticeable on the site photographs. The Waste Accumulation Area (SWMU 59) is located directly west of the southern end of Bldg. 8503, along the edge of the concrete surface (see Photograph A3-b in Appendix A).

The entire surface surrounding the Waste Accumulation Area and Bldg. 8503 is impervious, and stormwater flows away from the buildings to the north, south, and west onto the adjacent grassy areas. Sloping terrain in the area generally directs run-off from the north to the south. Drainageway 1, a ditch approximately 10 feet from the west side of the concrete pad, collects run-off and directs it south toward Bldg. 8500, where it discharges to Live Oaks Creek or infiltrates into the ground (see Figure 2-2). Methods used in Drainageway 1 characterization efforts are discussed separately in Section 2.2.2.

Task Objective

The task objective was to determine whether contamination had been released from the Waste Accumulation Area and/or Bldg. 8503 to the surrounding surface and subsurface soils. In addition, the investigation attempted to determine whether contamination was present in the subsurface soils directly below the Waste Accumulation Area concrete pad. Sample results from this task were evaluated in conjunction with those from the drainageway investigation to determine if contamination had migrated away from the immediate area via Drainageway 1.

Field Activities

The Waste Accumulation Area containment features were evaluated. Particular attention was given to the gaps in the concrete pad near the building. These gaps are 0.5-inch-wide separations between the individual concrete blocks that comprise the pad surrounding Bldg. 8503. Soils beneath two gaps were investigated during this RFI by drilling through the concrete and collecting subsurface soil samples for lithologic and chemical characterization. The first gap was located approximately 1 foot south of the southern edge of the Waste Accumulation Area building. The second gap was located approximately 15 feet north of the northern edge of the building. Along each of these gaps, two holes were drilled through the concrete at intervals of 10 feet (see Figure 2-2). Concrete thickness ranged from 1 to 1.2 feet in the four boreholes.

In each of the four boreholes (A3-18 through A3-21) drilled along the gaps, two subsurface soil samples were collected beneath the concrete pad. The first subsurface soil sample for chemical characterization was collected in the 2-foot interval directly below the pad. The second sample for chemical characterization was collected directly above the bedrock surface, approximately 5 to 7 feet bgs in all four boreholes. All subsurface soil samples collected beneath the concrete pad were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

Both surface and subsurface soil samples were collected from the unpaved area surrounding the concrete pad. The A-3 area and Drainageway 1 together encompass approximately 47,900 square feet. Around the perimeter of Bldg. 8503, three series of surface and subsurface soil samples were collected (Figure 2-2). The first series (A3-001 through A3-014) was located along the entire perimeter within 5 feet of the edge of the pad. The sample locations were spaced approximately 50 feet apart, except in the zone adjacent to the Waste Accumulation Area, where sample locations (A3-008, A3-009, and A3-010) were spaced approximately 10 feet apart. Surface and subsurface soil samples were collected from these locations to target potential contaminants transported across the pad with surface water runoff. A second series was positioned between Drainageway 1 and the first series of samples. The three locations in the second series sample locations (A3-015, A3-016, and A3-017) were spaced approximately 50 feet apart. The third series (A3-024 and A3-025) was located approximately 30 feet beyond of the edge of the pavement, west of Drainageway 1. Samples from these locations were positioned to identify the extent of any contamination related to the Waste Accumulation Area and Bldg. 8503.

Surface and subsurface soil samples were collected at each location as shown on Figure 2-2. Procedures outlined in Section 2.2.1 were followed for sample collection. Of the 23 boreholes drilled in this area, 21 terminated against bedrock, and two were terminated after the shallow, discontinuous water zone was reached at a depth of approximately 9 feet.

A previous investigation in the area indicated that VOC and inorganic contamination was present in the soils. There have been no historic analyses for pesticides/PCBs or explosive compounds in this area (Radian, 1989). Samples collected at Area A-3 were analyzed for VOCs, inorganics, and SVOCs, as described in Section 2.2.1. In order to provide complete characterization at those locations where previous contamination was reported, the surface and upper subsurface samples from the three locations directly adjacent to the Waste Accumulation Area building were also analyzed for pesticides/PCBs and explosive compounds. In addition, 10

percent of the total number of remaining samples collected at A-3 were analyzed for pesticides/PCBs and explosive compounds.

Following the initial characterization described above, a total of 22 supplemental sample locations were established in Area A-3 to verify reported PAH concentrations in the original samples (see Section 3.0) and to further define extent of the contamination. Sample locations were established at 15 and 30 feet from the edge of the pavement to determine the extent of PAH contamination. Sample locations were also established to verify previously reported anomalous antimony and mercury detects in Area A-3. Sample locations are shown in Figure 2-2.

2.2.1.3 Disturbed Surface Area (A-5)

Investigation Area

During TEC's October 1996 site reconnaissance, a disturbed surface area was noted at the southeast corner of the property, outside of the inner security fence. It appeared that earth-moving equipment had been used to excavate fill material. Photographs A5-a and A5-b (see Appendix A) provide a general view of Area A-5.

Task Objective

The objective of this task was to determine whether activities at this disturbed surface area were associated with waste products and whether these activities had resulted in contamination of surface and subsurface soils.

Field Activities

As there were no discrete anomalies at this site, four sample locations (A5-001 through A5-004) were established between 50 and 75 feet apart in the center of the area as indicated in Figure 2-2. The area of disturbed surface at A-5 encompasses approximately 47,400 square feet. Surface and subsurface samples were collected at each location. Procedures outlined in Section 2.2.1 were used for sample collection. Refusal against bedrock occurred in all four boreholes in Area A-5 at depths ranging from 1.5 to 4.5 feet bgs.

It is unknown what materials or contaminants might have been associated with this area. All locations were therefore characterized for potential contaminants associated with waste generating activities, which included inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds, as described in Section 2.2.1.

2.2.1.4 EOD Range

Investigation Area

The EOD range was located directly west of the fenced Offsite WSA area and consisted of approximately 40,000 square feet (see Figure 2-1). A protective bunker was built at the crest of a plateau for EOD personnel use during disposal activities (see Photograph EOD-a in Appendix A). To the west of the bunker is a 2-foot high berm forming a circle of approximately 300 feet in diameter. Based on EOD clearance reports (USAF, 1995) this berm is assumed to define the primary disposal range. However, the clearance report did identify a number of disposal pits east of the berm. Photographs EOD-b, EOD-c, and EOD-d (see Appendix A) show

views of the EOD Range from the top of the bunker. Warning signs mark the perimeter of the former range.

Task Objective

The objective of the task was to determine if residual explosive-related materials were present in the surface and subsurface soils.

Field Activities

A total of 11 sample locations were established across the EOD Range, as shown in Figure 2-2. The area enclosed by the berm around the EOD Range encompasses approximately 77,500 square feet. Sample locations EOD-001 through EOD-008 were assigned based on results of the ordnance-clearing operations conducted at the EOD Range in August and September 1996. The area outlined by the sample locations encompassed approximately 132,300 square feet. Field personnel positioned sample locations EOD-001 through EOD-009 where metallic debris had been recovered during the clearance. Location EOD-009 was positioned near the bunker. Two locations (EOD-010 and EOD-011) were randomly positioned near the center of the EOD Range. Surface and subsurface soil samples were collected at each location. Procedures outlined in Section 2.2.1 were used for sample collection.

Activity in the area was reportedly limited to ordnance disposal. Therefore, samples were analyzed for potentially related contaminants, specifically explosive compounds and inorganics. The surface and upper subsurface (0.5 to 2.5 feet) soil samples were analyzed for inorganics and explosive compounds. The deeper subsurface soil samples were archived. Where contamination was detected in the upper samples, the archived sample from that location was analyzed for the contaminants of concern.

Based on the initial characterization results, nine supplemental sample locations were established in the EOD Range to verify anomalous detects reported in the original samples (see Section 3.0) and to further define extent of the contamination. Two locations were established at the original sample locations, EOD-009 and EOD-006, to verify previously reported detects of thallium and dinitrotoluene, respectively. Three locations were positioned 10 feet to the south, east, and west of EOD-009 to determine the extent of thallium contamination. Four locations were positioned 10 feet to the north, south, and east of EOD-006 to delineate the dinitrotoluene contamination. Sample locations are shown in Figure 2-2.

2.2.1.5 Bunker Floor Drain Outlets

Investigation Area

The Offsite WSA contains 11 abandoned munitions storage bunkers. The interior floor of each of these bunkers is sloped to drainage troughs located along the side walls. Each drainage trough discharges to the exterior ground surface through drains located at the base of the front wall as indicated in Figure 2-1. Photographs BD-a and BD-b (see Appendix A) are representative of the bunker drains examined during the RFI. No signs of flow or stressed vegetation at the drains were noted during the TEC site reconnaissance. An area of approximately 4 square feet is considered the maximum zone where potential contamination from these outlet drains may have occurred.

Task Objective

The objective of this task was to determine whether spills inside the bunkers might have occurred and migrated through the drains to the exterior, thereby contaminating the surface and subsurface soils.

Field Activities

Each of the 11 bunkers contains two wall drains. As there were no signs of flow or stressed vegetation around the drains, any potential spills would most likely have infiltrated within the immediate vicinity of the drain. Therefore, sample locations BD-001 through BD-022 were established immediately outside of the wall drain (see Figure 2-2). All surface samples and most subsurface samples were collected from these locations immediately beneath the wall drains. In some cases, however, it was necessary to move the borehole location out from the bunker approximately one foot to avoid buried utilities and allow the drilling equipment room to operate. Procedures outlined in Section 2.2.1 were used for sample collection.

The bunkers provided storage for munitions. Munitions-related materials are the only potential source of contamination in the bunkers. The surface and upper subsurface soil samples were therefore analyzed for inorganics and explosive compounds. The deeper subsurface soil samples were archived. Where contamination was detected in the upper samples, the archived sample from that location was analyzed for the contaminants of concern.

Based on the initial characterization results, six supplemental sample locations were established at the bunker drains in October 1998 to verify anomalous detects of mercury and cadmium reported in the original samples (see Section 3.0). These locations were positioned at and in the vicinity of BD-002 and BD-005. Four more sample locations at each of the 11 bunkers (a total of 44 sample locations) were established in January 1999 to delineate the extent of cadmium, copper, lead, and zinc around the drains.

The latter effort was undertaken based on conversations with the TNRCC, which indicated that the presence of lead-based paint in drainage outlets could be considered an unauthorized discharge as defined by TAC Chapter 335 regulations (BCT, 1998). Sample locations are shown in Figure 2-2.

2.2.1.6 Removed UST Locations

Investigation Area

The Offsite WSA contained five USTs. These tanks provided fuel in support of emergency power generation, heating, and vehicle fueling. Each tank was associated with a building operation (see Figure 2-1). A description of each tank, including building number, contents, size, dimensions, and function, is shown in Table 2-3. These features were determined from facility use descriptions and diagrams developed as part of the tank removal effort. Photographs UST-a through UST-d (see Appendix A) show current site conditions at the locations of four of the former USTs. Diagrams showing the location of each UST and its associated piping are provided in Appendix B.

Task Objective

The objective for this task was to determine whether potential tank and piping leaks had contaminated subsurface soils and to indicate whether groundwater contamination had resulted.

Field Activities

Borehole subsurface samples were collected near each former UST in order to identify leaks associated with both the tanks and piping. Ten soil borings (UST-001 through UST-010) were installed at the USTs on the basis of the tank location and the presence of pipe joints. A summary of the borehole locations associated with each former UST location is provided in Table 2-3.

Samples at UST sites were collected to define the vertical extent of contamination as shown in Figure 2-4. Sampling at the removed UST locations varied from sampling conducted elsewhere at the Offsite WSA in that surface soil samples were not collected. As all potential contaminant sources were below the ground surface at these locations, soil samples from 0 to 0.5 feet were deemed unnecessary. Subsurface samples for volatile organic headspace screening and lithologic descriptions were collected continuously through each entire borehole. Collection of up to three analytical subsurface samples from each borehole was planned. However, due to the shallow depth to bedrock at these sites, no more than two samples could be collected from any borehole. At all locations samples were collected directly above bedrock, as there were indications that contamination may have migrated to the fill material/bedrock interface in some locations. Additional samples were collected from the borehole interval with the highest headspace reading.

Samples were analyzed for compounds indicative of contamination from gasoline, diesel, and fuel oils. Analyses included BTEX, TPHs, and PAHs, in accordance with TNRCC Petroleum Storage Tank (PST) guidance.

2.2.1.7 Vehicle Fueling Area (A-4)

Investigation Area

A vehicle fueling area was located approximately 300 feet southwest of Bldg. 8514 on an unpaved circular drive. Remnants of the fuel pump(s) are present on site in the form of a 2-foot by 4-foot concrete pad. The pad is located at the southern extent of the circular drive. The pump station was served by a 1,000-gallon UST located approximately 12.5 feet south of the drive. Potential contamination related to this former UST was investigated in conjunction with other former UST sites as described in Section 2.2.1.6. Photograph A4-a (see Appendix A) shows the condition of this area of concern as of August 1997.

Task Objective

As the fueling area is unpaved, spills might have resulted in soil contamination. The objective of this task was to determine if spills in the area contaminated the surface and subsurface soils.

Field Activities

Four sample locations (A4-001 through A4-004) were established directly north of the abandoned fuel pump. The sampling area encompassed roughly 65 square feet. The locations were positioned in the area where vehicle fueling would have occurred. Locations were spaced 5 to 10 feet apart based on observations made in the field.

Surface and subsurface soil samples were collected at each location shown in Figure 2-2. Procedures outlined in Section 2.2.1 were used for sample collection. All four boreholes at A-4 were drilled to a depth of 1.5 feet bgs, where they terminated against limestone bedrock. Only one subsurface sample was collected for chemical characterization at each location.

Samples collected from the vehicle fueling area were analyzed for those compounds indicative of contamination from gasoline, diesel, and fuel oils. Surface and subsurface soil sample analyses consisted of BTEX, TPHs, and PAHs, in accordance with TNRCC PST guidance.

2.2.1.8 Electrical Transformers

Investigation Area

A number of transformers are located on the Offsite WSA (see Figure 2-2). Generally, they are mounted 20 to 30 feet above the ground on telephone poles in groups of two and three (see Photographs A1-a, A1-b, and TRF-c, Appendix A). Multiple transformers are also located in the power generating substation northwest of Bldg. 8505 (see Photograph TRF-a in Appendix A). Several large transformers, now removed, had been placed on top of a concrete slab in the middle of the fenced substation area. Additional large transformers are still located on racks at the western side of the substation (see Photograph TRF-b in Appendix A). On the north side of Bldg. 8503, a rack of three large transformers is located on a platform roughly 15 feet above the ground and 10 feet north of the edge of the concrete pavement surrounding the building (see Photograph A3-a in Appendix A).

Any leaks associated with the pole-mounted transformers would probably have affected an area of no more that 16 square feet of ground surface surrounding the telephone pole. Possible leaks within the power-generating substation may have impacted an area of approximately 1,300 square feet in and around the substation. For the transformers north of Bldg. 8503, possible leaks may have affected an area of approximately 300 square feet directly beneath and surrounding the transformer platform.

All transformers at the site have been inspected, and all transformers with PCBs have been replaced (USAF, 1993a). Currently, all transformers at the site bear a sticker certifying that they are PCB-free.

Task Objective

Although all transformers at the Offsite WSA are currently certified as PCB-free, it is possible that PCB-containing transformers at the site might have leaked at some time in the past. The objective of this task was to determine if any transformers had leaked, thereby contaminating the nearby soil with PCBs.

Field Activities

Sixteen transformer sample locations were selected based on the configuration of the transformers and the localized topography. Samples associated with transformers mounted on telephone poles were collected from 12 locations (TRF-004, TRF-006 through TRF-016), each positioned directly beneath the middle of the bank of transformers and, if possible, on the downhill side of the telephone pole. At the power-generating substation, sample location TRF-001 was positioned on the downhill side of the concrete pad. A second substation sample location (TRF-002) was positioned beneath the rack of transformers on the western side. At the

transformer platform north of Bldg. 8503, sample location TRF-005 was established directly beneath the middle of the platform.

Surface and subsurface soil samples were collected at each location, with the exception of the two sample locations within the power-generating substation (TRF-001 and TRF-002). Due to logistical and safety problems associated with drilling inside the fenced area, only surface samples were collected for these substation transformer sites. In addition, the subsurface samples at the transformer platform north of Bldg. 8503 were collected approximately 5 feet south of the surface sample in order to allow the drill rig sufficient operating room. As at all other soil sampling locations at the Offsite WSA, procedures outlined in Section 2.2.1 were used for sample collection.

The surface and upper subsurface (0.5 to 2.5 feet) soil samples were analyzed for pesticides/PCBs. The deeper subsurface soil samples were archived. Where contamination was detected in the upper samples, the archived samples from that location were analyzed for pesticides/PCBs. **Semivolatiles were not analyzed because transformers were not identified as potential sources of these compounds.**

2.2.1.9 Leach Field

Investigation Area

A leach field was discovered in early 1998, after the preparation of the Draft RFI Report (TEC, 1998b). The leach field is located outside of the secured (fenced) portion of the offsite WSA, 140 feet south and 177 feet east of the security gate (Figure 2-1). The leach field is approximately 21 feet by 21 feet and connects to the sewer system, which drains from Bldg. 8503 and 8514. Manholes leading from these buildings identify the location of the sewer lines. At the time of the investigation, the leach field was exposed at the surface. Drainage rock and drain tiles were visible within a shallow concrete containment wall.

Task Objective

The objective of this task is to determine if potential contaminants were present within and outside of the leach field containment area.

Field Activities

Soil samples were collected from three locations, one within the leach field and two outside of the leach field (Figure 2-2). A backhoe was used to clear the leach field of drainage tile and rock. During excavation, the leach field was found to have been constructed directly above bedrock. Both the drainage rock and the containment wall continued to bedrock, approximately 3 feet bgs. As a result, the sampling scope described in the supplemental field sampling memorandum (TEC, 1998c) was modified during the sample collection effort.

The original scope specified that the leach field characterization effort would consist of collecting two subsurface soil samples in the leach field. Because of the proximity of the bedrock to the leach field and the limited sediment/soil at the leach field gravel and bedrock interface, however, one sample, which consisted mainly of crushed rock, was collected from approximately 3 feet bgs

(at the interface of the drainage tile and the bedrock) in the center of the leach field (LCH-001) (Figure 2-2).

Outcroppings of bedrock were visible at the ground surface both south and east of the leach field. In order to verify the depth of bedrock outside of the leach field, a test pit was excavated directly west of the leach field. Outside of the leach field, bedrock was encountered between 2.5 and 3 feet bgs. Subsurface soil samples were then collected at the soil/bedrock interface from two locations (LCH-002 and LCH-003) south of the leach field (Figure 2-2). These samples were collected with a decontaminated 2-inch diameter, 9-inch-tall soil auger. To collect enough soil for all analyses, sample material was collected from approximately 1 foot bgs to refusal (approximately 2.5 feet bgs).

Surface soil samples were also collected from LCH-002 and LCH-003 to characterize the potential for fluid overflow from the leach field. Surface soil samples were collected using a decontaminated shovel and stainless steel spoons and bowls. All samples were analyzed for inorganics, SVOCs, VOCs, pesticides/PCBs, and explosives.

Following this initial characterization effort, two supplemental verification and extent of contamination sample locations were established in the vicinity of the original sample location LCH-002. Samples collected from these locations were analyzed for metals and semivolatiles. Sample locations are shown in Figure 2-2.

2.2.1.10 Background Surface and Subsurface Soil

Background conditions in surface and subsurface soil samples were established during the RFI. The locations were selected so as to represent the physical and geologic conditions encountered at the Offsite WSA soil sample locations. A total of eight surface and subsurface soil background locations (BK-001 through BK-008) were sampled. A surface sample was collected at each of the eight locations. Subsurface samples were collected at six of these locations based on site location and depth to bedrock. All background locations were west to northwest of the site, beyond the property boundary. These locations are shown on Figure 2-3. Photographs of four of these background sites are also provided in Appendix A (see Photographs BK-a through BK-e). All background soil samples were analyzed for inorganics, SVOCs, pesticides/PCBs, and explosive compounds. All background subsurface soil samples were also analyzed for VOCs.

Samples collected from the background locations have been provided for comparative analysis of sample results generated from soil and sediment samples collected from all areas of concern at the Offsite WSA, including the drainages on the site. An analysis of the background data is provided in Section 3.1 of this report.

2.2.2 Drainageway and Seep Sediment Sampling

Investigation Area

Surface water run-off provides one of the two contaminant transport pathways identified in the conceptual site model (see Section 4.2.2). A number of drainageways transport surface water off-site (see Figure 2-5). Of these, six drainageways (DW-1 through DW-5 and DW-7) drain

buildings and surrounding areas located within the inner fence. Drainageway DW-6 includes the heads of two drainageways serving the north side of the Offsite WSA. Drainageways DW-8 and DW-9 are located to the west of the site and drain the EOD area. Appendix A contains 16 photographs taken in the drainages in and around the Offsite WSA.

In addition to these direct surface water routes, shallow groundwater discharges from the site as seeps in ravines to the south and east (see Figure 2-5). Seeps 1 and 2 occur along the perimeter road and drain the southern half of the WSA fenced area, including Area A-4. Seep 3 consists of a ponded area to the east of the WSA and north of Area A-5. Seep 4 occurs at the head of Drainageway 8 and drains the EOD Range. No seeps were observed during the RFI field sampling efforts in drainages to the north of the fenced WSA area.

Task Objective

The objective of this task was to determine whether potential contaminants had been transported off-site via the surface water pathway.

Field Activities

In order to determine if contaminants had been mobilized off-site, sediment samples were collected from 29 locations within the nine drainageways on and around the Offsite WSA **and from four seeps (see Figure 2-5). Drainageway sediment samples were collected during the August/September 1997 field sampling effort. Seeps around the perimeter of the site could not be identified during this effort due to a prolonged heat wave. Therefore, a two-person team of TEC personnel returned to the site in mid-February 1998 to collect sediment samples from four seeps located beyond the WSA fenced area while the seeps were discharging water.**

Sediment provides an indication of immediate contamination as well as an indication of past surface water contamination. Sediment samples were collected from each drainageway **and identified seep**. Locations were established in order to identify contamination immediately downgradient from potential sources such as buildings and outdoor materiel storage and maintenance areas; and differentiate between multiple source areas.

Two samples were collected downgradient from potential point source discharges. Sample DW1-009 was located directly beyond a pipe draining Bldg. 8503 (see Photograph DW-1-b). Sample DW3-001 was located at the outfall pipe draining the interior of Bldg. 8505, the power generation building (see Photograph DW-3-c).

Drainage pathways DW-1 through DW-7 might have been impacted by multiple sources. Sediment samples from drainageways DW-1 through DW-7 were analyzed for target contaminants that included inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds. EOD drainageways (DW-8 and DW-9) were analyzed for inorganics and explosive compounds.

Surface and subsurface soil samples were also collected at site locations in Drainageway DW-1. A maximum of two subsurface samples was collected in each borehole in Drainageway DW-1, using procedures outlined in Section 2.2.1. All subsurface samples from the Drainageway DW-1 boreholes were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

One sediment sample was collected from each seep where surface water was collected (Section 2.2.3) (SP-001, SP-002, SP-003, and SP-004). One duplicate sample was collected from SP-001. Because the seeps may have been impacted by multiple sources, sediment samples from all seep locations were analyzed for inorganics, VOCs, explosive-related compounds, SVOCs, and pesticides/PCBs.

It was necessary to return to the WSA in mid-May 1998 to collect additional seep sediment and surface water samples due to laboratory errors in processing the February 1998 samples for explosive residues. During February 1998, surface water and sediment samples were collected from four different seeps at the WSA. In May 1998, sediment was re-collected at each of the four seeps. Surface water collection is discussed further in Section 2.2.3. All seep sediment samples collected during May 1998 were analyzed for explosive residues. Samples were collected using the same procedures outlined for the February 1998 sampling. Approximately 8 ounces of sediment were collected from each seep. Sample handling, preparation, and shipping were performed in accordance with procedures specified in the FSP. All samples were labeled, then placed in an iced cooler to be maintained at 4°C.

Forty-seven supplemental verification and extent of contamination samples were collected from locations established in DW-1 (six locations), DW-3 (35 locations), and DW-4 (six locations) to further characterize PAH contamination in these drainageways. These locations are shown in Figure 2-2.

Drainageway Background

During the drainageway sampling in August 1997, three drainageway background locations (BK-011, BK-012, and BK-013) were established for comparison to the site related samples WSA (see Figure 2-5). One sediment sample was collected from each background location. Each of these samples was also analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds. No additional background samples were collected during the February field effort for comparing the seep sediment results because sediment background conditions had been adequately established during the initial field investigation in August 1997.

2.2.3 Surface Water Sampling

Investigation Area

As discussed in Section 2.2.2, surface water run-off provides one of the two contaminant transport pathways identified in the conceptual site model (see Section 4.2.2). See Section 2.2.2 for a more detailed description of the drainageways and seeps at the Offsite WSA.

Task Objective

The objective of this task was to determine whether potential contaminants had been transported off-site via the surface water pathway.

Field Activities

During the initial RFI, surface water was not present at the site due to a prolonged heat wave. A two-person team of TEC personnel returned to the site in February 1998 to collect surface water samples. Surface water samples were collected from seven Offsite WSA locations and four background locations. Offsite WSA surface water samples were collected from three drainageway locations (DW1-002, DW5-004, and DW9-003) and four seep locations (SP-001, SP-002, SP-003, and SP-004). The drainageway and seep locations were the only locations identified on site with surface water during the February 1998 sampling event. The seep sediment samples discussed in Section 2.2.2 were collected in mid-February 1998 at the same time as the seep surface water samples.

One surface water sample was collected from each of the three drainageway sample locations and each of the four seeps. One field duplicate was collected from Seep 2.

Unfiltered surface water samples were collected using sterile 16 ounce plastic sample bottles as sample bailers. Water was poured directly from the "bailers" into the final sample bottles. Approximately 4.5 liters of water were collected for each sample to provide adequate volume for all analyses to be performed.

Sampling handling, preparation, and shipping were done in accordance with procedures specified in the FSP. All water samples to be analyzed for volatiles and inorganics were properly preserved. All samples were labeled, then placed in an iced cooler to be maintained at 4°C.

Because surface water may have been impacted by multiple sources, all unfiltered water samples were analyzed for VOCs, SVOCs, inorganics, pesticides/PCBs, and explosive residues.

As noted in Section 2.2.2, it was necessary to return to the WSA in mid-May 1998 to collect additional seep sediment and surface water samples due to laboratory errors in processing the February 1998 samples for explosive residues (sediment collection is discussed in Section 2.2.2). During February 1998, surface water samples were collected from four different seeps at the WSA. In May 1998, surface water was re-collected from only Seep 3 because of the absence of water in the other three seeps. Such limited seep surface water sample analyses for explosives is considered to fulfill the objectives of this investigation because, as discussed in Section 3.0, no explosives were found in any of the sediment samples and only one of the 195 soil samples collected contained explosives at reportable concentrations. This location was latter shown to be contaminant free during a verification sampling effort.

During February 1998, surface water samples were also collected from four background sites (see below) and three drainageways. In May 1998, surface water samples were collected at sites BK-011 and BK-013. No water was available at the remaining five sites during this round of sampling.

All seep surface water samples collected during May 1998 were analyzed for explosive residues. Samples were collected using the same procedures outlined for the February 1998 sampling. Two liters of water were collected from each surface water location. Sample handling, preparation, and shipping were done in accordance with procedures specified in the FSP. All samples were labeled, then placed in an iced cooler to be maintained at 4°C.

Background Surface Water

Background conditions in surface water were established during the additional field sampling effort. Background samples were collected in upgradient drainageways that are not impacted by the Offsite WSA. A total of four samples were collected from four locations (three of which were established when background sediment was collected). All background surface water locations are northwest to north of the site (Figure 2-6). Sampling procedures and the analytical program for these samples are the same as those described for drainageway and seep surface water samples.

The drainageway and seep surface water sample data are compared to data for samples collected from the background locations to establish whether site concentrations are significantly different from background levels. An analysis of the background data is provided in Section 3.1.

2.2.4 Ground Water Monitoring

Investigation Area

Groundwater represents the second potential contaminant pathway identified in the conceptual site model (see Section 4.2.1). Groundwater sources include the overburden on top of the Walnut Formation and the Paluxy Formation. The upper portion of the Paluxy Aquifer is below the Walnut Formation at a depth of at least 30 feet bgs. This aquifer is a domestic and agricultural source of water for local residences. Groundwater in the Paluxy Aquifer flows to the east. Potential groundwater contamination was addressed by sampling Paluxy Formation monitoring wells at the site. These wells are shown in Figure 2-7.

Subsurface water associated with the overburden was detected in only eight of the 148 boreholes drilled during the RFI. Water in the overburden was limited to saturated soil areas where it is presumed that precipitation had drained along the impervious bedrock surface. Surface water sampling including the collection of seep samples as described above was used to characterize this subsurface water.

Task Objective

The objective of this task was to determine if contamination resulting from multiple sources at the Offsite WSA had migrated to the deeper Paluxy Aquifer.

Field Activities

Two water supply wells currently exist on site. These wells were the primary and back-up water supply for the Offsite WSA and are reportedly screened to depths of 184 and 186 feet bgs within the deeper Paluxy Aquifer (Johnson, 1997). As part of a completed background study, these wells were prepared for environmental sampling by removing existing hardware (Jacobs,

1997b). The primary well is located east of and downgradient from Bldg. 8503, the Waste Accumulation Area, and the EOD area. The backup well is located southeast of these same potential contaminant sources and may be downgradient from them as well. The background study efforts also included installation of two Paluxy Aquifer monitoring wells. Both of these wells are located upgradient from the site, on the hills to the west and northwest of the EOD Range.

During the RFI field investigation, measurements were made and samples collected from three wells screened in the Paluxy Aquifer (see Figure 2-7). These wells included the primary water supply well (XU-32-12-902), the backup well (XU-32-12-901), and the southernmost background well (WJEPX925).

Prior to sampling, an electronic interface probe was used to determine the static groundwater level (i.e., depth to groundwater) in each well. No floating product was detected in any of the wells. All groundwater samples were collected using low-flow (minimal drawdown) techniques. Samples were collected from the two on-site water supply wells using a Grundfos pump and portable electric generator. Water level measurements were taken with an interface probe in both wells prior to the start of pumping. The pump was lowered to a depth of 120 feet in each well. Pumping was maintained at low rates, between 0.6 and 0.7 gallons per minute, to insure minimal drawdown in the wells, and water level readings were taken during the pumping to measure the amount of drawdown. During the pumping, a Horiba® Water Checker U-10 was used to measure six parameters on the purge water: temperature, pH, electrical conductivity, turbidity, dissolved oxygen content, and salinity. When the first four of these parameters had stabilized according to specifications listed in the FSP (TEC, 1996a), the groundwater samples were collected. Purging efforts and static water level measurements were recorded in forms provided in Appendix F.

An additional sample was collected from a background well installed by Jacobs Engineering in 1996. This well had a bladder pump installed at a depth of 120 feet. Purging was conducted by connecting a Well Wizard to the down-hole pump, then setting the equipment to pump water at a rate of approximately 0.06 gallons per minute. As with the on-site wells, purging was conducted until temperature, pH, electrical conductivity, and turbidity had stabilized to levels specified in the FSP.

One groundwater sample was collected from each well, and a duplicate sample from the main supply well, using methods described in the FSP. Because the Paluxy Aquifer could potentially have been impacted by multiple contamination sources, all groundwater samples were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

2.2.5 Facility Surveys

The following section describes the tasks that were conducted during the RFI to characterize the extent of facility contamination or the presence of hazardous substances in and on facilities at the Offsite WSA. Asbestos and lead-based paint (LBP) testing was performed in order to characterize building materials. Additionally, wipe sampling was conducted to identify if other hazardous dust and particles are present on interior building surfaces. The discovery and characterization of potentially hazardous materials and constituents at the Offsite WSA will be used in the development of risk-based corrective action alternatives, presented under separate cover.

Of the 24 facilities located at the Offsite WSA, 23 facilities were surveyed for asbestos and LBP. The surveys included both visual inspections and the collection of samples. Wipe samples were collected from 13 Offsite WSA facilities. Wipe samples were also collected from three additional residential locations off-site to help establish facility surface background conditions.

Table 2-4 provides a brief description of the facilities that were surveyed at the Offsite WSA. Table 2-5 provides a summary of the types and numbers of samples collected in each building. Table 2-6 further summarizes the surveys conducted by identifying the analyses performed during each effort.

Descriptions of each of the surveys performed and the methods used are provided below. The results of the asbestos, LBP, and facility surface contamination surveys are presented in Sections 3.12.1, 3.12.2, and 3.12.3, respectively.

In support of all three facility surveys, physical descriptions and floor plan diagrams were developed. Data generated during the facility surveys were recorded in the field and later entered into a Microsoft Access® database for the purposes of generating reports specific to each facility and the Offsite WSA as a whole. The floor plan diagrams developed identify physical layout as well as sample locations. The reports, floor plan diagramming sample locations, as well as photographs of materials determined to be positive for asbestos are included in Appendix G

2.2.5.1 Asbestos Survey Field Activities

Survey Area

Facilities included in the asbestos survey are identified in Table 2-4. All but one facility was included. Bldg. 8552 was inaccessible and was therefore not surveyed. Building components surveyed included:

- roofing materials;
- flooring materials;
- ceilings tiles;
- gypsum walls; and
- pipe insulation.

Task Objectives

The objective of this task was to complete an asbestos survey of all buildings. The survey results will be used **to provide information supporting the** property's transfer. **Although Bldg. 8552 was not accessible, the inability to survey this bunker is not considered significant to this investigation. The bunker is identical in construction to Bldgs. 8531 and 8533. Therefore the survey results from these two buildings are directly applicable to Bldg. 8552.**

Field Activities

All accessible areas within the Offsite WSA facilities were visually inspected for the presence of suspect ACM. The survey was performed using the following steps:

- homogeneous area categorization;

- friable/nonfriable determination;
- homogeneous area assessment; and
- suspect ACM sampling.

A description of each of these steps is provided below.

Homogeneous Area Categorization. Homogeneous areas are defined as areas of suspect ACM that appear uniform throughout in both color and texture. Each homogeneous area of suspect ACM was categorized by the asbestos building inspector as either thermal system insulation (TSI), surfacing material (SFM), or miscellaneous material (MM) and given a unique identification. This unique identification begins with the last three numbers of the facility in which it is located. The facility number portion is immediately followed by TSI, MM, or SFM, depending on material type. The last part of the series is a two-digit number specific to the suspect ACM type and the number of times that ACM type has been encountered. For example, a homogeneous area number for the second kind of pipe insulation (TSI) encountered in Bldg. 8503 would be 503-TSI-02.

Friable/Nonfriable Determination. All accessible suspect ACM was touched by the asbestos building inspector to determine whether such materials are classified as friable materials. The term friable means that a material, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure. Friable materials may include previously nonfriable materials. Examples of friable asbestos are blown-on fireproofing and preformed pipe insulation. Examples of nonfriable materials would be floor tiles and transite-like panels.

Homogeneous Area Assessment. Each identified homogeneous area of suspect ACM was quantified, assessed according to physical condition, and assessed for accessibility and potential for disturbance (assuming the building has occupants). Suspect ACM was quantified by the asbestos building inspector in terms of area (square feet), length (linear feet), or item (each), dependent on the type of suspect ACM. Physical condition assessment included an evaluation of damage, documenting the type, severity, and extent of damage over the homogeneous area. Known or expected causes of damage were identified (e.g., water, air erosion, vibration, old age) by the building inspector.

Suspect ACM Sampling. Samples of suspect ACM were collected from each identified homogeneous area unless the area was assumed to be asbestos by the inspector. The sample identification scheme is broken down into three alphanumeric components. The first component is a group of letters that represent the type of sample taken. For example, STA is a structural asbestos sample. The second component is the last three digits of the facility number from which the sample came. For example, sample STA-503-02 is the second asbestos sample taken from facility 8503.

All samples were collected in a random manner representative of the homogeneous area. Sample collection procedures are dependent of the type of suspect ACM being sampled. Sample collection procedure for each of the homogeneous area categories (MM, SFM, and TSI) were as follows.

- Miscellaneous Material (MM) - Generally, a minimum of three samples was collected from each homogeneous area. If the homogeneous area was less than 100 SF, only one sample was collected.

- Surfacing Material (SFM) - A minimum of three samples was collected from each homogeneous area 1,000 SF or less. Larger SFM homogeneous areas were not encountered during this survey.
- Thermal System Insulation (TSI) - A minimum of three samples was collected from each identified homogeneous area. Fewer than three samples are acceptable for areas of patched TSI less than six linear or square feet, or areas where cement or plaster is used as insulation on fittings (e.g. tees, elbows, valves). Samples are not required nor were collected from TSI materials that the inspector has determined to be fiberglass, foam, rubber, or other non-ACM.

2.2.5.2 Lead-Based Paint Survey

The LBP survey was conducted using protocols outlined in the USEPA/U.S. Department of Housing and Labor Development (HUD) Guidelines (1995), and in accordance with Texas Environmental Lead Reduction Rules, Section 295.212. According to HUD, paint found to contain lead in concentrations greater than or equal to 5,000 ppm or 1.0 mg/cm^2 is considered to be LBP. TEC utilized a licensed LBP inspector/risk assessor to identify LBP in the facilities at the Offsite WSA.

Survey Area

Facilities included in the LBP survey are identified in Table 2-5. All but one facility was included. Bldg. 8552 was inaccessible and was therefore was not surveyed. Representative samples were collected from all facility types. Facility components typically sampled included:

- doors;
- door and window trim; and
- interior and exterior walls.

Task Objective

The task objective is to evaluate potential LBP hazards, determine the property's suitability for transfer, and develop necessary information supporting the development of potential LBP related corrective measures. **As with the asbestos survey, the inability to access Bldg. 8552 is not considered significant to the results of the LBP survey. The bunker is identical to Bldgs. 8531 and 8533.**

Field Activities

As with the asbestos survey, the LBP survey included a number of activities. These activities included:

- determination of representative area;
- sample collection;
- assessment of painted surface; and
- estimation of surface areas.

A description of each of these activities is provided below.

Representative Area Determination. Paint chip samples were collected from painted building materials/components with different painting histories. Different building

materials/components with similar painting histories were sampled independently. For example, if a wall and door are painted the same color, a sample was taken from both the wall and the door, because different colored layers may exist underneath. If similar building materials/components had similar painting histories, then a sample was taken from only one of the components, (i.e. all the doors on a building are painted white, then only one door sample was taken). Paint was sampled from both interior and exterior building materials/components.

Sample Collection. Bulk paint chips were collected from various Offsite WSA painted surfaces. Squares measuring 6-inches by 2-inches or 4-inches by 4-inches were measured with a stainless steel ruler. Paint was removed with a razor knife or paint scraper, capturing the chipped paint in a paper funnel. The paint chips were then transferred into laboratory vials, sealed, and marked with the sample number, time, and date. Sample numbering was similar to that used for the asbestos samples collected during the RFI, except that the prefix "STP" was used for the lead-based paint samples.

Surface Assessment. Painted surfaces at the Offsite WSA were assessed according to the HUD classification system. Paint is classified as either intact, fair, or poor. Additionally, the type of deterioration is determined (e.g. alligatoring, chalking, flaking). Specifically, if the entire surface of the paint is intact then the paint is classified as intact. If less than or equal to ($\leq$) 10 square feet (ft^2) of exterior components with a large surface area, or $\leq$ 2 ft^2 of interior components with a large surface area are damaged, then the paint is considered fair. Additionally, if $\leq$ 10 percent of the total surface area of interior and exterior components with small surface areas is deteriorated, then the paint is also considered fair. Any additional damage will result in a classification of poor condition.

Surface Area Estimation. Surface area estimates were made in SF for painted building materials/components. These estimates will be useful for pricing various corrective action measures.

2.2.5.3 Facility Contamination Survey

Facilities used for industrial processes and ammunition maintenance and storage were surveyed for the presence of potential hazardous residues on their interior surfaces.

Survey Area

Facilities included in the wipe sample survey are identified in Table 2-5. Sixteen facilities were sampled during the survey. Thirteen of the facilities were used to store various munitions that potentially contained explosive compounds. Three background structures were sampled. Because all bunkers provided the same function and were of similar design, only five of the 11 bunkers were sampled. Of the 13 Offsite WSA facilities that were sampled, Bldg. 8503 and 8514 were involved in maintenance and/or inspection activities potentially involving other wastes, as well as explosive compounds. Bldg. 8512 (SWMU 59) provided for storage of hazardous waste and was also included in the sampling effort.

Task Objective

The presence of residual surface contamination would present a health hazard to future site users. In addition to this general concern, TNRCC (30 TAC 335.6) and USEPA (40 CFR 265.11 and 40 CFR 265.114) regulations require that applicable units including foundation structures be decontaminated. The objective of this task is to identify those interior facility surfaces that

may be contaminated. This information was used during the assessment of overall corrective measures for the Offsite WSA.

Field Activities

Sixteen facilities were evaluated for possible interior surface contamination. As indicated above, contaminants of concern at the site include inorganics, SVOCs, and explosives. Wipe samples were collected from one wall and one floor of each room or work area in the suspect facilities.

Wipe sampling involved wiping a surface of known dimension using deionized water from the laboratory, and Johnson and Johnson Brand Sterile Gauze, either 3-inches by 3-inches or 4-inches by 4-inches. Two or four wipe samples were composited to form one sample for analysis. Composite sampling was chosen as a method of characterizing a larger area and reducing sampling and analysis costs. Composite sample locations were selected at random within each building. The number of wipes in each composite was determined by room size. Generally, samples for rooms larger than 250 ft^2 consisted of four subsamples.

Scotch tape templates were placed on the floors and walls of the buildings to provide the known dimension (929 cm^2 or 1 ft^2). Inorganic and explosive templates were placed immediately adjacent to each other to facilitate sample numbering and avoid confusion between sample types. Special care was taken not touch the sample surface while placing the template tape.

Before sampling, unpowdered latex gloves were donned and the sterile gauze was removed from its wrapping. The gauze pads were soaked with deionized water and the excess was squeezed out immediately before the collection of the sample.

Typical sample collection would begin by wiping the surface within the template until all the material in the collection area was visibly removed. Sample collection was performed using the same process to collect each sample. Sample collection starts by wiping in a horizontal "S" pattern, followed by a vertical "S" pattern. Between each "S" pattern wipe, the gauze was folded inward. This was followed, depending upon material visible on the surface, by either a wipe around the edge of the template or another horizontal "S" wipe. Three wipes were generally enough to remove all visible material. Care was taken not to wipe outside the template or on the template itself. Sample numbering was similar to that used for the asbestos and lead-based paint samples collected during the RFI. The prefix "STE" was used for the explosive samples and "STI" for the inorganics samples.

Background Sampling. TEC conducted background wipe sampling at three residential locations from 11300 White Settlement Road, Fort Worth, Texas, outside the Offsite WSA compound. A car garage, a boat storage shed, and a carpentry/tool shop were sampled. The background samples were compared to those taken at the Offsite WSA in order to determine whether levels of contamination at the Offsite WSA are significantly greater than those of residential structures in the area.

2.2.6 Other Field Investigation Activities

Other field investigation activities performed included:

- location of utilities;
- surveying of sample locations and other site features; and

- characterization of investigation derived waste;

Utilities Location

A utility location survey was conducted using a public utility locator service to identify the location and orientation of underground utilities in the vicinity of each intrusive sample location. All underground utilities were marked on the ground prior to the collection of any subsurface samples. A number of sample locations were adjusted as needed to avoid utilities. Locations adjusted included subsurface samples collected at bunker drains. The surface bunker drain samples were collected along the bunker outer wall, directly beneath the drain outlets. The subsurface bunker drain samples were moved approximately 1 to 2 feet out from the wall in order to avoid underground electric lines and to provide sufficient room to operate the direct push equipment.

Investigation-derived Waste Characterization

The field investigations described did not generate significant quantities of investigation derived waste (IDW) due to the usage of direct push methods for subsurface soil sampling. One drum of IDW soil was generated. Other IDW was generated from equipment decontamination and groundwater well purging. Two drums of purge water and three drums of decontamination fluids were generated. Three samples were collected from samples composited from the five drums representing soil cuttings, purge water and decontamination fluids. The samples were submitted for waste characterization analyses. Waste profiles were developed based on this data in support of disposal. **The materials were determined to be nonhazardous and within background concentration ranges. The materials were therefore deposited on-site. Documentation of IDW handling is provided in Appendix V.**

Sample Location and Site Features Survey

A land survey was performed throughout the study area to identify sample locations, existing easements, property boundaries, and site features such as building corners. The survey included a records search of adjacent landowners. In addition a metes and bounds determination was made of the Air Force property in support of property use and/or disposal. The survey was performed by Gorrondona and Associates, a State of Texas-registered land surveyor. The site map identifying Air Force property, sample locations, and other site features is provided in Appendix C.

2.2.7 Chronology of the Field Work

The majority of the fieldwork associated with the Offsite WSA RFI was completed in August and September 1997. **Sampling of surface water and seep sediment was performed in February 1998, however, when water was available to sample. Following this sampling event, a leach field was discovered; it was then sampled in May 1998. Drainageway and seep surface water and sediment samples associated with the February sampling locations were re-collected during the May 1998 event because the explosives analyses for original sample results were rejected by the laboratory for general exceedance of quality control parameters. Soil samples were collected in October, November, and December 1998 and January 1999 for verification of anomalous detects and final characterization efforts, as described in TEC (1998a).** The chronology of specific field investigation activities is presented below.

- Premobilization meeting - August 5, 1997
- Preliminary sample location - August 5, 1997
- Initial soil, sediment and groundwater sampling - August 13, 1997 to September 13. 1997
- Survey sample locations and site features - October 8, 1997
- **Supplemental surface water and seep sediment sampling – February 12, 1998 to February 14, 1998**
- **Leach field sampling – May 19, 1998 to May 20, 1998**
- **Resampled surface water and seep sediment for explosives analysis – May 21, 1998**
- **Supplemental verification and extent soil sampling – October 19, 1998 to October 22, 1998**
- **Supplemental extent of contamination sampling of areas A3, DW1, DW3, and Bunker Drains – November 6, 1998**
- **Supplemental DW3 sampling – December 8, 1998**
- **Supplemental extent of soil contamination sampling for DW3 and Bunker Drains – January 25, 1999 to January 28, 1999**

2.2.8 Field Quality Assurance Program

TEC maintained a comprehensive quality assurance (QA) program for field measurements and environmental sampling and analysis to ensure that sampling and monitoring activities met the prescribed project Data Quality Objectives (DQOs). Key components of the program included developing a project-specific Quality Assurance Project Plan (QAPP) in accordance with EPA and AFCEE guidance documents; establishing DQOs; applying predefined standard operating procedures (SOPs) for field sampling, record keeping, and analyses; conducting several levels of technical review of project activities, results, and deliverables; and implementing independent performance and system audits.

Quality control was primarily the responsibility of the project manager, project chemist, and field task leaders. These individuals were closest to the field tasks and laboratory processes and were therefore most capable of controlling the overall quality of the fieldwork. They implemented QC responsibility through five primary methods: clear and accurate instructions in the Sampling and Analysis Plan (SAP), integrated project planning, close coordination/communication with all subcontractors and the client, spot checking of work in progress, and review of all products and deliverables.

Quality assurance, in comparison, was oriented toward ensuring that quality products were initiated, developed, and produced by the project team. QA is best applied by personnel who are not directly conducting the specific project activities. QA was the responsibility of TEC's Project Director and QA Manager for the Offsite WSA RFI. They ensured that all AFCEE policy, procedure, and objectives were met in all project tasks. To accomplish this, they reviewed copies of written correspondence, audited office-based activities as appropriate, documented audit findings, and recommended corrective actions. Additional details pertaining to specific QA/QC program activities, problems encountered, and corrective actions taken are provided in the following subsections.

2.2.8.1 Field Quality Control Activities

To ensure that samples of appropriate quality and reliability were obtained, all field activities included QC elements such as:

- use of AFCEE- and EPA-approved sample collection techniques, field measurement methods, and sample containers;
- use of properly calibrated and maintained field instruments appropriate for the anticipated task and DQO;
- calibration and operational checks of field instruments to within acceptable limits according to EPA, AFCEE, and/or manufacturers recommendations before, during, and after use in the field;
- routine periodic inspection and maintenance of all equipment and instruments in accordance with manufacturer's recommendations;
- use of EPA-accepted sample handling, preparation, and preservation methods;
- collection of all important associated environmental data (e.g., weather conditions, sample location observations, unique or abnormal conditions) using acceptable and applicable methods and equipment;
- use of DOT-approved sample shipment procedures;
- use of formal chain-of-custody procedures in the field and during shipment;
- collection of appropriate numbers and types of field QC samples; and
- maintenance of adequate records and logs of all field-related activity.

All field instruments were calibrated on a daily basis if the instruments were used that day. The PID was calibrated at least once per day, more frequently in some cases. Calibration, repair, and service records were kept in individual site log books as described above, and on Instrument Calibration Log Sheets that are maintained in the project file. Each instrument has a unique identification number, which was transcribed on field data records when used for a sampling event. Calibration data were compared to the manufacturer's equipment calibration control limits. Field equipment that consistently failed to meet calibration standards or exceeded the manufacturer's control limits was promptly repaired or replaced with functioning equipment.

Other records maintained in association with the ongoing field quality control activities include sample chain-of-custody forms. These forms are included with the laboratory sample results in the data validation report, which is provided in Volume II.

2.2.8.2 Field Quality Control Samples

Field QC samples included field duplicates, equipment blanks, trip blanks, and ambient blanks. Appendix H summarizes the types and number of field blank samples collected. Appendix H also illustrates the correlation between the various field QC sample types and the individual environmental samples collected.

Equipment blanks

Equipment blanks were collected to assess the effectiveness of equipment decontamination procedures and the cleanliness of the sample containers. Equipment blanks in support of environmental media (soil and groundwater) investigations were collected at a rate of one per day during site characterization activities for the project. Equipment blanks were created by

pouring ASTM Type II reagent grade water into or over the decontaminated sampling equipment, collecting the water in an appropriate sample container, and packaging/transporting the sample to the laboratory for analysis. The equipment blanks were analyzed for all laboratory parameters requested for the environmental samples collected at the study area.

A total of 22 environmental media equipment blanks (EB-001 through EB-020, **EB-100, and EB-102**) were collected during the field sampling events; a summary of the results for the equipment blank samples is provided in Table 2-7. **Three samples (EB-017, EB-018, and EB-020)** contained VOCs at concentrations above the detection limit. One sample, EB-017, was collected in association with the groundwater field samples (see Appendix H). Four VOCs (benzene, chloroform, methylene chloride, and toluene) were detected at concentrations below the practical quantitation limit (PQL) and slightly above the method detection limit (MDL). In a review of field logs, it was discovered that the sample was collected in the vicinity of an operating gasoline-powered generator. The field groundwater sample results represented by this blank did not contain VOCs and therefore will not be impacted by these results.

Two VOCs (toluene and methylene chloride) were detected in EB-018 and EB-020 above the MDL and below the PQL. Given that these compounds are common laboratory contaminants (EPA, 1989b), the detections were likely due to laboratory contamination. The EB-020 data were qualified with a "B", indicating that the VOCs were also detected in the associated laboratory blank.

One semivolatile, diethyl phthalate, was present in the two equipment blanks collected with the Fall 1998 samples (EB-100 and EB-101).

The metals equipment blank fractions regularly contained aluminum, barium, calcium, magnesium, molybdenum, sodium, and zinc. Antimony, copper, iron, and manganese were found infrequently in the equipment blank fractions. The equipment blank results were taken into consideration during the data validation and review process.

Two additional equipment blanks were collected in support of the facility surface contamination survey. Field wipe blanks STI/E-509-18 and STS-600-01 were collected by pouring ASTM Type II reagent grade water onto the cotton gauze pad used to collect surface residue. The wetted gauze was placed an appropriate sample container, packaged, and transported to the laboratory. STI/E-509-18 was analyzed for inorganics and explosive compounds. STS-600-01 was analyzed for SVOCs.

A number of inorganic analytes were detected in the wipe blank sample. The detected analytes are attributable to the gauze material and water. Influences of both the gauze and water will be present in the site surface residue samples. This influence will be taken into account when identifying contaminants of concern in site surface residue samples.

Trip blanks

Trip blanks were used to assess potential cross-contamination of environmental samples during transportation and storage. Trip blanks were submitted at the rate of one per cooler of samples sent to the laboratory for analysis of VOCs. A 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 were not opened in the field. Trip blanks were prepared only when environmental samples were

collected and submitted for VOC analyses. Consequently, trip blank samples were analyzed only for VOCs.

A total of **19 trip blanks** was collected during the field sampling events. A summary of the results for the trip blank samples is provided in Table 2-8. Three samples (**TB-007, TB-016, and TB-021**) contained VOCs at concentrations above the detection limit. One trip blank (TB-007) contained methylene chloride at a concentration less than the PQL and slightly above the MDL. **Because methylene chloride is a common laboratory contaminant, and trip blanks are prepared in the laboratory prior to being taken into the field, it is likely that the detect is attributable to laboratory contamination.** Trip blank TB-016 contained **three** VOCs. However, TB-016 was collected in association with IDW characterization efforts and therefore does not impact the field results. **The VOC data associated with TB-016 was also qualified as having VOCs detected in the associated laboratory blank. TB-021 had detectable levels of tetrachloroethene (PCE) and toluene; however, the data for both of these compounds were qualified with a "B", indicating that these compounds were also detected in the laboratory blanks. These blank results were taken into consideration during the data validation and review process.**

Ambient blanks

Ambient blanks were used to assess the potential introduction of contaminants from ambient sources (e.g., air, dust, internal combustion motors in operation) to the samples during collection. **Four** ambient blanks were collected during the field investigation. The samples were collected downwind of potential sources that could have impacted the field samples. Furthermore, because the study area is adjacent to an urban area of the City of Forth Worth, numerous potential sources of airborne contamination are possible. The ambient blanks consisted of ASTM Type II reagent grade water poured into a VOC sample vial at the sampling site. They were handled like an environmental sample and were transported to the laboratory for VOC analysis.

The ambient blank results revealed limited contamination. A summary of the results for the ambient blank samples is provided in Table 2-9. **Three of the four ambient blank samples contained chloroform at a concentration below the PQL and slightly above the MDL. One of the ambient blanks also contained methylene chloride at a concentration slightly above the MDL and below the PQL. The ambient blank collected during the mid-May sampling effort contained PCE and toluene, both of which were also reported in associated laboratory blanks. These blank results were taken into consideration during the data validation and review process.** Data qualifiers associated with the definitive data are defined in Table 2-10.

Field Duplicates

Field duplicates are precision indicators of field and laboratory processes. **Field duplicate sample results are compared in table format in the data validation and data review reports (Volume II).**

2.2.8.3 Field System and Performance Audits

Two types of audits are typically performed as a part of TEC's overall QA program: system and performance. System audits are performed periodically for each engineering or environmental

program and technical services area in the company. Their frequency is determined by the results of previous audits and any nonconformance issues determined to be a quality issue in a service area. The need for more frequent audits is determined based on:

- importance of the activity to the successful completion of stated corporate objectives;
- significant changes in the functional areas of the quality assurance program, such as significant reorganization or procedural revisions;
- suspected nonconformance in an item or service; and
- necessity to verify implementation of required corrective action.

A field performance audit was conducted by reviewing the field QC sample results. The field blank results are good indicators of proper decontamination practices and field sampling techniques being implemented by the field team. The field duplicate samples help determine whether the sampling techniques utilized for this project produce homogeneous sample results.

Another type of performance audit was conducted for the field investigation in the area of field sampling data review. The field sampling data audit was conducted by TEC to ensure the field sampling results were correctly transferred from the field logs into electronic format.

2.2.8.4 Field Problems Detected and Corrective Actions

Two problems were encountered and remedied during the field event as a result of TEC's QA/QC efforts. These problems were elevated sample cooler temperatures and a malfunctioning PID meter.

Several sample coolers arrived at the analytical laboratory at elevated temperatures (above 6 degrees Celsius). Shipping problems were encountered due to a courier strike at the time. The project QAPP required field samples to be received at the laboratory cooled to 2 to 6 degrees Celsius. The samples were recollected by the field team and shipped to the laboratory. The recollected samples arrived in good condition and within acceptable temperature limits. No other major field problems were encountered during this project.

During the subsurface soil collection program, the Hnu PID meter began providing readings above the expected range. Although high relative humidity routinely resulted in high readings (0 to 10 ppm) for all samples, measurements in the 0 to 100 ppm range were obtained for several samples. The PID meter was recalibrated after several high readings, but recalibration had little effect on the elevated sample readings. Soil from background areas were repeatedly screened with similar results. A replacement Microtip PID was ordered to replace the questionable meter. Upon arrival, the replacement PID also provided slightly elevated readings (0 to 10 ppm); however, elevated readings above approximately 10 ppm were not obtained. Readings obtained between approximately 0 and 10 ppm were assumed to be due to moisture on the lamp during periods of high humidity. The PID meter did not impact the field investigation since the soil sample collection was not based on PID meter soil screening results.

2.3 ANALYTICAL PROGRAM

This section describes the analytical program developed to meet the DQOs of the Offsite WSA RFI project. Included are brief descriptions of the overall analytical program including the laboratories involved, the analytical parameters and methods specified, the chronology of

the laboratory analyses, and the QA/QC program that supported the analytical program. Appendix E provides a comprehensive list of analytical parameters and methods for each sample. RECRA Labnet Services, Inc performed all laboratory analyses for definitive quality level data. Appendix I provides a cross reference of field sample numbers and laboratory sample numbers. Appendix I also identifies sample dates and times, matrix, analyses performed and laboratory lot control number.

2.3.1 Data Quality Levels

Two types of analytical data quality levels were identified for this project: screening and definitive. Screening data included field measurements of organic vapors in the head space of subsurface soil samples, particle size distributions for subsurface soil samples, asbestos content determination for existing buildings, and routine measurements of pH, conductance, temperature, and turbidity of water samples. Definitive data consisted of the remaining chemical characteristics of water and soil samples as described in the SAP.

The water and soil samples collected for definitive characterization were analyzed for TPH, BTEX, VOCs, SVOCs, pesticides/PCBs, PAHs, explosive compounds, and inorganic parameters. The majority of the analytical work was performed utilizing the *United States Environmental Protection Agency (USEPA) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846, Third Edition).

In addition to the above analyses, grain size analyses (see Appendix J) were performed on selected samples to provide data regarding contaminant migration potential and to support preliminary development of remedial options.

2.3.2 Chronology of Laboratory Analyses

Environmental sampling during the project occurred in August and September 1997, **February 1998, May 1998, October 1998, November 1998, December 1998, and January 1999**. Appendix K provides a comprehensive chronology of associated laboratory extraction and analysis dates for each field sample.

2.3.3 Laboratory Quality Assurance Program

For all analytical work, whether carried out in the laboratory or in the field, strict adherence to established analytical program QA was required. Analytical QC checks for both screening and definitive data were defined in the project QAPP and included blank, duplicate/replicate, and matrix spike/matrix spike duplicate samples in accordance with a predetermined schedule. The results were tabulated and placed on control charts so that any deviations from routine analytical performance can be identified and rectified by the laboratory. Procedures for routine instrument tuning, calibration, and maintenance were also carefully applied and documented by the laboratory.

Appendix H provides a summary of laboratory QA/QC samples collected for this project. Laboratory QC results for definitive data are summarized in the Data Validation Report (Volume II). Included are lists of the types of QC samples collected, the frequency of QC sample analyses, problems detected, and corrective actions taken. In addition to laboratory QC actions, 10 percent of the analytical results were independently validated by Environmental Data Quality, Inc. (EDQ). **Appropriate qualifiers were added to data, per the AFCEE QAPP**. The Data Validation Report is presented in Volume II of this report. The methodology for assessing and validating the data is described in the project QAPP.

2.3.4 Laboratory System and Performance Audits

Laboratory system and performance audits were performed as independent assessments of sample collection and analytical procedures. Audit results were used to evaluate the ability of the testing laboratories to produce data that fulfilled the project objectives, complied with the QC criteria, and identified areas requiring corrective action.

A laboratory system audit was conducted on the analytical laboratory, RECRA Labnet, prior to the start of the project. The audit was conducted after the bidding process was complete to ensure RECRA LabNet of Amherst, New York had sufficient resources, experience, and quality assurance systems in place to conduct the analytical project work. The audit determined that RECRA LabNet was capable of successfully completing this project. A complete description of the laboratory audit is presented in Appendix L.

The laboratory performance audit is a combination of the data validation and review. The review and validation of all analytical data is the largest performance audit for this project. The data validation report is presented in Volume II of this report.

A Performance Evaluation (PE) sample was collected and submitted to the laboratory as part of this project. A PE sample is a sample spiked with known concentrations of the project constituents of concern. The PE sample is also included as part of the laboratory performance audit (Appendix L). The accuracy of the laboratory's results for the PE sample was used to determine if other related data is acceptable.

Other audits applicable to this project include an AFCEE risk assessment personnel review conducted at the TEC Charlottesville, Virginia office. The AFCEE risk assessment team determined that TEC has the capabilities and resources to conduct a large-scale risk assessment. This review is considered applicable as a risk assessment system audit.

2.3.5 Laboratory Problems Detected and Corrective Actions

Wipe samples were collected from various buildings for metals and explosives analysis. The wipe samples were collected from four separate areas and were placed in one sample container as composite samples. Initially, the analytical laboratory only digested and analyzed one wipe per container. The laboratory was instructed to digest all four wipes from each container and add the digestates together and analyze as one composite sample.

2.4 DATA EVALUATION

This section briefly discusses the procedures used to identify, validate, reduce, interpret, and utilize field and laboratory analytical data generated during the project. Included are discussions of the methodology for data quality assessment, methodology for risk evaluation, and data analysis and interpretation.

2.4.1 Methodology for Data Quality Assessment

The analytical data associated with water and soil samples collected for screening purposes only were not formally validated. The laboratory's quality control samples and data reporting formats were reviewed for screening data.

The analytical data used for definitive purposes were independently reviewed and validated by Environmental Data Quality (EDQ) of Exton, Pennsylvania. Ten percent of the data underwent

full data validation. The remaining 90 percent of the data was also validated by EDQ using the summary data forms. EDQ reviewed the data to identify any major data quality issues. Major data quality issues are defined as issues that would require rejection of data.

The data validation and review process includes identifying quality issues in the data in accordance with the QAPP (TEC 1996b). The AFCEE data validation requirements; SW-846 Methods, where applicable: the process also evaluates the data for validity and usability. Criteria to be evaluated during the data validation include:

- case narratives;
- holding times;
- initial and continuing calibration;
- blanks (Method and Field);
- laboratory control samples (LCS) recovery;
- GC/MS instrument performance check (for GC/MS methods only);
- surrogate spike recovery;
- matrix spikes (MS) and matrix spike duplicate (MSD) recoveries;
- internal standard recoveries (for GC/MS methods only);
- second source calibration confirmation;
- compound identification;
- compound quantitation and reported detection limits;
- ICP interference check sample recovery (for AA and ICP methods only);
- ICP serial dilution (for AA and ICP methods only); and
- sample result verification (for AA and ICP methods only).

The results of the data validation process are presented in the Data Validation Report in Volume II of this report.

2.4.2 Preliminary Data Assessment

The data validation reports, both full and summary, were used to make decisions on the usability of the data. The data usability or completeness goals of ninety-five percent for water samples and ninety percent for soils as presented in the QAPP were adhered to for this project. There were a few occasions where the completeness goals fell below the required amount, however, this was immediately identified and samples were re-collected and re-analyzed until this DQO was satisfied.

Accuracy and precision were addressed through the data validation process. The results of surrogate spikes, matrix spikes, and laboratory check samples as expressed in terms of percent recovery demonstrate the accuracy for a given sample during a specific analysis. The results of the variability between sample measurements, laboratory replicates, and field duplicates demonstrate the precision of a given sample and a group of samples during a specific analysis.

The representativeness and comparability of the data was addressed by adhering to the FSP and QAPP. The samples were collected in a manner believed to representative of site conditions. The samples were all stored, preserved, and analyzed according to industry and AFCEE standards. All sample results are representative of the site and comparable with previous and future investigations, if AFCEE protocol and SW-846 methods are requirements of the investigations.

In conclusion, the samples were collected and analyzed according to the project QAPP and FSP, with the exception noted in the previous sections. The sample results as qualified in the data validation reports are presented in Volume II of the report. Samples were qualified in accordance with the project QAPP. Qualified sample results, other than unusable ("R") results, were used for their intended purposes.

2.4.3 Methodology for Risk Evaluation

The Risk Evaluation (RE) for the Offsite WSA was performed to meet the objectives of the project, which were to identify the nature and extent of contamination associated with the buildings and areas at the Offsite WSA and to evaluate corresponding potential threats. To support these objectives, human health risks were evaluated through development of cleanup levels (CULs) for media of concern at the Offsite WSA. These CULs were compared with **average and maximum** site concentrations to characterize human health risks. Ecological risks were assessed using a conservative screening level evaluation as part of a tiered approach. In this approach, site concentrations were initially compared to established ecological benchmark concentrations to evaluate the potential impact of the detected compounds to ecological receptors. Based on the results of this screening, subsequent tiers, which represent more complex and site-specific assessments, were undertaken if necessary.

The RE presented in this report is consistent with the requirements and procedures outlined in the *AFCEE Handbook* (USAF, 1993c), TAC Chapter 335, Subchapter S (TNRCC, 1993), **and *Implementation of the Existing Risk Reduction Rule* memorandum (TNRCC, 1998)**. The areas under investigation at the Offsite WSA that contained non-fuel (heating) oil USTs were evaluated in accordance with protocols and guidelines set forth in TNRCC Petroleum Storage Tank Division's (PSTD's) risk-based corrective action (RBCA) methods, as outlined in *Risk-Based Corrective Action for Leaking Storage Tank Sites* (TNRCC, 1994) and *Guidance for Risk-Based Assessments at LSTP Sites in Texas* (TNRCC, 1995). All of these references, as well as this RE, generally follow standard risk assessment procedures, which include identifying chemicals of potential concern (COPCs), identifying potential receptors and exposure pathways, evaluating the toxicity of the COPCs, and characterizing risks (EPA, 1989b). The ecological risk assessment tiered approach is consistent with methods provided in the *Framework for Ecological Risk Assessment* (EPA, 1992b) and the *Draft Guidance for Conducting Ecological Risk Assessment Under The Texas Risk Reduction Program* (McBee et al., 1996).

The Subchapter S and PSTD RBCA methods rely on a multi-tiered approach to evaluating potential threats to human health and the environment. The first tier, identified as Risk Reduction Standard Number 1 (RRSN1) in the Subchapter S regulations and Plan A in the PSTD guidance, can be used as simple screening tools. Under RRSN1, detected concentrations of site-related compounds are compared to background levels. Attainment of CULs, represented by background concentrations, is demonstrated if site concentrations are below these levels. If exceedances exist, RRSN2 or RRSN3 procedures may be used to develop CULs based on promulgated standards/criteria or risk-based concentrations (RBCs). The screening levels derived under Plan A are based on conservative exposure assumptions for the residential scenario, although limited site-specific information may be used to determine appropriate concentrations. These levels are intended to be protective of human health and the environment in most site conditions (TNRCC, 1994). Plan A relies on promulgated standards/criteria and risk-based concentrations for use as target action levels. Chemicals with concentrations

exceeding Plan A target concentrations may be evaluated under a Plan B site-specific risk-assessment.

The general purpose of Plan A and RRSN1 is to clean sites to levels that ensure adequate protection of human health and the environment without the use of institutional controls and to provide a mechanism for eliminating a more costly and time-consuming site-specific risk assessment if site concentrations are below the Plan A or RRSN1 concentrations. Plan A and RRSN1 provide little flexibility in developing cleanup levels, but help eliminate the time and expense needed to conduct a full-scale risk assessment.

For areas being evaluated under both Subchapter S and PSTD RBCA, background data, generated from samples collected during this RFI (see Section 3.0 for discussion), were employed as the primary screening tool (RRSN1) in Section 3.0 to identify the chemicals of greatest concern for human health and the environment. Chemicals that were not screened out based on a comparison of maximum site concentrations and background upper tolerance limits were carried forward in the RE (Section 5.0) for CUL development and further screening. Because background levels of organic compounds are assumed to be below detection, compounds detected in more than 1 percent of the samples of any one medium were carried forward to the risk-based screening in the RE. Factors such as **relative concentration** and toxicity, **environmental persistence**, location of detection, **presence in other media**, and past chemical usage were considered before eliminating a compound based on frequency of detect.

Human health CULs for exposure scenarios identified in the RE for non-UST areas were obtained from the most recent TNRCC interoffice memorandum guidance on implementing the existing Subchapter S Risk Reduction Rule (TNRCC, 1998). No other sources of CULs for these media were necessary because the standards incorporate the most current EPA-approved exposure algorithms, and toxicity factors and values for all COPCs, with a few exceptions, were provided. CULs for the UST areas were developed according to procedures outlined for Plan B Target Concentrations in the PSTD guidance (TNRCC, 1994). Maximum detected concentrations of COPCs were compared to the CULs as an additional screening tool to reduce the number of chemicals for which site-specific exposure point concentrations would be calculated.

Site concentrations of COPCs identified for each area at the Offsite WSA were compared to the CULs to characterize potential human health risks that may exist in site media. Site concentrations of the COPCs were represented by exposure point concentrations (EPCs) calculated as the 95 percent upper confidence limit of the mean, assuming the appropriate data distribution (e.g., normal or lognormal). Chemicals with EPCs exceeding the CULs may need further evaluation. Conversely, chemicals with concentrations below the CULs were determined to be present at levels that are not expected to adversely impact human health.

The ecological evaluation was conducted within the framework of Tiers 1 and 2 outlined in TNRCC's draft *Guidance for Conducting Ecological Risk Assessment Under The Texas Risk Reduction Program* (McBee et al., 1996). The tiered approach proposed by the TNRCC serves as a framework within which protection of environmental receptors are addressed in accordance with the TNRCC Risk Reduction Rules. Tier 1, which is the ecological assessment checklist, was

performed during a site survey and the findings were incorporated into the ecological evaluation. To screen for ecological COPCs that could be carried forward to subsequent tiers if necessary, the maximum concentrations of contaminants detected at the Offsite WSA were compared to established soil screening benchmarks (Tier 2, Level A assessment) for plants and invertebrates and no-observed-adverse-effect-level (NOAEL) toxicity reference values (Tier 2, Level B assessment) for vertebrates. Contaminants above these criteria and/or background upper tolerance limits were retained as COPCs and carried forward to a Level C assessment. At this level, hazard quotients (HQs) were calculated using site-specific data on endpoint species and media-specific concentrations at the exposure point (i.e., exposure point concentrations). COPCs with HQs greater than 1 in the Level C assessment were discussed in the context of the human health CULs to determine whether these levels are adequately protective of ecological receptors.

The results of the human health portion of the RE, along with the ecological evaluation results and the background levels evaluation (Section 3.0), provided the basis for the recommendations and conclusions presented in Sections 6.0.

Table 2-1. Environmental Media Sample Locations and Numbers Summary

Investigation Tasks	Number of Locations	Number of Samples: Surface Soil	Subsurface Soil	Surface Soil/ Sediment	Surface Water	Ground-water	Quality Control	Total
Outdoor Materiel Storage and Maintenance (A-1)	44	48	47	-	-	-	-	95
Outdoor Materiel Storage and Maintenance (A-2)	8	9	10	-	-	-	-	19
Waste Accumulation Area/Bldg. 8503 (A-3)	45	41	52	-	-	-	-	93
Vehicle Fueling Area (A-4)	4	5	4	-	-	-	-	9
Disturbed Surface Area (A-5)	4	4	7	-	-	-	-	11
EOD Range	20	23	27	-	-	-	-	50
Bunker Floor Drains	72	79	34	-	-	-	-	113
Removed UST Locations	10	-	13	-	-	-	-	13
Drainageways	78	-	48[1]	87	3	-	-	138
Seeps	4	-	-	5	10	-	-	15
Transformers	16	16	15	-	-	-	-	31
Leach Field	5	2	6	-	-	-	-	8
Groundwater Monitoring	2	-	-	-	-	3	-	3
Background	13[2]	9	11	3	6	1	-	30

[1] - All subsurface samples collected in Drainageway 1 west of Building 8503, in Drainageway 3, north of Building 8505, and Drainageway 4.
[2] - Includes eight soil locations, four drainageway locations, and one monitoring well location.
[3] - See Appendix H for relationship of Field QC samples to environmental samples collected in each area.
[4] – Total number of locations excludes those related to quality control samples.

Table 2-1. Environmental Media Sample Locations and Numbers Summary, continued

Investigation Tasks	Number of Locations	Number of Samples						
		Surface Soil	Subsurface Soil	Surface Soil/ Sediment	Surface Water	Ground-water	Quality Control	Total
Quality Control		[3]	[3]	[3]	[3]	[3]	[3]	[3]
Equipment Blanks	22						22	22
Trip Blanks	19						19	19
Ambient Blanks	4						4	4
Totals	325[4]	234	274	93	19	4	45	664

[1] - All subsurface samples collected in Drainageway 1 west of Building 8503, in Drainageway 3, north of Building 8505, and Drainageway 4.
[2] - Includes eight soil locations, four drainageway locations, and one monitoring well location.
[3] - See Appendix H for relationship of Field QC samples to environmental samples collected in each area.
[4] – Total number of locations excludes those related to quality control samples.

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Table 2-2. Sample Analysis Summary, Environmental Media Sampling Locations[2]

Sample Type	No. of Samples	Number of Analyses									
		Inorganics	VOCs	SVOCs	Pest/PCBs	Explosives	BTEX	TPH	PAHs	Grain Size	TOC
Outdoor Materiel Storage and Maintenance Area (A-1)											
Surface Soil Samples	44	39		39	3	3					
Subsurface Soil Samples	43	43	43	35	3	4				1	
Duplicate Samples	8	8	4	6	3	4					
Outdoor Materiel Storage and Maintenance Area (A-2)											
Surface Soil Samples	8	8		8	1	1					
Subsurface Soil Samples	8	8	8	8	1	1					
Duplicate Samples	3	2	2	2							
Waste Accumulation Area /Bldg. 8503 (A-3)											
Surface Soil Samples	39	25		33	3	3					
Subsurface Soil Samples	48	46	38	30	13	15					
Duplicate Samples	6	5	3	4	3	4					
Vehicle Fueling Area (A-4)											
Surface Soil Samples	4						4	4	4		
Subsurface Soil Samples	4						4	4	4		
Duplicate Samples	1						1	1	1		
Disturbed Surface Area (A-5)											
Surface Soil Samples	4	4		4	4	4					
Subsurface Soil Samples	6	6	4	4	4	6					
Duplicate Samples	1	1	1	1	1	1					
EOD Range											
Surface Soil Samples	20	15				16					
Subsurface Soil Samples	25	20				22				1	1
Duplicate Samples	5	4				4					
Bunker Floor Drains											
Surface Soil Samples	72	72				22					
Subsurface Soil Samples	32	32				22					
Duplicate Samples	9	8				4					
Removed UST Locations											
Subsurface Soil Samples	12						12	12	12		
Duplicate Samples	1						1	1	1		

Table 2-2. Sample Analysis Summary, Environmental Media Sampling Locations[2] (continued)

Sample Type	No. of Samples	Number of Analyses									
		Inorganics	VOCs	SVOCs	Pest/PCBs	Explosives	BTEX	TPH	PAHs	Grain Size	TOC
Subsurface Soil Samples (DW1, DW3, DW4)	45	16	16	23	16	16			22		
Duplicate Samples	3	1	1	2	1	1			1		
Sediment Samples	81	34	25	40	25	31			38		
Duplicate Samples	6	2	2	3	2	2			4		
Surface Water Samples	3	3	3	3	3	3					
Seeps											
Sediment Samples	4	4	4	4	4	4					
Duplicate Samples	1	1	1	1	1	1					
Surface Water Samples	9	4	4	4	4	9					
Duplicate Samples	1	1	1	1	1	1					
Transformers											
Surface Soil Samples	16				16						
Subsurface Soil Samples	14				14					2	2
Duplicate Samples	1				1						
Leach Field											
Surface Soil Samples	2	2	2	2	2	2					
Subsurface Soil Samples	5	5	3	5	3	3					
Duplicate Samples	1	1	1	1	1	1					
Groundwater Monitoring											
Groundwater Samples	2	2	2	2	2	2					
Duplicate Samples	1	1	1	1	1	1					
Background Samples											
Surface Soil Samples	8	8	2	8	8	8					
Subsurface Soil Samples	9	9	9	9	9	9				1	1
Duplicate Samples	3	3	2	3	3	3					
Sediment Samples	3	3	3	3	3	3					
Surface Water Samples	6	4	4	4	4	6					
Groundwater Samples	1	1	1	1	1	1					
Quality Control Samples[1]											
Ambient Blanks	4		4								
Equipment Blanks	22	18	13	18	16	18	1	1	2		1
Trip Blanks	19		19								

1. See Appendix H for relationship between field QC samples and environmental field samples.

2. Summary does not include samples collected in support of asbestos, lead-based paint or surface wipe samples.

Table 2-3. Summary Of Underground Storage Tank Investigation Locations

Building Number	Tank Contents	Tank Size (gallons)	Tank Dimensions (feet)	Function	Borehole Locations	
					Tank	Piping
Bldg. 8503	Fuel Oil	2,000	12 by 6	Heating	UST-001	UST-010
Bldg. 8514	Diesel	1,000	10 by 6	Vehicle Fueling	UST-002	-
Bldg. 8500	Fuel Oil	750	8 by 4	Heating	UST-003	UST-004 UST-005
Bldg. 8505	Diesel	5,000	18 by 8	Power	UST-006	UST-007 UST-008
Bldg. 8507	Fuel Oil	1,000	10.6 by 4	Heating	UST-009	-

Table 2-4. Facility Descriptions Summary (continued)

Building Number	Building Name	Building Function	Facility Construction: Exterior	Facility Construction: Interior
8500	Safety, Control, and Identification	Administration, Communications, and Site Security	• 932 ft^2 • Concrete Slab Foundation • Concrete Masonry Unit (CMU) Walls • Flat Built-Up Roof	• Six Rooms - Administration (2) - Bathroom (1) - Hallway (1) - HVAC/Mechanical (1) - Communication (1)
8501	Water Tank Storage	Water Storage	• 1219 ft^2 • 40 ft Steel Tower	• Used Only For Water Storage
8502	Water Supply	Water Pump House	• 78 ft^2 • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof	• One Room - Pump Room
8503	Surveillance, Inspection, and Shipping	Administration, Spray Painting, and Weapons Maint.	• 6,959 ft^2 • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof	• Ten Rooms - Administration (5) - Bathroom (1) - Hallway (1) - Spray Paint Booth (1) - HVAC/Mechanical (1) - Maintenance Bay (1)

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Table 2-4. Facility Descriptions Summary (continued)

Building Number	Building Name	Building Function	Facility Construction: Exterior	Facility Construction: Interior
8504	Water Supply	Water Pump House	• 78 ft² • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof	• One Room - Pump Room
8505	Electric Power Station	House Electric Generators	• 1,488 ft² • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof	• Two Rooms - Generator Room - Bathroom
8506	Small Arms Ammunition Storage	Storage Warehouse	• 5,000 ft² • Concrete Slab Foundation • CMU Walls • Corrugated Asbestos Roof • Loading Dock	• One Room - Warehouse
8507	Spares Storage	Administration, Maintenance, and Warehouse	• 2,500 ft² • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof	• Two Rooms - Administration - Warehouse
8508	Pyrotechnic Storage	Storage	• 351 ft² • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof • Loading Dock	• One Room - Warehouse/Storage

Table 2-4. Facility Descriptions Summary (continued)

Building Number	Building Name	Building Function	Facility Construction: Exterior	Facility Construction: Interior
8509	Segmented Magazine Storage	Storage	• 540 ft^2 • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof	• Eight Rooms - Magazine Storage (8)
8511	Detonator Storage	Storage	• 126 ft^2 • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof • Loading Dock	• One Room - Warehouse/Storage
8512	Waste Accumulation Area (SWMU 59)	Waste Storage	• 86 ft^2 • Concrete Slab Foundation • Corrugated Aluminum Walls • Sloped Aluminum Roof	• Waste Storage Area
8514	Conventional Munitions Shop	Administrations, Maintenance, and Warehouse	• 2,600 ft^2 • Concrete Slab Foundation • CMU Walls • Flat Built-Up Roof • Loading Dock	• Seven Rooms - Maintenance Bay (3) - Administration Office (2) - Bathroom (1) - HVAC/Mechanical (1)
8531, 8533, and 8552	Munitions Storage Igloos	Munitions Storage	• 1,576 ft^2, 1,266 ft^2, and 1,060 ft^2, respectively • Concrete Slab Foundation • Precast Concrete Walls • Hinged Blast Doors	• Three Rooms - Storage/Warehouse (2) - Vault (1)

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Table 2-4. Facility Descriptions Summary (continued)

Building Number	Building Name	Building Function	Facility Construction	
			Exterior	Interior
8535-8560	Munitions Storage Igloos	Munitions Storage	• 2,147 ft^2 • Concrete Slab Foundation • Precast Concrete Walls • Overhead Blast Doors	• One Room - Warehouse

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Table 2-5. Building Characteristics and Number of Samples (continued)

Building Number	Name/Use	Square Footage	Number of Samples		
			Asbestos	Lead Paint	Surface Contaminants
8500	Safety, Control, and Identification	932	25	9	NA
8501	Water Tank Storage	1219[1]	0	1	NA
8502	Water Supply Facility	78	7	3	NA
8503	Maintenance, Inspection, Shipping	6,959	31	10	8
8504	Water Supply Facility	78	2	2	NA
8505	Electric Power Station	1,488	11	5	NA
8506	Small Arms Ammunition Storage	5,000	0	6	3
8507	Spares Storage	2,500	7	8	4
8508	Pyrotechnic Storage	351	1	4	2
8509	Segmented Magazine Storage	540	2	4	18
8511	Detonator Storage	126	1	4	2
8512	Waste Accumulation Area SWMU 59	86	0	2	2
8514	Conventional Munitions Shop	2,600	11	15	11
8531	Munitions Storage	1,576	0	8[2]	4[2]
8533	Munitions Storage	1,266	1	3[2]	0[2]
8535	Munitions Storage	2,147	0	1[2]	2[2]
8537	Munitions Storage	2,147	0	1[2]	0[2]

Table 2-5. Building Characteristics and Number of Samples (continued)

Building Number	Name/Use	Square Footage	Number of Samples		
			Asbestos	Lead Paint	Surface Contaminants
8539	Munitions Storage	2,147	0	1[2]	0[2]
8541	Munitions Storage	2,147	0	1[2]	3[2]
8552	Munitions Storage	1,060	0	1[2]	0[2]
8554	Munitions Storage	2,146	0	3[2]	2[2]
8556	Munitions Storage	2,146	0	1[2]	0[2]
8558	Munitions Storage	2,146	0	1[2]	0[2]
8560	Munitions Storage	2,146	0	1[2]	2[2]

[1] Approximate square footage extrapolated from Jacobs (1996).

[2] Representative munitions storage buildings with identical construction were sampled for lead paint and surficial contaminants

Table 2-6 Sample Analysis Summary, Facility Surveys, Offsite Weapons Storage Area RFI

Sample Type	Number of Samples	Number of Analyses				
		SVOCs	Inorganics	Explosives	Asbestos	Lead Paint
Asbestos Survey						
Asbestos Samples	94				94	
Duplicate Samples	5				5	
Lead-Based Paint Survey						
Lead Paint Samples	90					90
Duplicate Samples	5					5
Facility Contamination Survey						
Surface Contaminant Samples	59	2	59	59		
Duplicate Samples	4		4	4		
Background Samples	3		3	3		
Blank Samples	1		1	1		

Table 2-7. Summary of Equipment Blanks Results (Continued)

Sample Number: / Parameters[a,b]	EB-001	EB-002	EB-003	EB-004	EB-006	EB-007	EB-008	EB-009	EB-010	EB-011
Inorganics-(mg/L)			NA	NA						
Aluminum	0.024 F	0.38			0.09	0.045 U	0.13	0.33	0.045 U	0.045 U
Antimony	0.0038 U	0.0038 U			0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U
Barium	0.001 F	0.0018 F			0.0048 F	0.0016 F	0.0023 F	0.0015 F	0.002 F	0.0021 F
Cadmium	0.00035 U	0.00035 U			0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U
Calcium	0.66	1.2			0.26	0.33	1.8	0.51	0.7	0.59
Chromium	0.0018 U	0.0018 U			0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
Copper	0.0018 U	0.0018 F			0.0035 U	0.065	0.0035 U	0.0056	0.01	0.0035 U
Iron	0.022 U	0.038 F			0.045 U	0.045 U	0.22	0.045 U	0.045 U	0.045 U
Lead	0.0018 U	0.0018 U			0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
Magnesium	0.038 F	0.017 F			0.02 U	0.025 F	0.38	0.028 F	0.027 F	0.02 U
Manganese	0.0009 F	0.002 F			0.0015 U	0.0015 U	0.0066	0.0015 U	0.0015 U	0.0015 U
Molybdenum	0.0015 U	0.0015 U			0.0092	0.0093	0.003 U	0.003 U	0.0054	0.0033 F
Potassium	0.15 U	0.15 U			0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Sodium	1.8	3			1.5 U	1.5 U	1.5 U	1.5 U	1.6	1.5 U
Vanadium	0.0012 U	0.0012 U			0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Zinc	0.007 F	0.0086 F			0.02	0.044	0.014 F	0.05	0.016 F	0.023
Semivolatiles (ug/L)	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND
Diethyl phthalate										
Volatiles-(mg/L)	NA	NA	NA	NA	NA					
Benzene						0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U
Chloroform						0.00077 U	0.00077 U	0.00077 U	0.00077 U	0.00077 U
m-Xylene						0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
Methylene chloride						0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Toluene						0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Pesticides/PCB's	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH (ug/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene										
TPH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not Analyzed
ND - Not Detected
a - See Table 2-10 for data qualifier definitions
b - Parameter list includes only those detected in at least one sample. See complete list of analytical parameters in Appendix E.

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Table 2-7. Summary of Equipment Blanks Results (continued)

Sample Number:	EB-012	EB-013	EB-014	EB-015	EB-016	EB-017	STI/E-509-16	STS-600-01	EB-018	EB-019	EB-020
Parameters[a,b]							Wipe Blank	Wipe Blank			
Inorganics-(mg/L)								NA			
Aluminum	0.064	0.048 F	0.045 U	0.058	0.098	0.066	0.17		0.07	0.055	0.065 U
Antimony	0.0075 U	0.016	0.0075 U	0.0075 U	0.037	0.0075 U	0.018		0.0075 U	0.0075 U	0.0051 U
Barium	0.0022 F	0.0046 F	0.0026 F	0.0021 F	0.0034 F	0.0019 F	0.0031		0.0024 F	0.0016 F	0.0021 F
Cadmium	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.0007 U	0.00022		0.0007 U	0.0007 U	0.0005 U
Calcium	0.39	12	0.36	0.48	5.2	0.37	2.1		0.64	0.71	2.7
Chromium	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.017		0.0035 U	0.0035 U	0.002 U
Copper	0.0035 U	0.0035 U	0.0067	0.0035 U	0.0035 U	0.0035 U	0.0025		0.0035 U	0.0035 U	0.0026 F
Iron	0.057	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.28		0.045 U	0.045 U	0.04 U
Lead	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0039		0.004 U	0.004 U	0.03 U
Magnesium	0.02 U	0.02 U	0.15	0.02 U	1.8	0.02 F	0.1		0.063	0.02 U	0.088 U
Manganese	0.0015 U	0.0074	0.0015 U	0.0015 U	0.0015 F	0.0018 F	0.0062		0.0032 F	0.02	0.0027 F
Molybdenum	0.003 U	0.044	0.0081	0.0031 F	0.078	0.003 U	0.00038		0.003 U	0.003 U	0.0022 U
Potassium	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.47		0.3 U	0.3 U	0.1 U
Sodium	1.5 U	3.2	1.5 U	1.5	2	1.5 U	1.1		1.5 U	1.5 U	0.81
Vanadium	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.00041		0.0025 U	0.0025 U	0.001 U
Zinc	0.019 F	0.035	0.017 F	0.0057 F	0.028	0.0045 F	0.035		0.0032 F	0.2	0.028
Semivolatiles (ug/L)	ND	ND	ND	ND	ND	ND	NA	ND	ND	NA	ND
Diethyl phthalate											
Volatiles-(mg/L)							NA	NA	(ug/L)	NA	(ug/L)
Benzene	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.0002 F			0.2 U		0.2 U
Chloroform	0.00077 U	0.00077 U	0.00077 U	0.00077 U	0.00077 U	0.0003			0.1 U		0.1 U
m-Xylene	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.0003 1U			0.4 U		0.4 U
Methylene chloride	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0002 BF			0.2 F		0.2 BF
Toluene	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0004 F			0.2 F		0.5 BF
Pesticides/PCB's	ND	ND	ND	ND	ND	ND	NA	NA	ND	NA	ND
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
PAH (ug/L)	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Fluorene				2.1 U							
TPH	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
BTEX	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
TOC	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA

--/NA - Not Analyzed
ND - Not Detected
a - See Table 2-10 for data qualifier definitions
b - Parameter list includes only those detected in at least one sample. See complete list of analytical parameters in Appendix E.

Table 2-7. Summary of Equipment Blanks Results (continued)

Sample Number:	EB-100	EB-101	EB-102	EB-103	EB-104
Parameters[a,b]					
Inorganics-(mg/L)	NA		NA		
Aluminum		--			
Antimony		0.012			
Barium		--			
Cadmium		0.0005 U		0.00054 U	
Calcium		--			
Chromium		--			
Copper		--		0.0029 F	
Iron		--			
Lead		--		0.03 U	
Magnesium		--			
Manganese		--			
Molybdenum		--			
Potassium		--			
Sodium		--			
Vanadium		--			
Zinc		--		0.11	
Semivolatiles (ug/L)			NA		
Diethyl phthalate	9 F	10			
Volatiles-(mg/L)	NA	NA	NA		
Benzene					
Chloroform					
m-Xylene					
Methylene chloride					
Toluene					
Pesticides/PCB's	NA	NA	NA		
Explosives	NA	NA	NA		
PAH (ug/L)	NA	NA	ND		
Fluorene			0.08 U		0.4 F
TPH	NA	NA	NA		
BTEX	NA	NA	NA		
TOC	NA	NA	NA		

--/NA - Not Analyzed
ND - Not Detected
a - See Table 2-10 for data qualifier definitions
b - Parameter list includes only those detected in at least one sample. See complete list of analytical parameters in Appendix E.

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Table 2-9. Summary of Ambient Blank Results

Sample Number:	AB-001	AB-002	AB-003	AB-004
Units:	mg/Kg	ug/L	ug/L	ug/L
Parameters[a,b]				
Volatiles				
Chloroform	0.00077 U	0.2 F	0.3	0.1 U
Methylene chloride	0.0011 U	0.2 U	0.2 F	0.2 U
Tetrachloroethene (PCE)	0.0011 U	0.2 U	0.2 U	0.2 BF
Toluene	0.001 U	0.2 U	0.2 U	0.5 BF

a - See Table 2-10 for data qualifier definitions

b - Parameters listed include only those detected in at least one sample. See complete parameters list in Appendix E.

Table 2-8. Summary of Trip Blank Results

Sample Number:	TB-003	TB-004	TB-005	TB-006	TB-007	TB-008	TB-009	TB-010	TB-011
Units:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Parameters[a,b]									
Volatiles									
1,2,3-Trichlorobenzene	0.00066 U	0.00066 U	0.00066 U	0.00066 U	0.00066 U	0.00066 U	0.00066 U	0.00066 U	0.00066 U
Hexachlorobutadiene	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U	0.00068 U
Methylene chloride	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0016 F	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Naphthalene	0.00081 U	0.00081 U	0.00081 U	0.00081 U	0.00081 U	0.00081 U	0.00081 U	0.00081 U	0.00081 U
Tetrachloroethene	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Toluene	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U

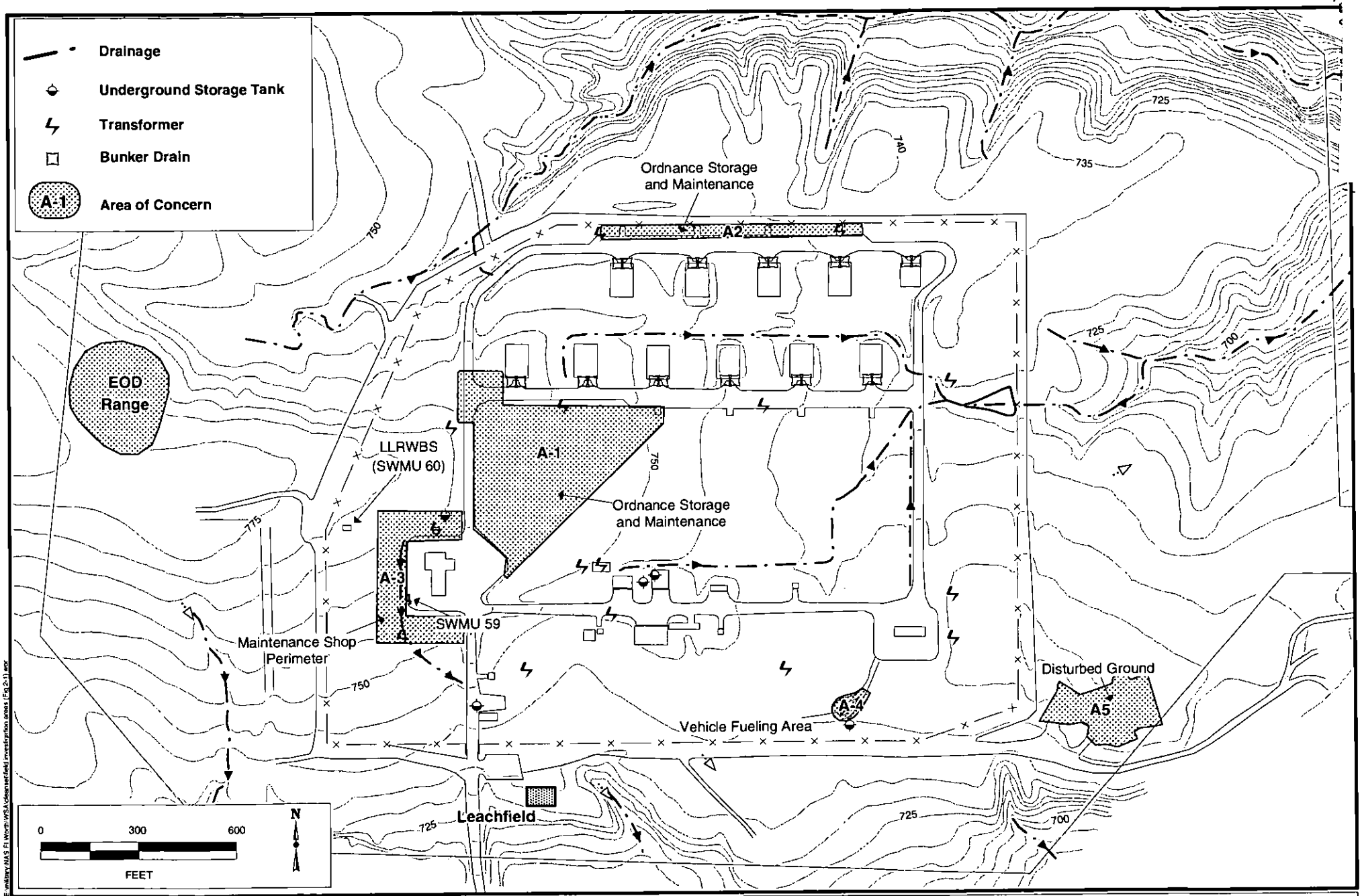
Sample Number:	TB-012	TB-013	TB-014	TB-015	TB-016	TB-017	TB-018	TB-019	TB-020	TB-021
Units:	mg/Kg	mg/Kg	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/Kg	ug/L
Parameters[a,b]										
Volatiles										
1,2,3-Trichlorobenzene	0.00066 U	0.00066 U	0.2 U	0.2 U	0.3 B	0.2 U	0.2 U	0.2 U	0.0012 U	0.2 U
Hexachlorobutadiene	0.00068 U	0.00068 U	0.2 U	0.2 U	0.3 BF	0.2 U	0.2 U	0.2 U	0.00096 U	0.2 U
Methylene chloride	0.0011 U	0.0011 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.00088 U	0.2 U
Naphthalene	0.00081 U	0.00081 U	0.2 U	0.2 U	0.3 BF	0.2 U	0.2 U	0.2 U	0.0014 U	0.2 U
Tetrachloroethene	0.0011 U	0.0011 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.0067 U	0.4 BF
Toluene	0.001 U	0.001 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.0011 U	0.7 BF

NA - Not Analyzed
ND - Not Detected
a - See Table 2-10 for data qualifier definitions.
b - Parameters listed include only those detected in at least one sample. See complete parameter list in Appendix E.

Table 2-10. Data Qualifier Definitions

Qualifier	Definition
Organics	
U	Indicates that the compound was analyzed for, but not detected. The associated numerical value is at or below the MDL.
J	The compound was positively identified. The associated numerical value is an *estimated quantity*.
U J	The compound was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance from quality control limits.
F	The compound was positively identified, however, the associated numerical value is below the PQL.
B	The compound was found in the associated blank as well as in the sample.
M	Designates that a matrix effect may be present due to accuracy and/or precision being generated out of specification for the MS/MSD.
E	Reported value is estimated due to quantitation above the calibration range.
D	Reported result taken from diluted sample analysis.
R	Reported value is unusable and rejected due to variance from quality control limits.
Inorganics	
U	Indicates that the compound was analyzed for, but not detected. The associated numerical value is at or below the MDL.
J	The analyte was positively identified. The reported value is estimated due to variance from quality control limits.
U J	The element was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance from quality control limits.
F	The compound was positively identified, however, the associated numerical value is below the PQL.
M	Designates that a matrix effect may be present due to accuracy and/or precision being generated out of specification for the MS/MSD.
B	The compound was found in the associated blank as well as in the sample.
R	Reported value is unusable and rejected due to variance from quality control limits.

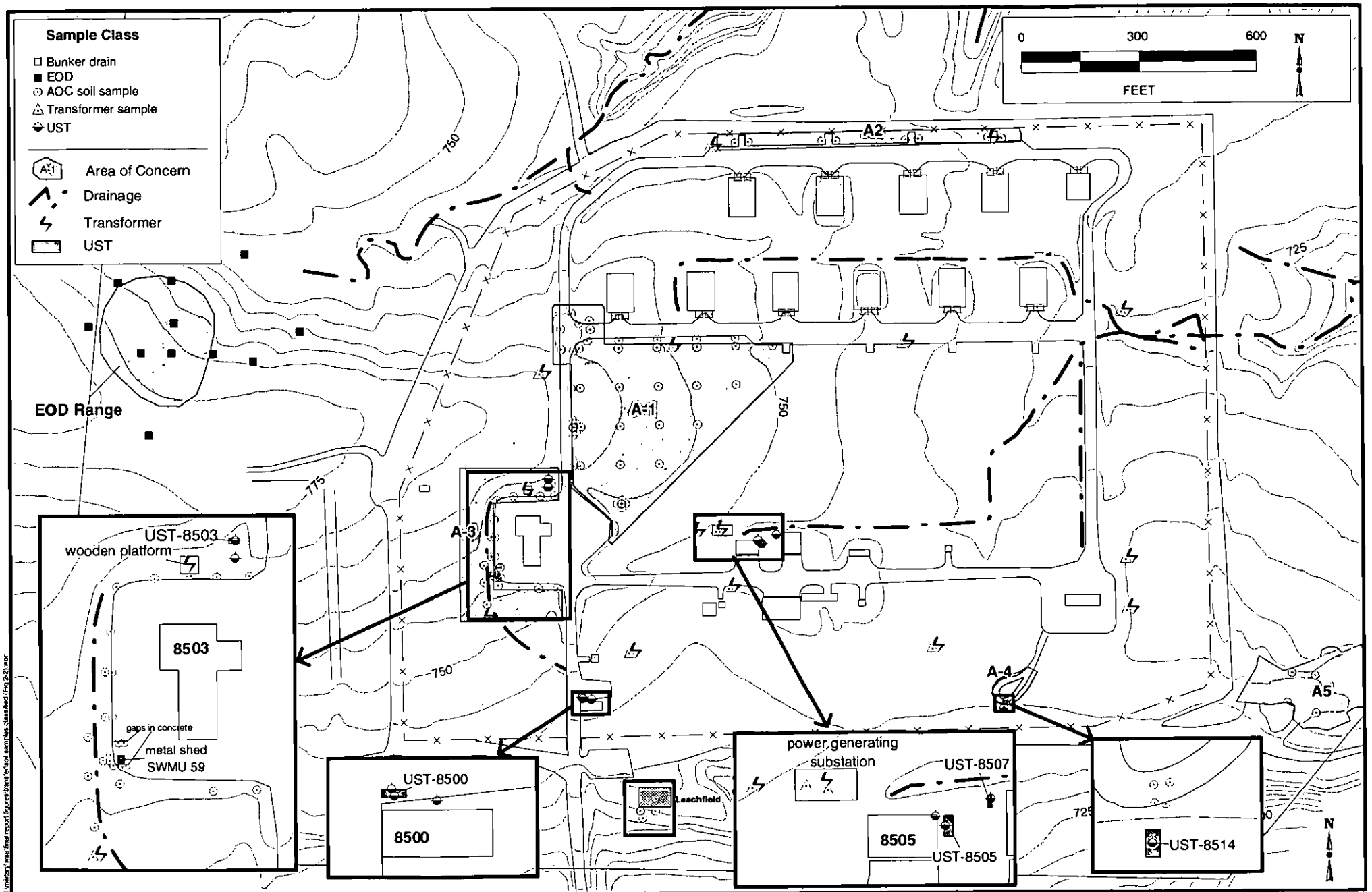
See Data Validation Report, Volume II, for specific details regarding data qualifiers and their application to the analytical results.



The Environmental Company, Inc.

Figure 2-1 -- Field Investigation Areas

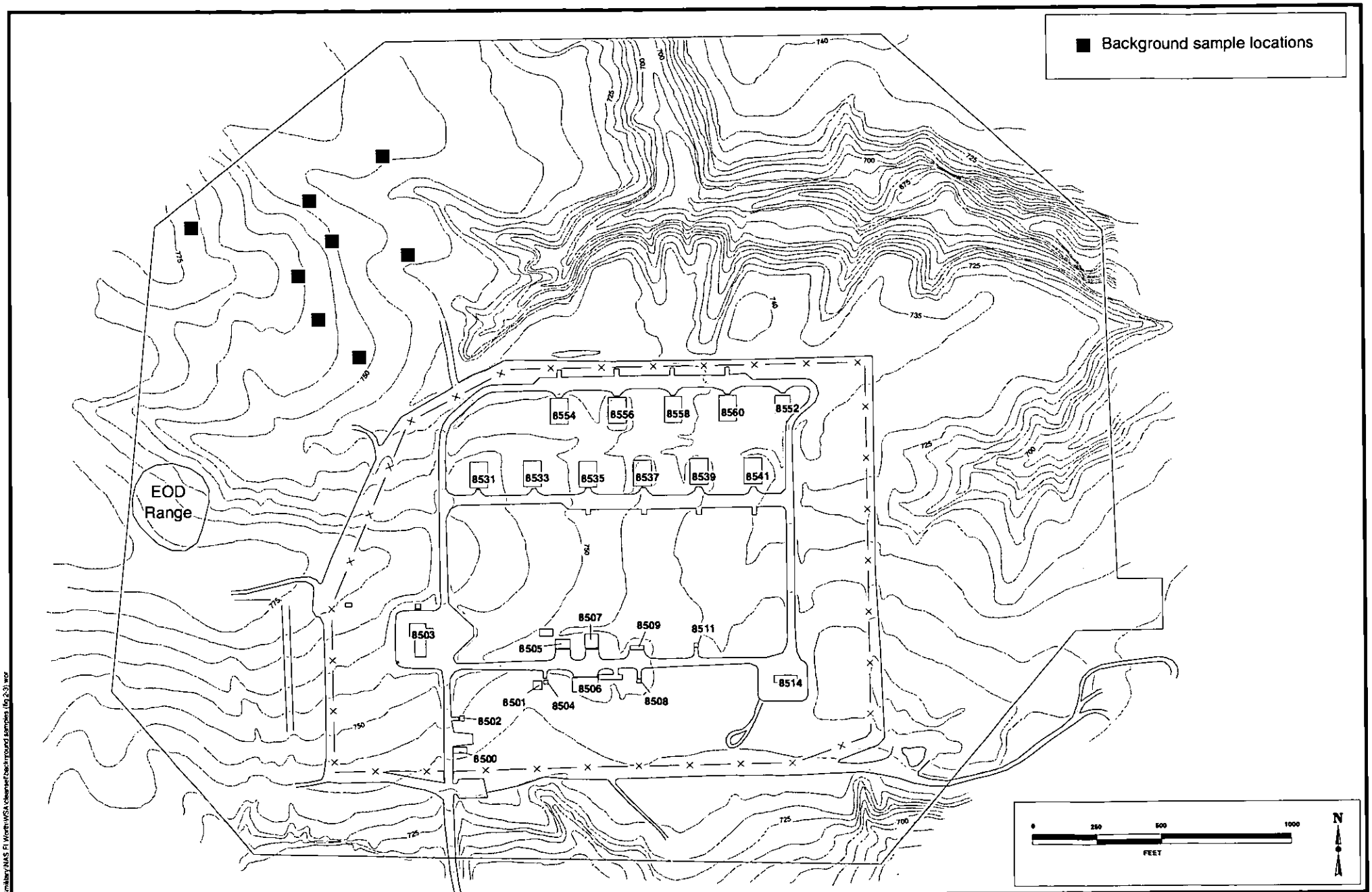
Creation Date:	12/01/1997
Rev. Date:	07/16/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109



The Environmental Company, Inc.

Figure 2-2 -- Surface and Subsurface Soil Sample Locations

Creation Date: 12/01/1997
Rev. Date: 05/10/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

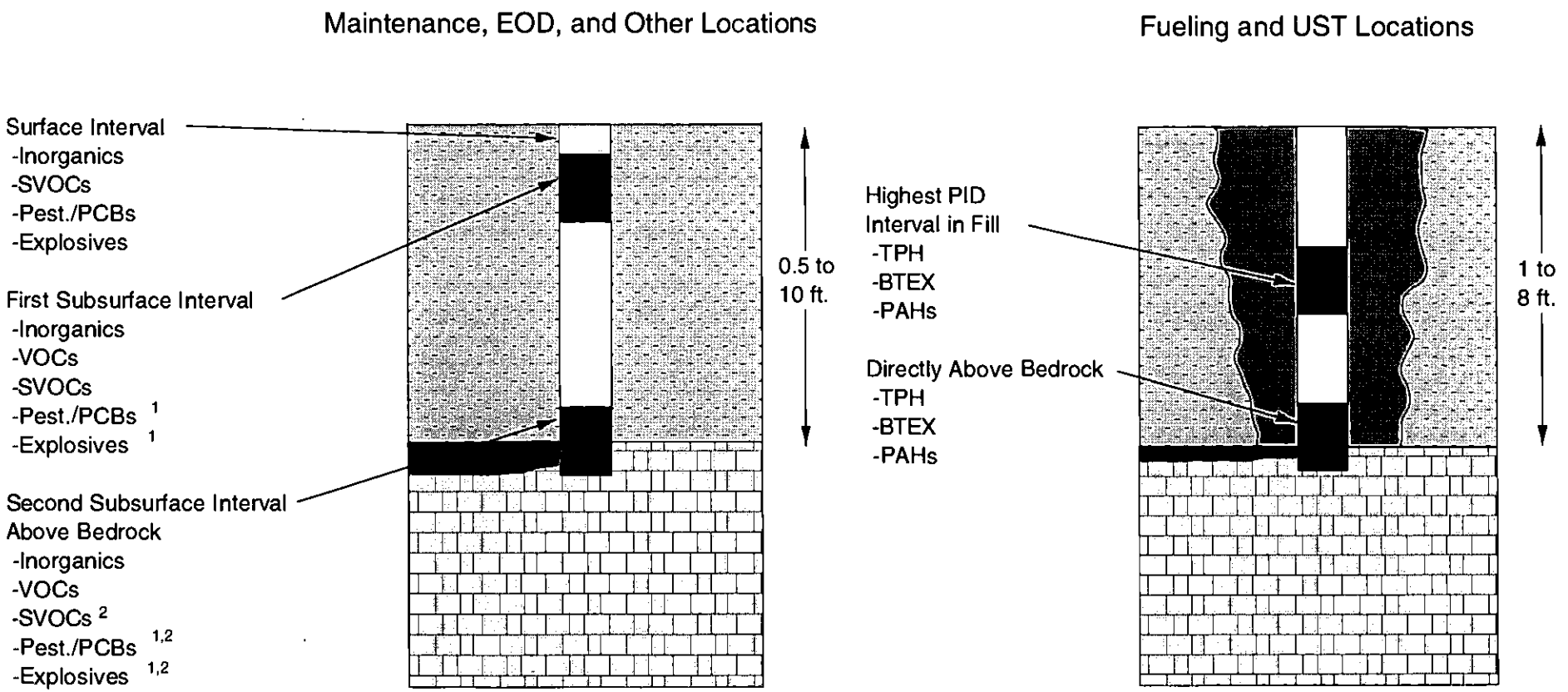


The Environmental Company, Inc.

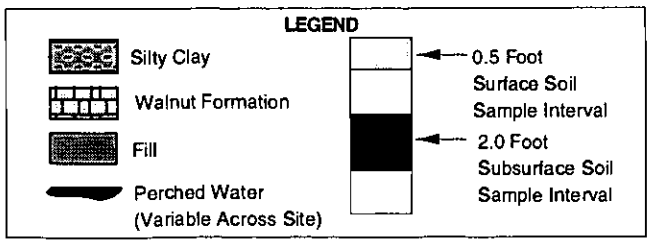
Figure 2-3 -- Background Soil Sample Locations

Creation Date:	12/01/1997
Rev. Date:	07/16/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109

E:\military\NAS Ft Worth\WSA\release\backgroundsamples (fig 2-3).wor



Note: 1 Collected at 10% of locations.
2 Analyzed only if detected in first subsurface soil interval sample.



The Environmental Company, Inc.

FIGURE 2-4 -- Typical Soil Sample Collection Scenarios

Date: March 1999
Project Manager: B. Duffner
Prepared By: D.Hurt
Project No.: P3109

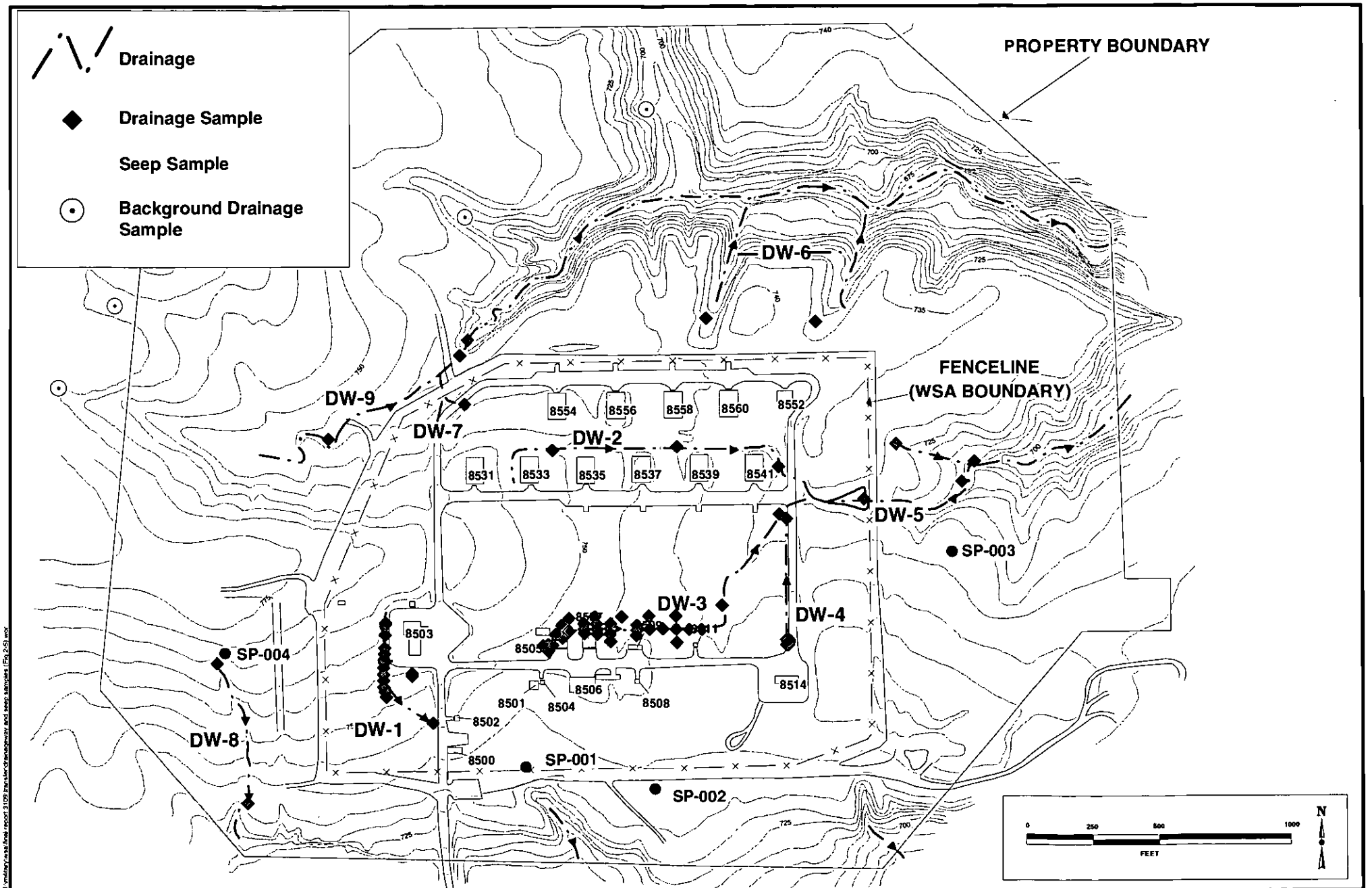


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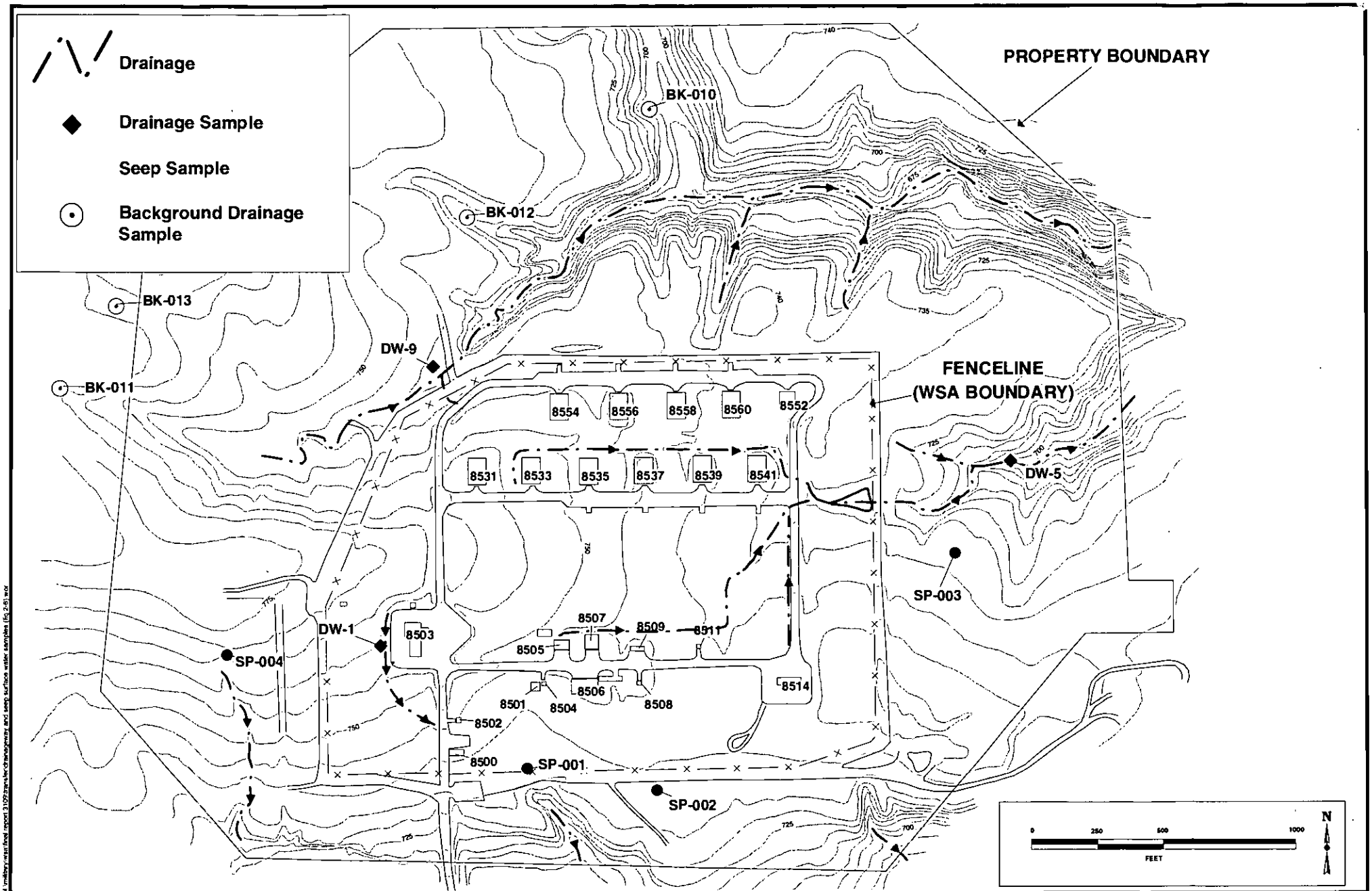
Figure 2-5 -- Drainageway and Seep Sediment Sample Locations

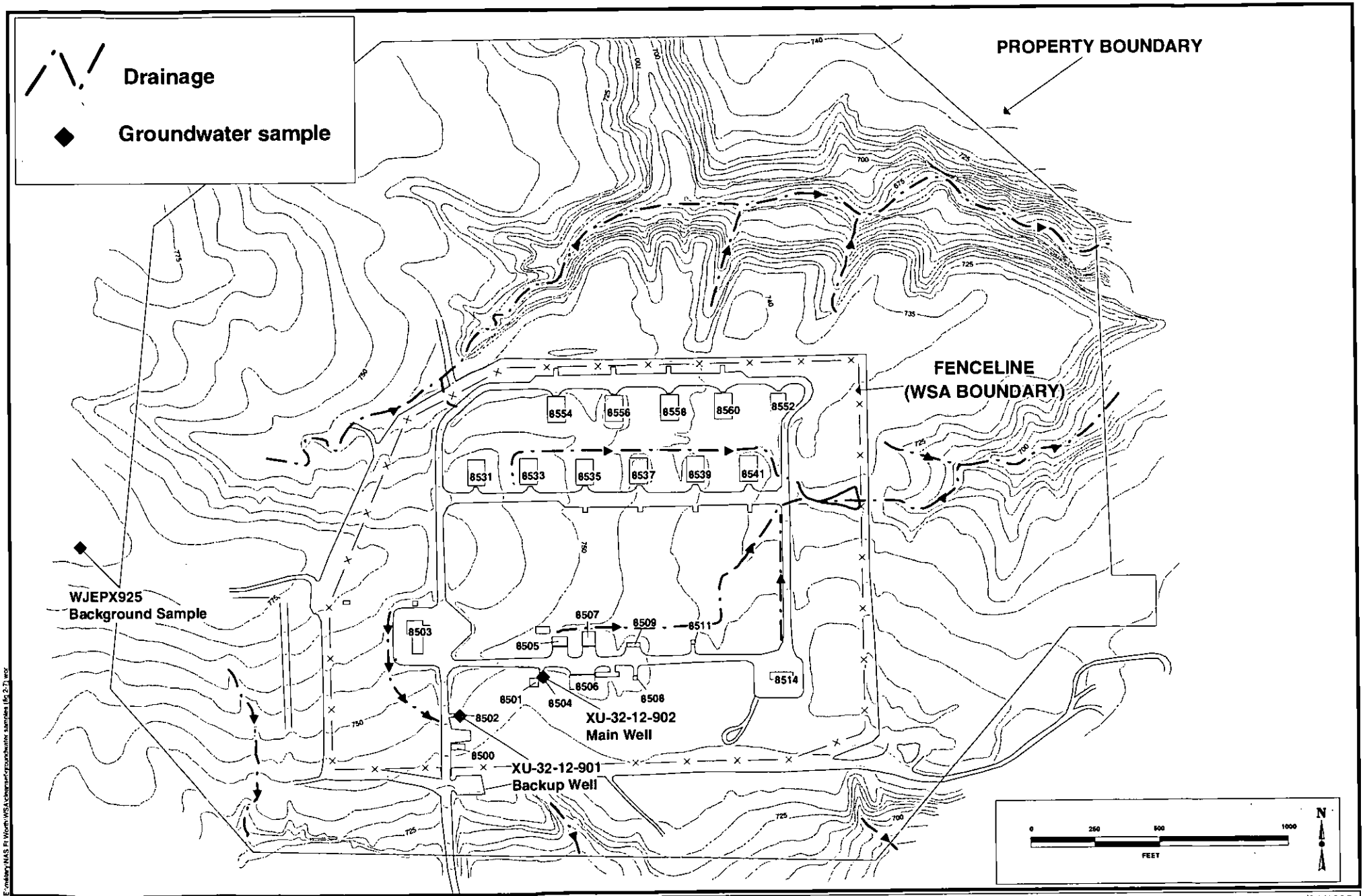
Creation Date:	04/01/1998
Rev. Date:	05/10/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109



The Environmental Company, Inc.

Figure 2-6 -- Drainageway and Seep Surface Water Sample Locations

Creation Date:	04/01/1998
Rev. Date:	05/10/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109



The Environmental Company, Inc.

Figure 2-7 -- Groundwater Sample Locations

Creation Date: 04/01/1998
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

498 165

TAB

3

3.0 SAMPLING AND ANALYSIS RESULTS

The following section presents the results of field investigations and surveys. As identified in Section 2.0, investigations were completed relating to:

- surface and subsurface soils;
- drainageway **and seep** sediment;
- **drainageway and seep surface water**; and
- groundwater.

In addition to these environmental media investigations, surveys of site facilities were also completed. These facilities surveys were focused on:

- asbestos materials;
- lead-based paint; and
- facility surface contamination.

In addition to these site-specific investigations, analyses were conducted on samples collected from background locations representative of the different media investigated. The results of the background levels determination, followed by the results of each of the site media investigations, are presented below. Discussions of each of these investigations include references to supporting tables and figures. These tables and figures are provided at the end of this section. The majority of these tables summarize analytical results. As noted in the tables, these summaries of results include only those analytical parameters that were detected in at least one of the samples collected from the individual area of concern. Data qualifiers have been assigned to the analytical results as needed. Definitions for each qualifier are provided in Table 2-10. Complete laboratory analytical reports are provided in Volume II.

All data provided in the tables and figures are identified on the basis of a unique sample number. Each sample number consists of a seven to eight -digit alpha-numeric code. The first two to three digits identify the area investigated, the next three digits identify the precise sample location within the area, and the last two digits are used to identify samples at a given location.

The soil and sediment samples were collected at specific depth intervals. As discussed in Section 2.2.1 and shown in Figure 2-2, sample depth intervals were:

- surface soil and sediment - 0.0 to 0.5 ft bgs;
- upper subsurface samples - 0.5 to 2.5 ft bgs; and
- lower subsurface soil samples - 2.0 ft interval above bedrock or water interface.

In general, sample numbers for a series of surface, upper subsurface and lower subsurface samples included final digits of 01, 02, and 03, respectively. Field duplicates collected at a sample location were independently identified using the same area-location codes in conjunction with the final digits 04, 05, and 06 for field duplicated surface, upper subsurface and lower subsurface samples, respectively. Other location samples not collected in series (i.e., groundwater) were identified using the same seven-digit area-location-series code, with 01 as the final two digits.

Soil samples collected from the 10th location established in Area A-1 are used as an illustration of the sample location and number identification system. Six samples were collected from location 10 within Area A-1. The location is independently identified as A1-010. Three field samples were collected in addition to three collocated field duplicate samples. The field samples and duplicates were collected from surface, upper subsurface, and lower subsurface intervals. The samples were therefore identified as follows:

- A1-010-01 - surface field sample;
- A1-010-02 - upper subsurface field sample;
- A1-010-03 - lower subsurface field sample;
- A1-010-04 - surface field duplicate sample;
- A1-010-05 - upper subsurface field duplicate sample; and
- A1-010-06 - lower subsurface field duplicate sample.

3.1 BACKGROUND SAMPLE INVESTIGATION EVALUATION

As a preliminary step to evaluating the site data collected during the investigation, analytical results for site samples were compared to the concentrations reported for the background samples. Background samples were collected from surface soil, subsurface soil, surface sediment, **surface water**, groundwater, and facility surfaces. The analytical results of the background samples and the methodology used to develop representative background levels for comparing to site data are presented below.

3.1.1 Soil, Sediment, Surface Water, and Groundwater Background Levels Determination

As discussed in Section 2.2.1.10, 20 background surface and subsurface soil samples were collected from eight off-site locations presumed to be free of site-related contamination. Three surface sediment and **six surface water samples** were collected from drainageways, also at a distance from site-related contamination. Two of the six surface water samples were re-collected from the same location due to a rejection of the explosive results in the original samples. One groundwater sample was collected from a background monitoring well. Analyses were conducted in background samples for all analytes tested for in site samples, with the exception of TPH. These include inorganics, SVOCs, VOCs, pesticides/PCBs, and explosive compounds. TPH is represented by individual constituents, such as PAHs and BTEX. Tables 3-1 through 3-5 present the analytical results for the background surface soil, subsurface soil, drainageway sediment, **drainageway surface water**, and groundwater samples, respectively.

Positive results of two common laboratory contaminants were found in many of the background samples. Nine of the 21 background samples analyzed for VOCs contained methylene chloride. The highest methylene chloride concentration, 0.0053 mg/Kg, was reported in background soil sample BK-013. The highest methylene chloride value reported in the field samples was 0.0089 mg/Kg in sample DW1-009-01. Methylene chloride is a common laboratory used to extract samples for semivolatile organic analysis and for other organic preparatory processes in the laboratory. Methylene chloride is prevalent throughout all environmental laboratories. The new capillary column methods have lower detection limits than the packed column methods, therefore, methylene chloride is now found in samples where it may not have been quantified in the past. **The presence of methylene chloride in these samples does not impact the data assessment.**

Three of the 28 background samples analyzed for SVOCs contained bis(2-ethylhexyl)phthalate. The highest bis(2-ethylhexyl)phthalate concentration, 3.8 mg/Kg, was reported in background sample BK-002. The highest bis(2-ethylhexyl)phthalate value reported in the field samples was 14.0 mg/Kg for DW1-004-02. Bis(2-ethylhexyl)phthalate is also a common laboratory contaminant and is found in many field and QC samples at low levels. Bis(2-ethylhexyl)phthalate is found in plastic products and in some latex products, and is prevalent throughout the environmental industry. **The presence of bis(2-ethylhexyl)phthalate in these samples does not impact the data assessment.**

Samples were analyzed for a total of 24 inorganic analytes. All inorganic analytes were detected in background soil samples except for mercury and silver. Antimony, selenium, and thallium had high frequency of nondetects, with thallium detected in only one subsurface soil sample. Ten out of the 24 inorganics analyzed were detected in groundwater and **13 out of the 24 were detected in surface water**. As expected, very few organic compounds were detected in the soil samples and no organics were detected in the groundwater and surface water samples. Of the three organic compounds detected in soil samples, two of them (bis[2-ethylhexyl]phthalate and methylene chloride) are suspected laboratory contaminants, and therefore were not considered actually present in background locations. Toluene, detected in the drainageway sediment samples, was not identified as a potential laboratory contaminant; therefore, it was assumed to be present at background locations. The source of the toluene is not known.

Representative background statistics for comparing to site concentrations were derived using the Tolerance Interval method, as outlined in RCRA Statistical Analysis Guidance (EPA 1989c, 1992a). This method is an analysis of variance used to determine whether there is statistically significant evidence of contamination among site data. It establishes a concentration range that contains a specified proportion of the population with a specified confidence. For this study, the 95 percent UTL with 95 percent coverage ($UTL_{95,95}$) represents the upper boundary of this concentration range and is used to determine whether site data belong to the background population. The $UTL_{95,95}$ denotes a 95 percent confidence level that the UTL will contain at least 95 percent of the distribution of observations from the background data. Random observations from the same distribution as the background data would exceed the $UTL_{95,95}$ less than 5 percent of the time (EPA, 1989c). Thus, site concentrations exceeding the $UTL_{95,95}$ have only a 5 percent probability of belonging to the background population and are therefore likely to indicate site-related contamination. The $UTL_{95,95}$ was calculated using the following equation (EPA, 1989c):

$$UTL = \overline{X} + (K)(S)$$

Where: $\overline{X}$ is the background mean;

K is the one-sided normal tolerance factor; and

S is the standard deviation.

$UTL_{95,95}$s were generated for all inorganics for which analysis was conducted in background soil and **surface water** samples (total of 24). UTLs were not calculated for organic compounds as described above because background for these constituents is presumed to be nondetect. All organic compounds (including toluene) in the site samples except bis(2-ethylhexyl)phthalate and methylene chloride were identified as being above background in site data tables.

Background levels were also identified for groundwater, although $UTL_{95,95}$s were not actually derived because only one background sample was collected. The single detects presented in Table 3-5 represent the background concentrations used to compare to site concentrations.

Background soil samples were collected from the surface (0-0.5 ft bgs), subsurface soil (greater than 0.5 ft bgs), and drainageway surface sediments. UTLs were generated separately for the surface and subsurface horizons. To increase the usefulness of the background data to the project and produce a more robust data set for background surface soil, data from the surface soil and drainageway surface sediment samples were combined for all metals except magnesium. The validity of combining these two data sets was analyzed prior to merging them. This was accomplished by comparing the confidence intervals and applying t-tests to compare the means of both sample sets for all the inorganics. If the means and confidence intervals are statistically the same, then it is valid to combine the two sample sets and let them represent one population. With the exception of magnesium, all comparisons indicated that there is not a statistically significant difference between the means or confidence intervals of the data sets. Therefore, the two data sets were combined into one. The comparisons of the confidence intervals and means for the magnesium suggest that the data sets are not similar, and therefore were not combined. The $UTL_{95,95}$ for this analyte in all areas, except the drainageways, is based on only the surface soil background data. The $UTL_{95,95}$ for magnesium in the drainageway surface sediment is based on the sediment data alone.

The $UTL_{95,95}$, summarized in Tables 3-6 and 3-7 for soil/sediment and surface water, respectively, were derived according to the frequency of nondetects and the data distribution for each data set (e.g., normal, lognormal, or not identifiable). If the frequency of nondetects was less than 15 percent, the undetected values were replaced by one-half the analytical method detection limits (EPA 1989c, 1992a) prior to generating $UTL_{95,95}$ according to the most relevant distribution. If the frequency of nondetects was between 15 and 50 percent, the reported nondetect concentrations were adjusted using Cohen's Adjustment Method outlined in EPA (1989c) and the $UTL_{95,95}$ was calculated according to the most relevant distribution. If the frequency of nondetects exceeded 50 percent (but were less than 100 percent), the maximum detected value was established as the $UTL_{95,95}$. If a compound was not detected, the $UTL_{95,95}$ was represented as the maximum detection limit.

Both the Shapiro-Wilk test and normal probability plots were employed to test the normality of each data set and identify appropriate data distribution for calculating the $UTL_{95,95}$. These tests were applied to both the raw data and the log-transformed data. The highest Shapiro-Wilk test statistic, combined with the observation of the plot, provided the basis for selecting the most appropriate distribution. Critical Shapiro-Wilk statistics were obtained from EPA (1992a).

As shown in Table 3-6, background soil data with a frequency of detect greater than 50 percent were also evaluated for the existence of any outliers and the extent to which these outliers may impact the $UTL_{95,95}$ (this test is invalid for data sets with high frequency of nondetects). Outliers were tested according to the T statistic procedures outlined in EPA (1989c). The T statistic was calculated for each compound using the following equation:

$$T_n = \frac{(X_n - \overline{X})}{S}$$

Where X_n is the data point in question;

$\overline{X}$ is the mean of the data set; and

S is the standard deviation.

A T statistic exceeding the tabulated critical value provided in EPA (1989c) is evidence that the data point is an outlier and not a member of the background data set. Outliers were not removed from any data sets on this basis, but were identified for the purpose of characterizing the data sets. Because no data validation issues associated with the outliers were identified, it was assumed that the outliers are a result of natural variation in background concentrations and were retained in the UTL calculations.

Outliers were identified for antimony, cadmium, and molybdenum in surface soil and for arsenic, cobalt, manganese, and nickel in subsurface soil. The outlier data points identified in the surface soil were all reported in one sample, BK-008. No obvious patterns were evident among the subsurface soil samples. In most cases, the data set was identifiable as normally or lognormally distributed via the normality tests, even with the outliers included. Therefore, a $UTL_{95,95}$ was derived based on the entire data set. The inclusion of the outliers yield a 35 to 60 percent increases in the $UTL_{95,95}$ for the metals noted above. The antimony data do not have an identifiable distribution, even with the two highest concentrations excluded from the data set. This may be because the frequency of nondetects was a relatively high 36 percent. As a result, the maximum detected concentration was used as the $UTL_{95,95}$. An outlier identified among the surface soil samples for cadmium impacted the surface soil vs. drainageway data set comparison performed above. Specifically, with the outlier included in the surface soil data set, the confidence intervals and sample means of the cadmium surface soil and drainageway sediment sample sets were statistically different. This result indicates that the sample sets should not be combined. When comparing these parameters with the outlier omitted from the data set, however, the confidence intervals and means were not significantly different. On this basis, the sample sets for cadmium were combined (including the outlier) to calculate a $UTL_{95,95}$.

3.1.2 Facility Surface Contamination Background Levels Determination

Background samples were also collected for comparison of wipe samples collected from the surfaces of selected Offsite WSA buildings' interior walls and floors. As described in Section 2.2.5.3, four background wipe samples were also collected from an adjacent residence. The samples were analyzed for inorganic analytes and explosive compounds. Table 3-8 presents the analytical results for the facility surface background wipe samples.

Twenty-two of 24 inorganic analytes were detected in at least one wipe background sample. Silver and thallium were not detected in any of the samples. One explosive compound was also detected in one background wipe sample.

Facility surface contamination background levels were determined utilizing the Tolerance Interval method described above (EPA, 1989c and 1992a). The wipe sample background $UTLs_{95,95}$ were generated for all metals analyzed in background facility samples. Wipe background $UTLs_{95,95}$ were not developed for explosive compounds because background for these constituents is presumed to be nondetect. 2,4,6-Trinitrotoluene was detected in one of the

background wipe samples, however, this compound was not detected in any of the facility wipe samples.

Results of the $UTL_{95,95}$ determinations are presented in Table 3-8; the distributions identified for each parameter's data set and the wipe background $UTL_{95,95}$ value are included.

3.2 SURFACE AND SUBSURFACE SOILS INVESTIGATIONS

As discussed in Section 2.2.1, surface and subsurface soils associated with ten separate potential source areas were investigated (see Figure 2-2). These areas include:

- outdoor materiel storage and maintenance area (A-1);
- outdoor materiel storage and maintenance area (A-2);
- waste accumulation area (SWMU 59) and Bldg. 8503 (A-3);
- disturbed surface area southwest of the control fence (A-5);
- EOD range;
- bunker floor drain outlets;
- removed UST locations;
- vehicle fueling area (A-4);
- areas beneath electrical transformers; and
- **leach field**.

Analytical results and supporting field measurements and observations associated with each of these potential source area investigations are presented below. Tables summarizing the results are included with each discussion. These tables only include results for those parameters reported at concentrations above the MDL in at least one sample. To further identify the parameters of potential concern, the reported values were compared to the media-specific background $UTL_{95,95}$ as described in Section 3.1. Boxes have been placed around those values greater than their associated $UTL_{95,95}$. Complete analytical results for all samples are provided in Volume II of this report.

In order to aid in the interpretation of the **initial characterization** results for areas with a large number of samples, statistical summaries of the analytical results have also been provided when appropriate. They are included immediately following the summary of detected results table for each area. Statistical parameters provided include:

- frequency of detection above the MDL;
- percent of reported values greater than the media specific background $UTL_{95,95}$; and
- maximum reported concentration.

The results for the supplemental sampling used to verify previous detects and delineate the extent of contamination are not included in the statistical summaries.

It should be noted that the reported detection limit for a number of parameters, including antimony and mercury, were in some cases greater than the background $UTL_{95,95}$. These undetected values have been identified with boxes in the data tables but are not included in the statistical summary of results.

In order to highlight potential contaminant spatial distribution, the results from each area investigation are also provided on area maps that show any potential sources and sample locations. Reported values exceeding media specific background $UTL_{95,95}$ are posted for each sample location. These potential contaminant distribution maps are provided at the end of this section, following all tables.

3.2.1 Outdoor Materiel Storage and Maintenance Area (A-1)

Materiel storage and maintenance reportedly took place in a number of areas at the Offsite WSA. The largest of these potential source areas is between Bldg. 8503 and Munitions Storage Bunkers 8531, 8533, and 8535 (Area A-1) (see Figure 2-2).

A total of 84 surface and subsurface soil samples were collected during the initial characterization effort from 34 locations within Area A-1. Surface soil samples were collected at each location. Although attempts were made to collect two subsurface samples at each of the 34 locations, the relatively shallow limestone bedrock in this area limited the number of Area A-1 subsurface soil samples to 47. Area A-1 samples included seven field duplicates; three were collocated with surface samples and four were associated with subsurface samples.

Area A-1 samples were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Sections 2.2.1 and 2.2.1.1. Table 3-9 provides a summary of sample results for Area A-1 soil samples. As indicated above, only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. Table 3-11 further summarizes the **initial characterization** results from Area A-1.

Eleven supplemental surface soil samples (including one duplicate) were collected from 10 sample locations established in the vicinity of A1-019 and A1-028 (A1-100 to A1-114). Two of these samples were collected from the original locations of A1-019 and A1-028 to verify previous anomalous detects. The remaining nine samples were collected to further define the horizontal extent of these detects. The results for these samples are summarized in Table 3-9.

Inorganics

Ten inorganic analytes were detected at concentrations above the background $UTL_{95,95}$. Cadmium and antimony were most often detected above the background $UTL_{95,95}$. In each case, the exceedance was present in subsurface soils only. As shown in Table 3-11, this pattern was typical of most of the inorganics reported. Although cadmium and antimony most often exceeded the background $UTL_{95,95}$, the difference between the maximum reported value and the background $UTL_{95,95}$ was not great. The maximum reported cadmium and antimony values of 1.4 mg/kg and 2.0 mg/kg were less than three times their respective background $UTL_{95,95}$ values.

In contrast, the maximum nickel concentration of 514 mg/kg originally reported for sample A1-028-01 was 24 times greater than the background $UTL_{95,95}$. **This surface sample was the only one to exceed the nickel background $UTL_{95,95}$. However, the verification and extent of contamination samples collected from and in the vicinity of A1-028 during the Fall 1998 field effort (locations A1-100 to A1-114) had nickel concentrations below the $UTL_{95,95}$ (see Table 3-9). Therefore, the**

original detect is assumed to have been either an analytical anomaly or existing contamination that was removed during sampling.

Figure 3-1 shows the distribution of inorganic analytes detected at concentrations greater than the background $UTL_{95,95}$. A review of this distribution reveals no evidence of a source-related pattern. The contaminants appear to be randomly distributed across Area A-1. Figure 3-2 **depicts the results of the verification and extent of contamination sampling for nickel relative to background.**

Organics

Excluding methylene chloride and bis(2-ethyhexyl)phthalate, organic compounds were estimated to be present in only three of the 84 samples, at concentrations slightly greater than the MDL, but less than the PQL (see Table 3-9 and Figure 3-1). The organic compounds included five PAHs and one VOC. Pesticide/PCBs and explosives were not detected.

In one sample (A1-019-01), two of the five PAHs (benzo[a]pyrene and benz[a]anthracene) detected were reported above TNRCC RRSN2 cleanup levels (TNRCC, 1998). A verification sample (A1-100-01) was therefore collected at the original sample location A1-019 to verify the PAH results. Four additional samples (A1-101-01, A1-102-01, A1-103-01, and 1-104-01) were collected to delineate the extent of the detects. PAHs in initial samples A1-024-01 and A1-028-01 were detected well below TNRCC RRSN2 cleanup levels.

PAHs were not detected in the verification and extent of contamination samples collected at or in the vicinity of A1-019 (see Table 3-9 and Figure 3-3). The original detects are therefore assumed to have been either analytical anomalies or existing contamination that was removed during sampling. In addition, the limited number of PAHs detected in Area A-1 were found in samples collected closest to the roadway. The concentrations reported for these compounds are comparable to background PAHs levels reported in the literature for agricultural soil (see Table 3-10). It is therefore assumed that these compounds are due to anthropogenic sources rather than an unauthorized discharge as defined by TNRCC Industrial Solid Waste and Municipal Hazardous Waste (TAC Chapter 335) regulations.

Although the MDLs for these compounds are above TNRCC RRSN2 standards (TNRCC, 1998), laboratory documentation provided in Appendix U demonstrates that the analytical results were reported at the lowest achievable detection limit using U.S. EPA Method SW8270.

3.2.2 Outdoor Materiel Storage and Maintenance Area (A-2)

The second area where outdoor materiel storage and maintenance reportedly took place is identified as Area A-2. This area is located along the northern perimeter of the Outdoor WSA, between the northernmost service road and the security fence (see Figure 2-2).

A total of 19 surface and subsurface soil samples were collected from eight locations in Area A-2. At each location, one surface sample and one upper subsurface sample were collected. In

addition to these field samples, one surface and two subsurface duplicate field samples were collected.

Area A-2 samples were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Sections 2.2.1 and 2.2.1.1. Table 3-12 provides a summary of sample results for Area A-2 soil samples. As indicated above, only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. Table 3-13 further summarizes the results from the A-2 soil investigation by providing a statistical summary of parameters detected above the background $UTL_{95,95}$.

Inorganics

Six inorganic analytes were detected at concentrations above the background $UTL_{95,95}$. Arsenic, copper, and zinc were detected above the background $UTL_{95,95}$ in surface soil samples; subsurface samples contained elevated concentrations of antimony, copper, and molybdenum. All inorganic concentrations were less than twice the background $UTL_{95,95}$.

Figure 3-4 shows the results of the Area A-2 soil investigation on the basis of sample location. Only those values exceeding the background $UTL_{95,95}$ are posted. As with Area A-1, the distribution of inorganic analytes do not show a concentration in any one area. Although six of eight locations contained a parameter with concentrations above the background $UTL_{95,95}$, the parameters were varied at each location. The distribution of inorganic analytes with respect to depth also failed to show any discernible pattern.

Organics

Toluene was the only organic detected above the background $UTL_{95,95}$. The VOC was detected in one sample at a concentration less than the PQL.

3.2.3 Waste Accumulation Area (SWMU 59) and Building 8503 (A-3)

Area A-3 encompasses those areas potentially impacted from activities associated with the Waste Accumulation Area (SWMU 59) and Bldg. 8503. As indicated in Section 2.2.1.2, Bldg. 8503 is the largest building at the Offsite WSA and contained multiple facilities for equipment maintenance activities, including painting operations.

A total of 61 samples were collected during the initial characterization effort from 23 locations within Area A-3 (see Figure 2-2). Nineteen locations were beyond the perimeter of the concrete pad. Surface soil samples were collected at all of these locations. Thirty subsurface soil samples were also collected from the locations positioned beyond the perimeter of the concrete pad. Four locations (A3-018, A3-019, A3-020 and A3-021) were at gaps in the concrete pad adjacent to the Waste Accumulation Area. A total of eight subsurface soil samples, two from each location, were collected from boreholes located at gaps in the concrete. In addition to these field samples, four field duplicate samples (one surface and three subsurface) were collected.

Area A-3 samples were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Sections 2.2.1 and 2.2.1.2. As indicated, analyses for pesticides/PCBs and explosive compounds were typically performed on approximately 10 percent of the samples. Because of the complexity of wastes potentially associated with the

Waste Accumulation Area, pesticides/PCB and explosive compound analyses were focused on samples collected from locations closest to the accumulation area (A3-009, A3-018, A3-019, A3-020, and A3-021).

Table 3-14 provides a summary of sample results for Area A-3 soil samples. As indicated above, only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. Table 3-15 provides a statistical summary of A-3 parameters detected above the background $UTL_{95,95}$. A greater number of inorganic analytes and organic compounds with concentrations exceeding the background $UTL_{95,95}$ were present in Area A-3 samples as compared to those collected from Areas A-1 and A-2. A total of 10 inorganic analytes and 21 organic compounds were present in at least one sample at a concentration in excess of the background $UTL_{95,95}$.

Based on the results of the initial characterization effort, a supplemental effort was completed at Area A-3. A total of 32 supplemental surface and subsurface soil samples (including two duplicates) were collected from 22 Area A-3 locations (A3-100 to A3-133) to verify anomalous detects reported in the original samples and to further define extent of the contamination. Fifteen surface samples were collected for semivolatile analysis (Method SW8270) from locations that were 15 and 30 feet from the edge of the pavement to determine the extent of PAH contamination. Two subsurface (0.5 to 2.5 ft bgs) and one surface (0 to 0.5 ft bgs) samples were also collected at three of the locations that were adjacent to original sample locations A3-002 and A3-013. Additional soil samples were collected to verify previously reported anomalous antimony and mercury detects in Area A-3. Supplemental samples were collected to delineate the extent of these compounds. Results of the verification and extent of contamination samples collected from locations A3-100 to A3-133 are provided in Table 3-14 and depicted in Figures 3-6 through 3-8 with the other results.

Inorganics

Five of the 10 inorganics detected at concentrations above the background $UTL_{95,95}$ did so in at least 25 percent of the surface samples. The most common inorganic analytes with elevated concentrations in surface samples were arsenic, cadmium, copper, lead, and zinc. Lead was the most frequently detected (60 percent) analyte in surface samples with elevated concentrations above the background $UTL_{95,95}$. Sample A3-007-01 contained the greatest concentration of lead at 153 mg/kg, more than five times the background $UTL_{95,95}$. Cadmium and mercury were also reported at high concentrations relative to the background $UTL_{95,95}$. Cadmium was detected in sample A3-015-01 at a concentration of 6.3 mg/kg, more than five times the background $UTL_{95,95}$. The maximum mercury concentration (10.9 mg/kg) detected in the surface soil at A3-006 was more than 200 times the background $UTL_{95,95}$.

Although inorganic analytes were also detected in subsurface soils, the extent and magnitude of subsurface contamination generally decreased relative to surface contamination. With the exception of antimony and copper, the percent of inorganics reported at concentrations above the background $UTL_{95,95}$ and the maximum reported concentration decreased with depth (see Table 3-15. Although no surface sample contained antinomy at a concentration greater than the background $UTL_{95,95}$, 39 percent of subsurface samples did. This relative increase is largely attributable to antimony's lower subsurface soil background $UTL_{95,95}$ (0.92 mg/kg) compared to

the surface value (4.5 mg/kg). Sample A3-019-02, located beneath the concrete pad and adjacent to the Waste Accumulation Area, contained the greatest concentration of antimony (1,300 mg/kg). Although subsurface copper was detected above the background $UTL_{95,95}$ less frequently than in surface samples, the maximum reported concentration increased to 112 mg/kg in sample A3-021-02.

Figure 3-5 shows the initial characterization results of the Area A-3 soil investigation on the basis of sample location. Only those values exceeding the background $UTL_{95,95}$ are posted. The figure shows inorganic analytes with concentrations greater than background $UTL_{95,95}$ distributed around the entire perimeter of the concrete pad. The second series of samples, collected further to the west and east of drainageway DW-1 (A3-015, A3-016, and A3-017), contained fewer inorganic analytes of concern at lower concentrations. The westernmost samples (A3-024 and A3-025) did not contain inorganic analytes at concentrations greater than the background $UTL_{95,95}$. Samples collected beneath the concrete pad contained relatively fewer inorganic analytes with elevated concentrations; however, one of these samples (A3-019-02) contained 1,300 mg/kg of antimony.

With the exception of antimony and mercury, the inorganic concentrations appeared to be randomly distributed around the area at relatively low levels. No unauthorized discharges of inorganic compounds were evident (per TNRCC Industrial Solid Waste and Municipal Hazardous Waste, TAC Chapter 335). Within the data set generated for antimony and mercury, some concentrations were anomalously high, as noted above. To verify these concentrations, additional samples were collected in the vicinity of where they were reported, as discussed in Section 2.2.1.2.

Samples A3-006-20 and A3-120-01 were collected to verify the original reported mercury concentration in sample A3-006-01. These verification samples contained 0.079 mg/kg and 0.32 mg/kg. These values are lower than the original concentration of 10.9 mg/kg, but above the $UTL_{95,95}$. Extent of contamination samples A3-121-1, A3-122-01, and A3-123-01 were collected within 10 feet of A3-006. These samples show that mercury is present in the surface soil at concentrations as high as 7.5 times the background $UTL_{95,95}$. Distribution of this compound above background based on the original and supplemental samples is shown in Figure 3-6.

Verification samples also were collected at locations A3-130, A3-131, A3-132, and A3-133 directly adjacent to original locations A3-019 and A3-020, where high antimony levels were reported. All verification samples yielded antimony concentrations below MDLs and near the background $UTL_{95,95}$. The contamination initially identified at A3-019 and A3-020 is therefore assumed to have been either represented by analytical anomalies, removed during sampling, or influenced by concrete drilling techniques used in the initial characterization effort. During the supplemental verification effort, care was taken to blow all concrete cuttings away from the holes during coring. Figure 3-7 presents the antimony results relative to background by original and additional sample locations.

SVOCs

A number of organic compounds, most of which are PAHs, are also highlighted in Tables 3-14 and 3-15. As the background $UTL_{95,95}$ for organics is defined as the detection limit, any compound reported present is of potential concern. Eleven of the 14 SVOCs detected were present in more than 50 percent of the samples. Pyrene and fluoranthene were reported at the greatest concentrations in surface samples, at 10.0 and 13.0 mg/kg, respectively.

As with inorganics, the percent of samples with SVOCs and the reported concentrations decreased with depth. For example, pyrene was only present in 10 percent of subsurface samples at maximum concentrations of 0.92 mg/kg. Fluoranthene was not detected in subsurface samples.

The distribution of SVOCs generally matched that displayed by inorganic analytes (see Figure 3-5). SVOCs were present around the entire perimeter of the concrete pad, including the three locations further to the west (A3-015, A3-016, and A3-017). The westernmost samples (A3-024 and A3-025) and samples beneath the concrete pad were free of SVOCs.

The surficial and ubiquitous low-level nature of the PAH detects in the original samples suggests that these compounds are due to anthropogenic sources rather than an unauthorized discharge as defined by TNRCC Industrial Solid Waste and Municipal Hazardous Waste (TAC Chapter 335) regulations. To confirm this possibility, supplemental samples were collected at locations A3-100 through A3-115 and were analyzed for SVOCs to delineate the extent of the PAHs (see Table 3-14). The results demonstrate that PAHs are limited to surface soil located within 15 feet of roadways and parking areas. Figure 3-8 displays the surface distribution of PAHs by sample location based on both the initial characterization and additional samples collected. The distribution of these results show that PAH concentrations decrease to nondetect as samples are collected progressively further from the pavement surrounding Bldg. 8503. Samples collected 30 feet from the edge of the pavement had no detectable levels of PAHs. Samples with the highest reported PAH concentrations are adjacent to areas believed to have been used as parking and loading/unloading zones. Based on these results, it is assumed that the PAH concentrations reported for A-3 soil are due to roadway runoff from the pavement surrounding Bldg. 8503.

In support of this conclusion, PAH results were compared to anthropogenic background levels of PAHs reported in the literature. Literature sources indicate that the principal sources of PAHs along roadways are due to vehicular exhausts and surface runoff of emissions and that the majority of PAH deposition occurs within 15 feet of roadways Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR, 1995 and USFWS, 1987). Background concentrations for rural, agricultural, and urban soils from the United States and other countries are shown in Table 3-10. The values reported in Table 3-10 were derived from a variety of sources. PAH concentrations identified in the literature were therefore compared to site concentrations as a whole in order to assess general trends with respect to anthropogenic sources.

PAH concentrations detected in A-3 soils are generally comparable to those reported in this table for agricultural soils. PAH concentrations that are more

consistent with those documented for urban soils were detected in locations adjacent to pavement edge where vehicle use would have greatest impact.

Although some of the MDLs for the PAHs reported in A-3 samples are above the TNRCC RRSN2 cleanup levels (TNRCC, 1998), laboratory documentation provided in Appendix U demonstrates that the analytical results were reported at the lowest achievable detection limits using U.S. EPA Method SW8270.

VOCs

Four VOCs (in addition to methylene chloride) were also detected in the subsurface samples. A total of six out of 41 subsurface samples (including one duplicate) contained trichloroethene (TCE). TCE was present at the greatest concentration (0.0560 mg/kg) in sample A3-009-03. The VOCs were present in both upper subsurface and lower subsurface samples.

With the exception of methylene chloride, samples with VOCs were located adjacent to the Waste Accumulation Area. Samples containing TCE included those from three locations directly adjacent to the concrete pad (A3-009, A3-010, and A3-011) and a location beneath the concrete pad (A3-018). As shown in Figure 3-5, location A3-018 is adjacent to the edge of the pad, indicating that VOC contamination has migrated under the concrete to a limited extent.

Pesticides/PCBs and Explosives

Three pesticides were also detected at concentrations below the MDL. Beta-BHC was present in all four of the subsurface samples analyzed for pesticide/PCBs. One of the four subsurface samples also contained 4,4'-DDE and 4,4'-DDT. Explosives were not detected in any of the surface samples. Pesticide/PCBs and explosives were not detected in any of the surface samples. As shown in Figure 3-5, samples containing pesticides were not associated with respect to location.

3.2.4 Disturbed Surface Area (A-5)

The disturbed surface area is located at the southeast corner of the property, outside of the inner security fence (see Figure 2-2). Four sample locations were established within Area A-5. Surface and subsurface soil samples were collected. One surface sample was collected from each location. A total of seven subsurface samples were collected from the area. One of the seven subsurface soil samples was a field duplicate.

Area A-5 samples were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Sections 2.2.1 and 2.2.1.3. Table 3-16 provides a summary of sample results for Area A-5 soil samples. As indicated above, only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. Results are also reported with respect to location on Figure 3-9.

Inorganics

Six inorganic analytes were detected in Area A-5 samples at concentrations greater than the background $UTL_{95,95}$. These included antimony, cadmium, copper, molybdenum, selenium, and zinc. As shown in Table 3-17, only subsurface soil samples contained analytes with concentrations greater than the background $UTL_{95,95}$. Cadmium was most frequently detected at elevated concentrations. Three of the seven subsurface sample cadmium values were greater

than the background $UTL_{95,95}$. Sample A5-001-02 contained the greatest concentration of cadmium, 1.0 mg/kg. It should be noted that the subsurface background $UTL_{95,95}$ for these potential contaminates of concern, with the exception of selenium, are greater than the surface background $UTL_{95,95}$ (see Table 3-6). As a result, the maximum cadmium concentration in the subsurface is less than the surface background $UTL_{95,95}$.

Organics

With the exception of methylene chloride, no organic compounds were detected in A-5 soil samples.

3.2.5 EOD Range

The EOD range was located directly west of the fenced Offsite WSA area (see Figure 2-2). As described in Section 2.2.1.4, remaining features include a protective bunker and a 2-foot high berm forming a circle approximately 300 feet in diameter north of the bunker. Debris and burial pits previously cleared of ordnance were located within the bermed area and to the east of the berm (USAF, 1995).

A total of 31 soil samples were collected from 11 locations during the initial characterization effort. Twelve of the samples were collected from the surface; 19 were collected from the subsurface. Eight of the sample locations were established where the ordnance clearance report identified ordnance related debris or burial pits (EOD-001 through EOD-008). One sample was located directly south of the protective bunker (EOD-009). Two additional, unbiased locations were established within the center of the bermed area (EOD-010 and EOD-011).

Analyses conducted on EOD Range samples included inorganic analytes and explosive compounds as described in Sections 2.2.1 and 2.2.1.4. One sample was also analyzed for leachable total organic carbon. Table 3-18 provides a summary of sample results for EOD Range soil samples. As indicated above, only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. The sample results greater than the background $UTL_{95,95}$ are posted on a map of the EOD Range showing sample location in Figure 3-10.

Based on the results reported for the 31 initial samples, a total of 19 supplemental surface and subsurface soil samples from nine locations (EOD-100 through EOD-113) were collected from the EOD Range to verify the detects reported in the initial samples and to further define extent of the contamination. Two verification samples (one surface, one subsurface) were collected at EOD-110 directly adjacent to the initial sample location, EOD-009, to verify previously reported detects of thallium. Six supplemental samples were collected from three locations (EOD-111, EOD-112, and EOD-113) 10 feet to the south, east, and west of EOD-009 to determine the extent of the thallium contamination. Two samples were also collected at EOD-100 directly adjacent to original sample location EOD-006 to verify dinitrotoluene detects. Eight surface and subsurface supplemental samples were collected from four locations (EOD-101, EOD-102, EOD-103, and EOD-104) 10 feet to the north, south, and east of EOD-006. Sample results for the verification and extent of contamination sampling are provided in Table 3-18 and depicted, relative to background levels, in Figures 3-11 and 3-12.

Inorganics

Nine inorganics were detected in surface and subsurface samples at concentrations greater than the background $UTL_{95,95}$. Arsenic, silver, and vanadium were reported in at least one surface sample at concentrations greater than the surface background $UTL_{95,95}$. As shown in Table 3-19, concentrations of silver most often exceeded the surface background $UTL_{95,95}$. Sample EOD-006-01 contained the greatest concentration of silver at the surface (1.5 mg/kg), approximately 2.5 times the background $UTL_{95,95}$.

Four subsurface samples contained inorganic analytes at concentrations greater than the background $UTL_{95,95}$. Antimony and zinc were present in all four subsurface samples above background (see Table 3-19). Cadmium and copper were present at elevated levels in two subsurface samples. Selenium, silver, and thallium concentrations were elevated in one subsurface sample.

Thallium was detected in only one subsurface sample (EOD-009-02) at a concentration of 4.1 mg/kg. This value is four times the background $UTL_{95,95}$ and TNRCC RRSN2 cleanup levels (TNRCC, 1998). Two verification samples were therefore collected at location EOD-110 to confirm this detect. Six additional samples (including one duplicate) from locations EOD-111 to EOD-113 were collected to delineate the potential extent of thallium. As shown in Table 3-18 and depicted in Figure 3-11, thallium was reported as nondetect and below the background level in all samples. The original detect on sample EOD-009-02 is therefore assumed to have been either an analytical anomaly or existing contamination that was removed during sampling.

As shown in Section 5.0, all other inorganics were present at levels below RRSN2 cleanup levels.

Explosives

Explosives were only detected in one of the 31 soil samples collected during the initial characterization effort. Subsurface soil sample EOD-006-02 contained 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, and 2,6-dinitrotoluene. There were no traces of these compounds in the location's surface sample. 2,4-dinitrotoluene was found at the greatest concentration of 26.0 mg/kg. A site map associated with the clearance report indicated that location EOD-006 contained "miscellaneous metal" (USAF, 1995).

The verification and extent of contamination samples collected from EOD-100 to EOD-104 all had nondetectable levels of the dinitrotoluenes (see Figure 3-12). The original detects are therefore assumed to have been either analytical anomalies or existing contamination that was removed during sampling.

Although the MDLs for the explosive residues reported for the verification and extent of contamination samples are above the RRSN2 concentrations, laboratory documentation provided in Appendix U demonstrates that the analytical results were reported at the lowest achievable detection limits using U.S. EPA Method SW8330.

3.2.6 Bunker Floor Drain Outlets

As discussed in Section 2.2.1.5, each of the 11 abandoned munitions storage bunkers contain two interior drainage troughs located along the side walls. Each drainage trough discharges to the exterior ground surface through drains located at the base of the front wall. Surface and subsurface soil samples were collected at each drain discharge location (see Figure 2-2).

A total of 56 samples were collected from original bunker drain sample locations. Twenty-four of the samples were collected from the surface; the remaining 32 were collected from the subsurface. Four of the samples were duplicate field samples. Two of the duplicates were collocated with surface samples and two were collocated with subsurface samples.

Analyses conducted on bunker floor drain samples included inorganic analytes and explosive compounds as described in Sections 2.2.1 and 2.2.1.5. Table 3-20 provides a summary of sample results for soil samples. As indicated above, only results for parameters detected above the MDL in at least one sample are shown. A statistical summary of the results is provided in Table 3-21. A box has been placed around those values detected above the background $UTL_{95,95}$. The distribution of contaminants detected above the background $UTL_{95,95}$ are shown in Figure 3-13.

Based on the results of the 56 initial samples, 57 supplemental surface and subsurface soil samples (including five field duplicates) were collected from bunker drain locations BD-100 through BD-150 to verify detects of inorganic compounds reported in the original samples and to further define extent of contamination. Five surface samples were collected from locations BD-100, BD-101, BD-104, and BD-105 at and in the vicinity of BD-002 (adjacent to Building 8531) to verify and determine the extent of mercury. Five samples were collected from locations BD-102 and BD-103 at and in the vicinity of BD-005 (adjacent to Building 8535) to verify and determine the extent of anomalous copper detects. The remaining 47 samples (locations BD-106 through BD-150) were collected from each bunker drain (four from each bunker) to delineate cadmium, copper, lead, and zinc. The distribution of the results associated with the additional samples are shown in Figures 3-14 to 3-18.

Inorganics

Compared to other areas investigated, the bunker drain samples contained the greatest number of inorganic analytes with concentrations greater than the background $UTL_{95,95}$. A total of 13 analytes were present at concentrations greater than the background $UTL_{95,95}$. **Mercury was detected in five samples, with the highest reported for BD-002-01.** Four inorganic analytes, cadmium, copper, lead, and zinc, were reported at concentrations elevated above the background $UTL_{95,95}$ in more than 50 percent of the surface samples (see Table 3-21).

Cadmium and lead concentrations were the highest relative to the background $UTL_{95,95}$. Cadmium was detected at more than eight times the background $UTL_{95,95}$ in sample BD-004-01 at a concentration of 9.7 mg/kg. The greatest concentration of lead (200.0 mg/kg) was reported in subsurface soil sample BD-005-02, at more than 11 times the background $UTL_{95,95}$. The highest concentration of copper was also detected in BD-005-02. It was more than 100 times

the background level and generally 10 times or more higher than the concentrations of the other samples.

The verification sample collected from BD-002 (BD-100-01) confirmed that mercury is present in the surface soil at a concentration less than 10 times the background $UTL_{95,95}$ at this location. The delineation samples show that the mercury concentration increases just south of BD-002, at BD-101, then decreases to background at six to seven feet south of BD-002 (BD-105) (see Figure 3-14). The sample collected east of the original location (from BD-104) had no detectable levels of mercury.

As shown in Figure 3-15, the verification sample collected from BD-005 (BD-102-02) had a copper concentration below the subsurface background $UTL_{95,95}$. Surface and subsurface samples collected in the near vicinity of BD-005 (BD-102 and BD-103) also had copper levels below the background level. Sample results relative to background for all locations are provided in Figure 3-15. This depiction shows that the majority of the results are below background. All of those reported as above background, except the original result for BD-005, exceed less than 10 times.

An additional 47 samples were collected from 44 locations (BD-106 to BD-150) associated with each bunker drain in order to further delineate copper, cadmium, lead, and zinc concentrations. Of the samples collected only one a reported copper concentration above background. This sample was collected adjacent to Bldg. 8558.

As shown in Table 3-20 and depicted in Figure 3-16, the majority of the results for cadmium are either below or less than 10 times the background levels. The three notable exceptions are cadmium detected in surface soil samples collected from locations BD-130, BD-137, and BD-138 (adjacent to Bldg. 8554, Bldg. 8556, and Bldg. 8558, respectively). These samples contained cadmium at concentrations ranging from 23.7 mg/kg to 51.4 mg/kg, 20 to 43 times the background $UTL_{95,95}$ of 1.2 mg/kg.

Similarly, all but one of the results for lead are either below or less than 10 times background (see Figure 3-17). The one exception, which is discussed above, is the result of the original upper subsurface sample BD-005-02, adjacent to Bldg. 8535. The surface sample collected at BD-005 had a lead level (49.5 mg/kg) that was less than twice the background; the sample collected below BD-005-02 (at 2.5 to 4.5 feet bgs) had levels below background. The other initial sample location adjacent to Bldg. 8535 (BD-006) had below-background lead levels in the surface and lower subsurface (2.5 to 4 feet bgs) samples; it had a lead concentration (19.8 mg/kg) slightly exceeded background in the upper subsurface sample (0.5 to 2.5 feet bgs). The supplemental samples collected in the vicinity of location BD-005 contained levels of lead below background (locations BD-114 to BD-117).

As shown in Figure 3-18, the majority of the results for zinc are below the background levels. Approximately 50 percent of the initial characterization samples collected adjacent to the drains (locations BD-001 to BD-022) were

above background. Only six of the extent of contamination samples had zinc concentrations above background. The zinc concentrations at these locations (BD-120, BD-123, BD-124, BD-125, BD-137, and BD-144) were 1.5 times the background level.

Explosives

Explosive compounds were not detected in any of the surface or subsurface bunker drain samples.

3.2.7 Removed UST Locations

As discussed in Section 2.2.1.6, five USTs were located at the Offsite WSA (see Figure 2-2). Each UST was connected to their associated buildings by pipes. Boreholes were advanced at each former UST location and along the former pipes feeding into buildings. Borehole locations are shown on drawings provided in Appendix B.

During the field investigation, disturbed soil presumed to be fill was identified from surface to bedrock at each UST location. Geologic logs for each borehole are provided in Appendix D. Depth to bedrock ranged from 1 foot at the Bldg. 8500 UST location to 8 feet at the Bldg. 8507 UST location. The combination of fill to bedrock and shallow depth to bedrock indicates that the tanks were placed directly on bedrock in shallow excavations. After tank removal, fill was likely placed in each excavation.

During collection, all soil samples were screened for volatile vapors by PID headspace analyses. PID readings indicated the presence of volatile vapors at three of the five tank sites. The vapors were most often evident in the deeper samples immediately above bedrock (see Appendix D).

Former UST location samples were analyzed for TPHs, BTEX, and PAHs as described in Sections 2.2.1 and 2.2.1.6. Table 3-22 provides a summary of sample results. Only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. A statistical summary of the results is provided in Table 3-23. The distribution of contaminants detected above the background $UTL_{95,95}$ are shown in Figure 3-19.

TPHs

TPHs were detected in eight of the 10 samples collected. Detected TPH concentrations ranged from 19 mg/kg at a Bldg. 8585 pipe location (sample UST-008-01) to 1160 mg/kg at the Bldg. 8507 tank location (sample UST-009-02). TPHs were not detected at Bldg. 8503 and 8505 pipe locations.

BTEX

TPHs represent specific contaminants potentially composed of both volatile and semi-volatile fractions. The BTEX sample results indicated that the petroleum hydrocarbons discussed above were not represented by significant volatile fractions. Only one sample collected at the Bldg. 8500 tank location contained a BTEX compound. Toluene was estimated to be present at 0.00095 mg/kg in sample UST-003-01.

PAHs

The results from the PAH analyses indicated that the contamination remaining at the former UST locations is primarily composed of semi-volatile fractions. A total of 12 PAHs were detected in at least one sample. Eight of 10 samples collected contained at least one PAH. Samples UST-001-01 and UST-002-02, collected at the former USTs at Bldgs. 8503 and 8514, did not contain PAHs. The one sample at the former UST near Bldg. 8503 that did contain PAHs was alocated to characterize the connecting pipe and was collected from the surface approximately 15 feet from the concrete pad. The PAH concentrations are with the range of Area A-3 PAH contamination attributable to vehicle pollutants. Due to the sample proximity to the pad and low level concentrations, the PAH contamination in sample UST-001-02 is therefore not considered attributable to the former UST. The highest concentration of PAHs was detected near Bldg. 8500 in samples associated with the UST pipe.

3.2.8 Vehicle Fueling Area (A-4)

The vehicle fueling area, Area A-4, was served by the UST associated with Bldg. 8514 (see Figure 2-2). A concrete pad, presumably used to support fueling pump(s), is still present on site. Also evident is the gravel service road that extends southwest from Bldg. 8514 to the fueling area (see Appendix B).

A total of nine samples were collected from four locations within the vehicle fueling area. One of the nine samples was a duplicate of a field surface sample. Samples targeted potential surface contamination resulting from spills that may have occurred during fueling. Attempts were made to collect one surface and two subsurface samples at each location. Shallow depth to bedrock (1.5 to 2.0 feet) limited collection, however, to one surface and one subsurface sample at all but one location.

Area A-4 location samples were analyzed for TPHs, BTEX, and PAHs as described in Sections 2.2.1 and 2.2.1.7. Table 3-24 provides a summary of sample results. Only results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. Statistical summaries of the those values greater than the background $UTL_{95,95}$ are provided in Table 3-25. The distribution of contaminants detected above the background $UTL_{95,95}$ are shown in Figure 3-20.

TPHs

TPHs were detected in all nine samples. Detected TPH concentrations ranged from 26.1 mg/kg (A4-004-02) to 177mg/kg (A2-002-01).

BTEX

The BTEX sample results indicated that the petroleum hydrocarbons discussed above were not represented by significant volatile fractions. Five samples contained toluene at concentrations ranging from 0.011 mg/kg to 0.03 mg/kg. At each location, the toluene contamination was limited to the surface sample collected from 0.0 to 0.5 feet bgs.

PAHs

The results from the PAH analyses indicated that the TPH contamination at Area A-4 primarily consists of semi-volatile fractions. Five PAHs were detected in at least one sample. PAHs were detected in the surface sample at all four locations. PAHs were not detected in any of the

subsurface samples. The distribution of contaminants detected above the background $UTL_{95,95}$ are shown in Figure 3-20.

3.2.9 Electrical Transformers

A total of 31 samples were collected from 16 transformer sample locations.. As described in Sections 2.2.1 and 2.2.1.8, 25 samples were collected from 12 locations (TRF-004, and TRF-006 through TRF-016) associated with transformers mounted on telephone poles. At the power generating substation, two samples were collected from sample locations TRF-001 and TRF-002. Two additional samples were collected at sample location TRF-005 in association with the transformer platform north of Bldg. 8503 (see Figure 2-2).

All transformer investigation samples were analyzed for pesticides/PCBs. No PCBs were detected in any of the samples. One sample contained 0.0110 mg/kg of 4,4'-DDE. Table 3-16 summarizes the sample results. The sample locations and results are shown in Figure 3-21.

3.2.10 Leach Field

The leach field is located outside of the secured (fenced) area, offsite, along the southern perimeter of the base; and it encompasses an area approximately 21 feet by 21 feet (see Figure 2-2). A sewer system drains from Bldgs. 8503 and 8514 and connects to the leach field. Manholes were present, indicating the location of the sewer lines. The leach field was exposed at the surface during the investigation.

Six samples (two surface and four subsurface) were collected from three locations. Sample location LCH-001 was in the center of the leach field; LCH-002 and LCH-003 sample locations were approximately 2 feet south of the southern perimeter of the leach field. The work plan for the leach field sampling specified that one surface and two subsurface samples would be collected at each location. Because of the absence of surface soil inside the leach field, however, only a subsurface soil was collected from this location (LCH-001). In addition, due to the shallow nature of the bedrock, only one subsurface sample from each location was collected. One duplicate subsurface sample was collected at sample location LCH–002. The subsurface samples were obtained at the soil/bedrock interface from approximately 1 foot bgs to refusal, which was approximately 2.5 feet bgs.

All leach field samples were analyzed for inorganics, SVOCs, VOCs, and pesticides/PCBs. Table 3-27 provides a summary of sample results for parameters detected above the MDL. A box has been placed around those values detected above the background $UTL_{95,95}$. Statistical summaries of the those values greater than the background $UTL_{95,95}$ are provided in Table 3-28. The distribution of contaminants detected above the background $UTL_{95,95}$ are shown in Figure 3-22.

Two verification samples were collected from and approximately 20 feet south of original sample location LCH-002 to verify inorganic and PAH detects. Results associated with these samples are provided in Table 3-27 and depicted in Figures 3-23 to 3-25.

Inorganics

Antimony and cadmium were the only inorganic analytes detected in the leach field at concentrations greater than the background $UTL_{95,95}$. These compounds were detected in the three subsurface samples collected outside of the leach field (LCH-002-02, LCH-002-03, and LCH-003-02). The subsurface sample from LCH-001 and the two surface samples had no inorganics detected above background levels. The highest levels of antimony and cadmium were found in sample LCH-002-02 (1.3 mg/Kg and 0.66 mg/Kg, respectively).

The two verification samples collected from the subsurface at and south of LCH-002 had no detectable levels of antimony or cadmium above background (see Figures 3-23 and 3-24, respectively). Therefore, the original detects are assumed to have been either analytical anomalies or existing contamination that was removed during sampling.

SVOCs

Two SVOC compounds, 2-methylnapthalene and naphthalene, were detected in both surface and subsurface leach field samples. 2-Methylnapthalene was detected in four of the six samples at concentrations ranging from 0.11 mg/Kg in sample LCH-001-01 to 0.35 mg/Kg in the duplicate sample LCH-002-03. Naphthalene was detected in all samples except the surface sample collected from location LCH-003.

The two verification samples collected from the subsurface at and south of LCH-002 had no detectable levels of either PAH originally detected in the leach field samples (see Figure 3-25). The original detects are therefore assumed to have been either analytical anomalies or existing contamination that was removed during sampling.

VOCs

Tetrachloroethene (PCE) was detected in all samples except one. However, it was also detected in the trip and ambient blank samples collected during the sampling event (Tables 2-8 and 2-9). The PCE data in both samples were quantified as "B", indicating that this compound was detected in the associated laboratory blank. The PCE detects reported in the leach field samples are therefore assumed to be due to laboratory-related contamination and is not considered attributable to the site. The distribution of these compounds is presented in Figure 3-22.

Pesticides/PCBs

No pesticides or PCBs were detected in any of the six samples.

3.3 DRAINAGEWAY AND SEEP SEDIMENT INVESTIGATION

As discussed in Section 2.2.2, nine individual drainageways and four seeps were investigated as part of the Offsite WSA RFI. Six of the drainageways (DW-1 through DW-5 and DW-7) drain buildings and surrounding areas located within the fence. Drainageway DW-6 includes the

uppermost reaches of two drainageways serving the north side of the Offsite WSA. Drainageways DW-8 and DW-9 are located to the west of the site and drain the EOD Range area (see Figure 2-5).

Analytical results and supporting field measurements and observations associated with drainageway are presented below. Tables summarizing results are included with each drainageway and seep discussion. These tables only include results for those parameters reported at concentrations above the MDL in at least one sample. To further identify the parameters of potential concern, the reported values were compared to the media specific background $UTL_{95,95}$ as described in Section 3.1. Boxes have been placed around those values greater than their associated $UTL_{95,95}$. Complete analytical results for all samples are provided in Volume II.

In addition to the table of results, statistical summaries of the analytical results for the initial characterization have also been provided for Drainageway DW-1 immediately following the drainageway's summary of detected results table. The verification and extent of contamination sampling data were not included in the statistical summaries. Statistical summaries for the remaining drainageways were not provided due to the limited number of samples collected.

In order to highlight potential contaminant spatial distribution, the results of all drainageway sampling efforts are provided on site maps that show any potential sources and sample locations. Reported values exceeding media specific background $UTL_{95,95}$ are posted for each sample location. Drainageway contaminant distribution maps based on the initial characterization samples are provided in Figures 3-26 and 3-28 and are located at the end of this section following all tables.

3.3.1 Drainageway DW-1

Drainageway DW-1 collects surface water runoff from the concrete pad and unpaved surfaces surrounding Bldg. 8503 and SWMU 59 (see Figure 2-5). This drainage area is identified as Area A-3 in this report, the results for which have been presented above in Section 3.2.3.

Drainageway DW-1 consists of a ditch located approximately 15 feet from the western edge of the concrete pad. The ditch drains toward the southwestern corner of the pad, where it becomes less defined. Drainage from the ditch flows to the southeast and becomes unconfined in heavy vegetation approximately 100 feet south of the concrete pad. Directly across the road from Bldg. 8502 flow becomes confined again in a roadside ditch which flows to the south, directly to Live Oak Creek (see Figure 2-5).

Eight sampling locations (DW1-001 through DW1-008) were established in the ditch that parallels the concrete pad. Location DW1-010 was established to the south, directly across from Bldg. 8502. During the field effort, a pipe was identified leading directly from Bldg. 8503. Potential discharges from the pipe would be collected in the roadside ditch near location DW1-010. Location DW1-009 was established 1 foot downgradient from the pipe (see Figure 2-5).

A total of 28 surface sediment and soil samples (including two field duplicates) were collected during the initial characterization effort from the ten DW-1 locations. Each was analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Section 2.2.2. Table 3-29 provides a summary of sample results for parameters detected above the

MDL in at least one sample. A box has been placed around those values detected above the background $UTL_{95,95}$. Statistical summaries of the those values greater than the background $UTL_{95,95}$ are provided in Table 3-30. The distribution of contaminants detected above the background $UTL_{95,95}$ is shown in Figure 3-26.

One supplemental sample (DW1-003-20) was collected to verify the high cadmium concentration reported in initial characterization sample DW3-003-01. Eight other supplemental surface soil samples (including one field duplicate) and one subsurface soil sample were collected from DW-1 at locations DW1-100, DW1-101, DW1-102, DW1-103, DW1-104, and DW1-105 to verify and determine the extent of PAH detects. Three of the seven surface samples were collected from locations that were downgradient of the original sample location DW1-008. One surface soil sample was collected north of DW1-008; another was collected just south of DW1-009. Two additional surface samples (including one duplicate) were collected from original sample location DW1-001-02 to verify the previously reported PAH detects. The results associated with these samples are summarized in Table 3-29 and depicted in Figure 3-27, along with the other data.

Inorganics

Contaminants in samples collected from the drainage ditch reflected those identified in Area A-3. Thirteen inorganic analytes were identified in DW-1 surface sediment and subsurface soil samples at concentrations above the background $UTL_{95,95}$. Eleven of the 13 exceeded the background $UTL_{95,95}$ in surface samples. Cadmium and arsenic were most often detected at elevated concentration as shown in Table 3-30. Maximum concentrations of cadmium and arsenic were 4.9 mg/kg and 24.6 mg/kg, respectively. The maximum cadmium and arsenic values are approximately four and three times greater than their respective background $UTL_{95,95}$ values. The high cadmium concentration at DW1-003 was not verified in supplemental sample DW1-003-20.

With the exception of iron, magnesium, and selenium, maximum inorganic analyte concentrations decreased in subsurface samples. In addition, the percent of samples with inorganic concentrations greater than the background $UTL_{95,95}$ generally decreased.

SVOCs

Eleven SVOCs were detected in a total of nine DW-1 samples, one of which was a duplicate. Eight of the nine samples were collected from surface sediment. Surface sediment sample DW1-008-01 contained the greatest total concentration of SVOCs, which included pyrene at a concentration of 1.8 mg/kg. The downgradient samples collected at location DW1-010 did not contain SVOCs at detectable concentrations.

Results from sample location DW3-100 verified the decrease in PAH concentrations at the upgradient reach of the ditch. The downgradient extent of PAH contamination was defined by samples from locations DW3-104 and DW3-105. DW3-104 and DW3-105 were located approximately 80 and 120 feet south of the concrete pad. The other three surface samples, collected from sample locations DW1-101, DW1-102, and DW1-103, had reported concentrations comparable to the levels detected in the original samples (see Table 3-29 and Figure 3-27).

A comparison of PAH concentrations illustrated in Figures 3-8 and 3-27 indicates that the contamination in DW-1 is a continuation of that identified along the perimeter of the concrete pad surrounding Bldg. 8503. As indicated in Figure 3-27, samples collected from locations DW1-001 through DW1-007 are adjacent to the concrete pad. In general, the maximum PAH concentration in these samples is less than 1.0 ug/kg. Area A-1 PAH concentrations (see Section 3.2.3) between the ditch and concrete pad were slightly higher (less than 5.6 mg/kg). This relationship suggests that the low-level PAHs in DW1 are associated with the adjacent soils that have been impacted by anthropogenic, rather than an unauthorized discharge.

Although the MDLs for benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene reported in A-3 samples are above the RRSN2 cleanup levels, laboratory documentation provided in Appendix U demonstrates that the analytical results were reported at the lowest achievable detection limits using U.S. EPA Method SW8270.

VOCs

Cis-1,2 dichloroethene (cis-1,2 DCE), toluene, and TCE were detected in DW-1 samples. Toluene was only detected in surface samples at a maximum concentration of 0.013 mg/kg in sample DW1-010-01. Cis-1,2-DCE and TCE were found only in soils at locations DW1-001, DW1-007 and DW1-008. Contaminants were primarily found in subsurface samples. Maximum concentrations of cis-1,2-DCE and TCE were 0.063 mg/kg and 0.071 mg/kg. Both of these locations are adjacent to the Waste Accumulation Area shed.

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

Pesticides/PCBs

Three surface sediment samples contained pesticides at concentrations less than the MDL.

3.3.2 Drainageway DW-2

Drainageway DW-2 collects surface water run-off generated from the north central portion of the Offsite WSA including bunker Bldgs. 8531 through 8541. The drainageway extends east to the easternmost service road, which it crosses through a 3-foot-diameter culvert before entering drainageway DW-5 (see Figure 2-5). Drainageway DW-5 is discussed below.

Three surface sediment samples were collected from DW-2. The samples were located at approximately equal intervals along the drainageway (see Figure 2-5). As discussed in Section 2.2.2, each sediment sample was collected from the 0.0 to 0.5 foot interval and was analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

Table 3-31 provides a summary of sample results for parameters detected above the MDL in at least one sample. A box has been placed around those values detected above the background

$UTL_{95,95}$. The distribution of contaminants detected above the background $UTL_{95,95}$ is shown in Figure 3-28.

Excluding methylene chloride, only one analyte was detected above the background $UTL_{95,95}$. Toluene was detected at concentrations of 0.0027 mg/kg and 0.0078 mg/kg in samples DW2-001-01 and DW2-002-01, respectively.

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

3.3.3 Drainageway DW-3

Drainageway DW-3 collects surface water run-off generated from the south central portion of the Offsite WSA, including run-off from Area A-1 and Bldgs. 8505, 8507, 8509, and 8511. The drainageway extends directly east and then to the northeast before it crosses the eastern-most service road through a 3-foot-diameter culvert and enters drainageway DW-5 (see Figure 2-5).

Three surface sediment samples were collected during the initial characterization effort from DW-3. The samples were located at approximately equal intervals along the drainageway (see Figure 2-5). Sample location DW3-001-01 was biased to identify potential contamination related to a pipe connected to floor drains in Bldg. 8505. As discussed in Section 1.2, Bldg. 8505 was a power generating station and housed a number of diesel powered generators. As discussed in Section 2.2.2, each sediment sample was collected from the 0.0 to 0.5 foot interval and was analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

Table 3-32 provides a summary of sample results for parameters detected above the MDL in at least one sample. A box has been placed around those values detected above the background $UTL_{95,95}$. The distribution of contaminants detected above the background $UTL_{95,95}$ is shown in Figure 3-28.

Sixty supplemental samples (including four field duplicates) were collected at locations DW3-100 through DW3-134 from DW-3 to delineate the horizontal and vertical extent of PAH contamination in this drainageway. Supplemental samples DW3-100-01 and DW3-100-02 were collected near original sample location DW3-001 to verify previously reported PAH detects. Data associated with these and the original samples are summarized in Table 3-32 and depicted in Figure 3-29.

Inorganics

Analytes detected in DW3-001-01 reflect potential influence of a power generating station. Detected analytes include arsenic, cadmium, copper, mercury, and zinc. The cadmium concentration of 4.9 mg/kg was greater than four times the background $UTL_{95,95}$. Generally, inorganic analyte concentrations decreased below the background $UTL_{95,95}$ in the two DW-3 downgradient sediment samples.

SVOCs

SVOCs in the initial characterization samples were detected at concentrations as high as 5.3 mg/kg of fluoranthene. SVOCs were not detected in the two DW-3 downgradient sediment samples. As a result of the source related contamination, supplemental samples were collected.

Verification and extent of contamination samples collected from DW3-001 and along the drainageway confirm that PAHs are present in the surface sediments of this drainageway and that the outlet adjacent to Bldg. 8505 is a source (see Figure 3-29). The data reported for these samples indicate that PAH concentrations are highest near Bldg. 8505, where the drainageway begins. Samples collected from DW3-101, DW3-103, and DW3-105 have the highest reported levels of PAHs. The concentrations begin to decrease significantly in the vicinity of DW3-117 (Figure 3-29).

The analytical results for the samples collected from the adjacent upland on either side of the drainage also indicate the presence of PAHs. No unauthorized discharge source is associated with these PAHs, however the concentrations at these locations are comparable to those reported for the Area A-3, Drainageway 1, and Drainageway 4 samples, where PAH levels are considered anthropogenic background. Old tire tracks and a dirt roadway overgrown with vegetation are evident on the upland areas, suggesting that the PAHs are likely a result of vehicular exhausts and oil leaks. The distribution of these PAHs is shown in Figure 3-29.

In support of this conclusion, PAH results were compared to anthropogenic background levels of PAHs reported in the literature. Background concentrations for rural, agricultural, and urban soils from the United States and other countries are shown in Table 3-10. PAH concentrations detected in the DW-3 upland samples are generally comparable to those reported in this table for agricultural soils. In addition, literature sources indicate that the principal sources of PAHs along roadways are due to vehicular exhausts and surface runoff of emissions and that the majority of PAH deposition occurs within 15 feet of roadways (ATSDR, 1995 and USWFS, 1987).

VOCs

One VOC was detected. Toluene was detected in all three sediment samples. Sample DW3-001-01 contained the greatest concentration of toluene at 0.01 mg/kg.

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

Pesticides/PCBs

One pesticide, beta-BHC, was detected in the sample associated with the power generating station (DW3-001-01). The pesticide was estimated to be present at a concentration of 0.031 mg/kg.

Explosives

No explosive compounds were detected in the three DW-3 sediment samples.

3.3.4 Drainageway DW-4

Drainageway DW-4 collects surface water run-off generated from the southeast portion of the Offsite WSA, including that from Bldg. 8514. The drainageway extends to the north where it merges with DW-3, crosses the service road through a 3-foot-diameter culvert, and enters drainageway DW-5 (see Figure 2-5).

Two surface sediment samples were collected from DW-4. The samples were located at the beginning and end of the drainageway (see Figure 2-5). As discussed in Section 2.2.2, each sediment sample was collected from the 0.0 to 0.5 foot interval and was analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

Two supplemental soil samples (one surface, one subsurface) were collected at location DW4-100 adjacent to the original location DW4-001 to verify previously reported PAH detects. Nine surface and subsurface samples were collected from the four additional sample locations (DW4-101 through DW4-104) established to delineate the horizontal and vertical extent of PAH contamination associated with DW4-001.

Table 3-33 provides a summary of sample results for parameters detected above the MDL in at least one sample. A box has been placed around those values detected above the background $UTL_{95,95}$. The distribution of contaminants detected above the background $UTL_{95,95}$ is shown in Figures 3-28 (original data only) and 3-30.

Inorganics

A total of five inorganic analytes were detected in DW-4 samples at concentrations greater than the background $UTL_{95,95}$. The lead concentration was the highest relative to the background $UTL_{95,95}$. Sample DW4-001-01 contained lead at a concentration of 71.6 mg/kg, approximately 2.7 times the background $UTL_{95,95}$. Generally, inorganic analyte concentrations decreased below the background $UTL_{95,95}$ in DW4-002-01, the downgradient sediment sample.

SVOCs

The sample collected at the head of the drainageway near Bldg. 8514 (DW4-001-01) contained 13 SVOCs. Fluoranthene was detected at the highest concentration (3.8 mg/kg). SVOCs were not present in DW4-002-01, the downgradient sediment sample.

Of the two verifications samples collected near DW4-001-01, only one contained detectable concentrations of PAHs. The one sample with detectable concentrations of PAHs (DW4-102-01) was collected within 5 feet of the roadway and approximately 13 feet from the original location (DW4-001). The concentrations were comparable to those in the original sample collected at DW4-001. The distribution of PAHs by sample location based on the original and supplemental samples is shown on Figure 3-30.

Although the MDLs for the PAHs reported in DW-4 samples are above the TNRCC RRSN2 standards, laboratory documentation provided in Appendix U

demonstrates that the analytical results were reported at the lowest achievable detection limits using U.S. EPA Method SW8270.

Also, similar to DW-1 and A-3, the surficial and ubiquitous low-level nature of the PAH detects in the original samples suggests that these compounds are from anthropogenic sources rather than an unauthorized discharge as defined by TNRCC Industrial Solid Waste and Municipal Hazardous Waste (TAC Chapter 335) regulations. The results demonstrate that PAHs are randomly detected and are limited to surface soil located within five feet of the roadway. Based on these results, it is assumed that the PAH concentrations reported for DW-4 sediment are due to roadway runoff from the pavement adjacent to this drainageway.

In support of this conclusion, PAH results were compared to anthropogenic background levels of PAHs reported in the literature. Background concentrations for rural, agricultural, and urban soils from the United States and other countries are shown in Table 3-10. PAH concentrations detected in the one DW-4 sample are comparable to those reported in this table for urban soils. Given that DW-4 collects runoff from an expected high vehicle use area (i.e., parking and loading/unloading at Bldg. 8514), these PAH levels can be considered anthropogenic background for this area. In addition, literature sources indicate that the principal sources of PAHs along roadways are due to vehicular exhausts and surface runoff of emissions and that the majority of PAH deposition occurs within 15 feet of roadways (ATSDR, 1995 and USFWS, 1987).

VOCs

One VOC was detected. Toluene was detected in both sediment samples. Sample DW4-002-01 contained the greatest concentration (0.01 mg/kg).

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

Pesticides/PCBs

Two pesticides, 4,4'-DDE and 4,4'-DDE, were estimated to be present in the upgradient sample (DW4-001-01) at concentrations of 0.0096 mg/kg and 0.0086 mg/kg, respectively.

Explosives

No explosive compounds were detected.

3.3.5 Drainageway DW-5

Drainageway DW-5 collects surface water run-off generated from the central portion of the site through drainageways DW-2, DW-3, and DW-4. This surface water is discharged off site to the east and into the tributary of Live Oak Creek as shown in Figure 1-5.

Five surface sediment samples were collected from DW-5 (see Figure 2-5). As discussed in Section 2.2.2, each sediment sample was collected from the 0.0 to 0.5 foot intervals and was analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

Table 3-34 provides a summary of sample results. As shown on the table no inorganic analytes were detected at concentrations greater than the background $UTL_{95,95}$. In addition there were no SVOCs, pesticides/PCBs explosive compounds detected. Excluding methylene chloride, the only VOC detected was toluene in the two upgradient most samples, DW5-001-01 and DW5-002-01. Sample locations and the toluene results are shown on Figure 3-28.

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

3.3.6 Drainageway DW-6

Drainageway DW-6 collects surface water run-off generated from the northern portion of the Offsite WSA, including from Area A-2 and bunker Bldgs. 8554 through 8552. As shown in Figure 2-5, the drainageway includes two ravines that drain to the north into the tributary of Live Oak Creek.

One surface sediment sample was collected at the upper extent of each ravine. The two surface sediment samples were collected from the 0.0 to 0.5 foot interval and were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Section 2.2.2.

Table 3-35 provides a summary of sample results. As shown in the table, no inorganic analytes were detected at concentrations greater than the background $UTL_{95,95}$. In addition, there were no SVOCs, pesticides/PCBs explosive compounds detected. The only VOC detected was toluene in sample DW6-001-01. Sample locations and the toluene results are shown in Figure 3-28.

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

3.3.7 Drainageway DW-7

Drainageway DW-7 is a relatively short drainageway that collects surface water run-off generated from the northwest corner of the Offsite WSA, including the northern portion of Area A-1 and bunker Bldgs. 8554 and 8531. As shown in Figure 2-5, DW-7 drains to the north into the tributary of Live Oak Creek.

One surface sediment sample and a duplicate sample were collected along the service road. The sample location was directly upgradient from a culvert that transmits the run-off off site towards the Live Oak Creek tributary. The two surface sediment samples were collected from

the 0.0 to 0.5 foot interval and were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds as described in Section 2.2.2.

Table 3-36 provides a summary of sample results. As shown in the table, no inorganic analytes were detected at concentrations greater than the background $UTL_{95,95}$. In addition no SVOCs, pesticides/PCBs, or explosive compounds were detected. Excluding methylene chloride, only one VOC, toluene, was detected. The sample location and the toluene results are shown in Figure 3-28.

Although toluene was not detected in the field blanks or method blanks specifically associated with the sample, toluene in the field sample is not considered attributable to the site. Although toluene was detected in the drainageway sample, it was not detected in other samples collected to characterize potential source area. Toluene was detected in other field blanks and laboratory blanks analyzed for the project.

3.3.8 Drainageway DW-8

Drainageway DW-8 is one of two drainageways potentially impacted by the EOD Range. DW-8 collects run-off from the southernmost portion of the EOD range and drains directly to the south into Live Oak Creek. Based on the assumed boundary to the range as discussed in Section 2.2.1.4, however, little if any run-off from areas used to dispose of ordnance would enter DW-8.

Two samples were collected from DW-8. Sample DW8-001-01 was located at the head of the drainageway. Sample DW8-002-01 was located downgradient. The two surface sediment samples were collected from the 0.0 to 0.5 foot intervals and were analyzed for inorganic and explosive compounds as described in Section 2.2.2.

Table 3-37 provides a summary of sample results. As shown in the table, only magnesium was detected above the drainageway sediment background $UTL_{95,95}$. This compounds was detected in both samples at concentrations only slightly exceeding the background level. No explosive compounds were detected. The sample locations and magnesium results are shown in Figure 3-28.

3.3.9 Drainageway DW-9

Drainageway DW-9 is the primary drainageway potentially impacted by the EOD Range. DW-9 collects run-off from the majority of the EOD Range and drains to the northeast. This drainageway is the uppermost reach of the Live Oak Creek tributary.

Two samples were collected from DW-9 (see Figure 2-5). Sample DW9-001-01 was collected at the head of the drainageway directly downgradient of those locations sampled as part of the EOD soil investigation (see Section 3.2.5). Sample DW9-002-01 was located downgradient, directly below the limestone ledge that crosses the drainageway. Below the ledge, the drainageway becomes confined with a sharp increase in grade. The area directly below the ledge was the location of the soil and debris removal effort completed in September 1993 (M&E, 1993). The two surface sediment samples were collected from the 0.0 to 0.5 foot interval. The upgradient sample, DW9-001-01, was analyzed for inorganic and explosive compounds as described in Section 2.2.2. Sample DW9-002-01 was analyzed for inorganics, VOCs, SVOCs,

pesticides/PCBs, and explosive compounds in order to identify potential downgradient impacts from DW-7, as well as those from the EOD Range.

Table 3-37 provides a summary of sample results of the two samples collected from DW-9. No analytes were detected above the background $UTL_{95,95}$ in the sample collected directly downgradient from the EOD range (DW9-001-01). The sample collected further downgradient contained a number of inorganic analytes at concentrations above the background $UTL_{95,95}$. The majority of these analytes had concentrations less than two times the background levels. Copper and lead were reported at concentrations that are less than five times the background levels. Chromium and nickel exceeded respective background $UTL_{95,95}$ by approximately eight and ten times, respectively. The concentrations were greater than those reported for the upgradient DW-9 and DW-7 samples. Therefore, it is concluded that the increased concentrations are attributable to residuals remaining from the soil and debris removal. The sample locations with inorganic analyte concentrations are shown in Figure 3-28.

3.3.10 Seeps

A summary of detected results for seep sediment samples is provided in Table 3-38. The results associated with the explosives analysis re-performed in May 1998 were incorporated into this table. These results are compared to the surface soil/sediment $UTL_{95,95}$ derived in Section 3.1.1. The only compound with concentrations exceeding background levels is zinc at SP-001. It exceeds the background value by less than two times. All other inorganics are below respective $UTL_{95,95}$ and no organic compounds were detected. The sample locations with the zinc concentrations are shown with the drainageway results in Figure 3-28.

3.4 SURFACE WATER INVESTIGATION

Results of detected compounds in the drainageway and seep surface water samples are presented in Tables 3-39 and 3-40, respectively. The results associated with the explosives analysis re-performed in May, 1998 were incorporated into these tables. Several inorganics and no organic compounds were detected in the drainageway surface water samples. Exceedances of background surface water $UTL_{95,95}$ were limited to two inorganic compounds. Magnesium and sodium exceeded less than two times the background levels in the sample collected from DW1-002. All other samples had nondetectable levels of these compounds.

Copper and nickel were detected above background $UTL_{95,95}$ at concentrations less than two times in the seep surface water samples. Chloroform was detected in one sample. However. it was also detected at the same concentration in the ambient blank collected during the additional sampling effort (Table 2-9). Therefore, the chloroform detected in the surface water sample is assumed to be due to sampling, ambient air, or laboratory-related contamination and is not considered attributable to the site. The distribution of these compounds is presented in Figure 3-31.

3.5 GROUNDWATER INVESTIGATION

Potential groundwater contamination was investigated by sampling three Paluxy Formation wells at the site (see Figure 2-6). These wells included two of the previously existing on-site water supply wells and one upgradient monitoring well (WJEPX925) installed during a previous investigation. The primary and back-up water supply wells are reportedly screened to depths of 184 and 186 feet bgs within the deeper Paluxy Aquifer (Johnson, 1997). The primary well (XU-32-12-902) is located east of and downgradient from Bldg. 8503, the Waste Accumulation Area, and the EOD area. The back-up well (XU-32-12-901), is located southeast of these same potential contaminant sources and may be downgradient from them as well.

Samples from the primary water supply well (XU-32-12-902-01), the back-up on-site well (XU-32-12-901-01) and the upgradient background monitor well (WSEPX 925) were collected using low sampling techniques as described in Section 2.2.4. A duplicate sample (XU-32-12-902-02) was also collected from the primary water supply well. All samples, including the background well sample, were analyzed for inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds. Prior to collecting samples, field water quality measurements were obtained immediately following well purging. Purge volumes and water quality measurement results are provided in Table 3-41.

Table 3-42 provides a summary of results from the on-site well samples. Background sample results are discussed in Section 3.1 and are presented in Table 3-5. Results for parameters detected above the MDL in at least one sample are shown. A box has been placed around those values detected above the background $UTL_{95,95}$. The distribution of contaminants detected above the background $UTL_{95,95}$ are shown in Figure 3-32.

There were no SVOCs, VOCs, pesticide/PCBs, or explosive compounds detected in the on-site wells. Twelve inorganic analytes were detected; seven were at concentrations above those reported for the background sample. Iron, magnesium, manganese, and potassium were no more than twice the background. Sodium, copper, and zinc were approximately three, four, and seven times the background, respectively.

It should be noted that the on-site wells are constructed of metal casings. As such, the data discussed above may be influenced by the casing material and not necessarily reflective of true groundwater conditions. The data will be analyzed further to determine whether potential contaminants at these worse case concentrations pose a risk to human health.

3.6 FACILITY ASSESSMENT RESULTS

Asbestos, LBP, and facility contamination surveys were performed as part of an overall WSA facility assessment, as described in Section 2.2.5. The results from these surveys are presented below and in Appendix G.

3.6.1 Asbestos Survey

All of the facilities that were located at the Offsite WSA were visually inspected for the presence of ACM with the exception of Bldg. 8552, which was inaccessible at the time of the survey. For each of the suspect materials, inspection personnel:

- identified and categorized homogeneous areas;

- determined friable/nonfriable characteristics;
- assessed physical conditions;
- assessed potential for disturbance;
- estimated quantities; and
- sampled suspect materials for laboratory analysis.

The information collected using the procedures listed above are presented in the homogeneous area description sheets in Appendix G. The detailed methods for conducting the asbestos survey, and making these determinations, are described in Section 2.2.5.1 of this report.

Appendix G provides a comprehensive summary of all field observations and laboratory determinations. This detailed summary is presented on a building-by-building basis. Included in Appendix G summaries are:

- homogeneous area description sheets;
- floorplan diagrams, detailing individual sample locations and the extent of homogeneous areas within a building; and
- photographic documentation for materials that tested positive for asbestos.

During the asbestos survey, 99 suspect ACM samples were collected, 32 of which were found to contain asbestos in eight of the 23 buildings surveyed. One homogeneous area was assumed to be asbestos, for a total of nine buildings containing asbestos. Types of asbestos found included amosite, chrysotile, and crocidolite. ACMs that were identified included:

- floor tile and associated mastic compound;
- pipe insulation and fittings;
- duct cloth;
- corrugated transite-like paneling;
- roofing felt and associated tar; and
- roofing sealant.

Table 3-43 summarizes all the materials sampled, and lists respective laboratory determinations, quantities, and various physical characteristics for each homogeneous area. A general description of ACM and suspect ACM for each building surveyed are discussed below.

Bldg. 8500-Safety, Control, and Identification

Eleven homogeneous areas of suspect ACM were identified and a total of 25 samples were collected during the asbestos survey. These 11 homogeneous areas included: two types of floor tile with associated mastic compound, four types of ceiling tile, plaster, gypsum board, aircell pipe insulation, roofing felt, and roof sealant. Of the 11 homogeneous areas sampled, three were determined to contain asbestos. The positive materials included: 9-inch by 9-inch gray floor tile (500-MSC-01) with additional layers of floor tile underneath in Administrative Rooms 1 and 5, the Communication Room, and the hallway; aircell TSI (500-TSI-01) on piping in the bathroom; and 9-inch by 9-inch black floor tile (500-MSC-05) in the Communication Room.

Bldg. 8501-Water Tank Storage

No homogeneous areas of suspect ACM were identified during the asbestos building survey.

Bldg. 8502-Water Supply Facility

Four homogeneous areas of suspect ACM were identified and a total of seven samples were collected during the asbestos building survey. These four homogeneous areas included aircell TSI, mudpack TSI, roofing tar/felt, and a pipe gasket. Of the four homogeneous areas sampled, two were determined to contain asbestos. Aircell TSI (502-TSI-02) on one section of piping contains asbestos, as does roofing felt and the associated tar (502-MSC-02).

Bldg. 8503-Surveillance, Inspection, and Shipping

Twelve homogeneous areas of suspect ACM were identified and a total of 31 samples were collected during the asbestos building survey. These 12 homogeneous areas included: three types of floor tile, two types of ceiling tile, aircell TSI, fitting TSI (mudpack), plaster, roofing felt/tar, roofing shingles, roofing mesh, and roof sealant. Of the 12 homogeneous areas sampled, three were determined to contain asbestos. The positive materials included: aircell TSI (503-TSI-01) in the hallway, bathroom, and above the drop ceiling throughout the building; TSI on fittings (503-TSI-02) also located in the hallway, bathroom, Administration Room 3 and above the drop ceiling throughout the building; and roofing sealant (503-MSC-09) at base of walls and vents on the roof.

Bldg. 8504-Water Supply Facility

Two homogeneous areas of suspect ACM were identified during the asbestos building survey. One sample was collected of each area. The materials identified included TSI on a pipe tee joint, and roofing felt/tar. Laboratory analysis determined that neither of these materials contain asbestos.

Bldg. 8505-Electric Power Station

Five homogeneous areas of suspect ACM were identified and a total of 11 samples were collected during the asbestos building survey. These five areas included: aircell TSI, preformed TSI, fitting TSI, roofing felt/tar, and roof sealant. Of the five homogeneous areas sampled, two materials, the aircell TSI (505-TSI-03), and roofing sealant (505-MSC-02), were determined to contain asbestos. The TSI material is located in the northeastern corner of the building on a vertical pipe and on a horizontal pipe running along the north wall. The roofing sealant is located on the roof around the base of vents.

Bldg. 8506-Small Arms Ammunition Storage

One homogenous area of suspect ACM was identified during the asbestos building survey. The area is corrugated transite-like panels (506-MSC-01) which make up the roof of this building. No samples were taken. Therefore, the material was assumed to contain asbestos. It is widely accepted that transite-like panels contain asbestos fibers.

Bldg. 8507-Spares Storage

Four homogeneous areas of suspect ACM were identified and a total of seven samples were collected during the asbestos building survey. The four homogeneous areas identified are; floor tile, duct cloth, roofing felt/tar, and roofing sealant. Of the four homogeneous areas sampled, three of them were found to contain asbestos. The positive materials include: 9-inch by 9-inch beige floor tile (507-MSC-02) located in the administration area, the duct cloth (507-MSC-01) located above the furnace, and roofing sealant (507-MSC-04) located around roof vents.

Bldg. 8508-Pyrotechnic Storage

One homogeneous area of suspect ACM was identified and sampled during the asbestos building survey. Roofing felt and the associated tar was sampled and determined not to contain asbestos.

Bldg. 8509-Segmented Magazine Storage

Two homogeneous areas of suspect ACM were identified. One sample of each was collected during the asbestos building survey. The two homogeneous areas identified are roofing felt/tar and roof sealant. The roofing felt and associated tar (509-MSC-01) were determined to contain asbestos.

Bldg. 8511-Detonator Storage

One homogeneous area of suspect ACM was identified and one sample was collected during the asbestos building survey. Roofing felt and the associated tar (511-MSC-01) were sampled and determined to contain asbestos.

Bldg. 8512-Waste Accumulation Area (SWMU 59)

No homogeneous areas of suspect ACM were identified during the asbestos building survey.

Bldg. 8514-Conventional Munitions Shop

Four homogeneous areas of suspect ACM were identified and a total of 11 samples were collected during the asbestos building survey. These four homogeneous areas included: aircell TSI, preformed TSI, fitting TSI, and roofing felt/tar. Of the four homogeneous areas sampled, two were found to contain asbestos. The positive materials included: aircell TSI (514-TSI-01) on piping in the bathroom, and preformed TSI (514-TSI-02) on piping in the HVAC/mechanical room.

Laboratory analysis of the aircell TSI showed that sample STA-514-01 contained 15 percent chrysotile. The laboratory results also showed that samples STA-514-02 and STA-514-03, which are part of the same homogeneous area, did not contain any asbestos. Due to the inability to distinguish between TSI that tests positive and TSI that tests negative, the entire homogeneous area must be considered to contain asbestos. The material appeared to be the same texture and color, and seemed to have been installed at the same time

Bldgs. 8531 to 8560-Munitions Storage Bunkers

The munitions bunkers at the Offsite WSA were visually surveyed and were found to contain no suspect homogeneous areas of asbestos with the following exceptions. Bldg. 8533 has one suspect homogeneous area of miscellaneous insulation around the overhead door. One sample of the insulation was taken and laboratory analysis proved negative. It should be noted that Bldg. 8552 was inaccessible and was not included in the facility surveys; however, construction of these munitions storage bunkers were identical. Therefore, it can be reasonably assumed that Bldg. 8552 did not contain asbestos materials.

3.6.2 Lead-Based Paint Survey Results

The LBP survey was conducted on 24 Offsite WSA facilities from 22-25 August 1997. A description of the method used during the LBP survey is provided in Section 2.2.5.2. Ninety-five paint samples were collected. Forty-two samples were found to be LBP in 19 of the 24

facilities surveyed. EPA/HUD guidelines define LBP to be paint with a lead concentration greater than 5,000 ppm (HUD, 1995). All of the facilities were constructed prior to the implementation of a DoD ban on LBPs in 1978. Both interior and exterior paint was found to contain lead in excess of 5,000 ppm. Structural components with LBP on them included:

- exterior and interior walls;
- doors and door frames;
- shoe molding;
- structural beams;
- paint on handrails; and
- loading docks and ramps.

The majority of the paint was found to be in poor condition. Table 3-44 summarizes the results of the Offsite WSA LBP field sampling activities. A box has been placed around samples with results greater than the 5,000 ppm EPA/HUD threshold for LBP. Additional sampling information is contained in Appendix G, along with specific details on the description, quantity, condition, and location of LBP in/on the facilities. This information is contained in LBP sampling summary sheets and floorplans detailing sample locations for each building surveyed.

During the initial survey, it was observed that building materials/components had similar painting histories. Representative buildings and areas were therefore sampled. As an example, facia material on all the buildings is copper and is painted off-white. The facia was sampled twice at Bldgs. 8509 and 8514. Both samples were analyzed and found not to be LBP. Therefore, because all facia appears to have been painted with the same paint and at the same time, it is assumed that the paint on all facia material at the WSA is not LBP. A similar observation is made with respect to paint on the door frames of the bunkers. Silver paint was sampled from the door frame in Bldg. 8554. This is the same single-layer paint found in all of the other bunkers with metal overhead doors. The material was determined to be LBP. Therefore, it is assumed that all silver paint is LBP on the door frames of bunkers with metal overhead doors.

A description of building-specific LBP for each facility surveyed is presented below.

Bldg. 8500-Safety, Control, and Identification

Nine bulk paint chip samples were taken from the interior and exterior of the building. Two of the nine samples were found to be LBP. The positive paint includes white paint on two exterior doors as well as brown paint on the exterior walls of the building. Other paints sampled and found not to be LBP included brown paint on exterior window frames, brown paint on window sills, white paint on window sash, white paint on interior walls, brown paint on interior window glass, brown paint on bathroom door, and brown paint on interior walls.

Bldg. 8501-Water Tank Storage

One bulk paint chip sample was taken from the water tower support frame. The paint was determined to be LBP. The paint color is tan and is similar in color to all other WSA facilities.

Bldg. 8502-Water Supply Facility

Three bulk paint chip samples were collected from the exterior of the building. The interior of the building has no painted surfaces. Two of the three samples were found to be LBP. The positive paint includes brown paint on the door jamb and white paint on the exterior door. Also sampled and found not to be positive for LBP was the brown paint on the exterior of the building.

Bldg. 8503-Surveillance, Inspection, and Shipping

Ten bulk paint chip samples were collected from the interior and exterior of the building. Two of the ten samples collected were found to be LBP. The positive paint includes brown paint on the door to the mechanical room and beige paint on the steel beams in the maintenance bay. Also sampled and found not to be LBP were; tan paint on the exterior walls, light blue paint on the wall in the paint booth, white paint on the walls in the paint booth, white paint from interior walls, brown paint inside the front door, white paint from the interior wall of the mechanical room, white paint from the ceiling in the maintenance bay, and beige paint from the walls in the maintenance bay.

Bldg. 8504-Water Supply Facility

Two bulk paint chip samples were collected from the exterior of the building. One of the two samples was found to be LBP. The positive paint is on the white front door. Also sampled and found not to be LBP was the tan paint from the exterior walls.

Bldg. 8505-Electric Power Station

Five bulk paint chip samples were collected from the interior and exterior of the building. One of the five samples collected was found to be LBP. The positive paint is tan paint on the exterior walls. Other paints were sampled and found not to be LBP. These included white paint on the metal exterior doors, white paint on interior walls, and white paint on interior AHUs.

Bldg. 8506-Small Arms Ammunition Storage

Six bulk paint chip samples were collected from the interior and exterior of the building. Four of the samples were found to be positive, however, one of those samples is a field duplicate. The positive paint includes white paint on the metal overhead doors, yellow safety paint on the loading dock and ramp, and the tan paint on the exterior walls of the building. Red paint on roof support beams could not be reached to sample, but this paint is assumed to be LBP. Similar beams were found to be coated with LBP in Bldg. 8507.

Bldg. 8507-Spares Storage

Eight bulk paint chip samples were collected from the interior and exterior of the building. Two of the samples were found to be LBP. The positive paint includes black paint on floor molding and red paint on steel beams around the furnace. Other paint sampled and found not to be LBP included white paint on the exterior overhead door, tan paint on exterior walls, yellow paint from an interior wall, dark green paint from the door to the inset room, white paint on the HVAC duct and ceiling, and light blue paint from the inset room walls.

Bldg. 8508-Pyrotechnic Storage

Four bulk paint chip samples were collected from the interior and exterior of the building. Three of the samples were found to be LBP. The positive paint identified includes: tan paint

from the handrail, steps, and loading dock; white paint on the exterior of metal doors; and gray paint from the interior of the metal doors.

Bldg. 8509-Segmented Magazine Storage

Four bulk paint chip samples were collected from the interior and exterior of the building. One of the samples was determined to be LBP. The positive paint is olive drab, and is located on the interior of the eight metal doors. Other paints sampled and determined not to be LBP included: tan paint from the exterior walls, off-white paint from the soffit, and white paint located on the exterior of the eight metal doors.

Bldg. 8511-Detonator Storage

Four bulk paint chip samples were collected from the interior and exterior of the building. Two of the samples were determined to be LBP. The positive paint includes off-white paint on the exterior of the metal doors and door frame as well as olive green paint on the interior of the metal doors. Tan paint on the exterior walls was sampled and determined not to be LBP. One field duplicate sample was taken of the olive green paint. Its associated sample was lower than EPA/HUD guidelines, however, because the duplicate sample is considered LBP, then all olive green paint in Bldg. 8511 is considered LBP.

Bldg. 8512-Waste Accumulation Area (SWMU 59)

Two bulk paint chip samples were collected from the building. One of the samples collected was determined to be LBP. Tan paint on the aluminum sides of the shed were determined to be LBP. Dark brown paint on the aluminum support columns was determined not to be LBP.

Bldg. 8514-Conventional Munitions Shop

Fifteen bulk paint chip samples were collected from the interior and exterior of the building. Eight of the samples were determined to be LBP. One of the positive samples is a field duplicate. The positive paint identified includes: tan paint on the stair rail, white paint on the exterior of the front door, black paint from the door frame on the interior door, black paint on the floor molding, white paint on some interior walls, dark blue stripe on interior wall, brown paint from the inside of mechanical room doors, and yellow safety paint from the loading dock and ramp. Other paints that were sampled and found not to contain LBP included: the tan exterior walls, off-white paint from overhead doors, light blue paint on the upper half of interior wall, creme-colored paint from the lower half of the interior walls, black paint on the bathroom door, and the white paint from the soffit.

Bldg. 8531-Munitions Storage Bunker

Eight bulk paint chip samples were collected from the interior and exterior of the building. Six of the eight samples were determined to be LBP. One of the positive samples is a field duplicate. The positive paint includes: dark pink paint from exterior swinging metal doors, black paint from interior metal door, white paint on an interior metal door frame, dark pink paint on the interior metal door frame, and gray paint from the back of the interior metal door. Other paint sampled found not to be LBP included white and pink paint from interior walls.

Bldg. 8533-Munitions Storage Bunker

Three bulk paint chip samples were collected from the interior and exterior of the building. One of the samples was determined to be LBP. The positive paint was dark pink paint from the exterior metal doors. Other paint sampled and found not to be LBP included white and pink paint from interior walls.

Bldg. 8535-Munitions Storage Bunker

One bulk chip sample of dark pink paint was collected from the metal swinging door of the building. The dark pink paint was determined to be LBP.

Bldg. 8537-Munitions Storage Bunker

Only the dark pink paint from the metal overhead door was sampled and determined not to be LBP. The silver paint on the door frame is assumed to be LBP based on results from Bldg. 8554 door frame samples.

Bldg. 8539-Munitions Storage Bunker

Dark pink paint from the metal overhead door was sampled and determined not to be LBP. The silver paint on the door frame is assumed to be LBP based on results from Bldg. 8554 door frame samples.

Bldg. 8541-Munitions Storage Bunker

Dark pink paint from the metal overhead door was sampled and determined not to be LBP. The silver paint on the door frame is assumed to be LBP based on results from Bldg. 8554 door frame samples.

Bldg. 8552-Munitions Storage Bunker

Dark pink paint from the metal swinging door was sampled and determined to be LBP.

Bldg. 8554-Munitions Storage Bunker

Dark pink paint from the metal overhead door was sampled and determined not to be LBP. Two bulk samples of silver paint were collected, one of which is a field duplicate. The silver paint on the inside door frame was determined to be LBP.

Bldg. 8556-Munitions Storage Bunker

Dark pink paint from the metal overhead door was sampled and determined not to be LBP. The silver paint on the door frame is assumed to be LBP based on results from Bldg. 8554 door frame samples.

Bldg. 8558-Munitions Storage Bunker

Dark pink paint from the metal overhead door was sampled and determined not to be LBP. The silver paint on the door frame is assumed to be LBP based on results from Bldg. 8554 door frame samples.

Bldg. 8560-Munitions Storage Bunker

Dark pink paint from the metal overhead door was sampled and determined not to be LBP. The silver paint on the door frame is assumed to be LBP based on results from Bldg. 8554 door frame samples.

3.6.3 Facility Surface Contamination Results

Weapons maintenance, inspection, and storage took place in many of the Offsite WSA facilities and are a potential source for facility surface contamination. A facility surface contamination survey was conducted at 13 WSA facilities as part of this RFI to determine the extent of contamination associated with particulates and dust on the surfaces on various Offsite WSA facilities. Potential contaminants of concern for facility surfaces generally include inorganics and explosives. In addition, SVOCs are of potential concern at Bldg. 8512, the waste accumulation shed (SWMU 59). Wipe sampling was performed as a means of identifying these contaminants. The results from this survey are presented below and are summarized in Table 3-45. Boxes have been placed around those values greater than their associated background $UTL_{95,95}$. Appendix G contains building-by-building wipe sample results and individual sample locations shown on floorplan diagrams.

The facilities sampled include Bldgs. 8503, 8506, 8507, 8508, 8509, 8511, and 8514, and of special concern, Bldg. 8512, the waste accumulation shed (SWMU 59). Several bunkers were also sampled; these include Bldgs. 8531, 8535, 8541, 8554, and 8560. All of the bunkers were not sampled. Trends from the results gathered from the surveyed bunkers will be applied to the development of corrective action alternatives for all the bunkers.

The only SVOC wipe sample collected as part of this facility wipe survey was collected in the waste accumulation area (SWMU 59). Analytical laboratory results yielded no detectable amounts of SVOCs in SWMU 59. Two composite explosive samples and two composite inorganic samples were also taken here. No explosives were detected. Inorganic analytes detected in SWMU 59 were all below their respective background $UTL_{95,95}$.

Fifteen inorganic analytes and two explosives were detected in the remaining 12 facilities sampled. Lead and mercury were the most often detected, in 28 of 62 samples taken. The maximum reported lead and mercury values were 7.475 mg/ft^2 and 0.0019 mg/ft^2, respectively. That is more than 250 times greater than the .0294 mg/ft^2 background $UTL_{95,95}$ for lead, and 13 times greater than the 0.00015 mg/ft^2 background $UTL_{95,95}$ for mercury. Cadmium is the next most frequently detected inorganic analyte. Cadmium was detected in 23 of the 62 samples collected. The highest reported cadmium value of 0.045 mg/ft^2 was 10 times greater than the associated background $UTL_{95,95}$. The only detected explosive compound was 1,3-dinitrobenzene. It was discovered on the paint booth floor in Bldg. 8503 at a concentration of 6.5 mg/kg, and on the Heating, Ventilation and Air Conditioning (HVAC)/mechanical room floor in Bldg. 8514 at a concentration of 5.4 mg/kg.

Table 3-1. Summary of Background Surface Soil Sample Results

Location:	BK-001	BK-002	BK-003	BK-004	BK-005	BK-006		BK-007	BK-008
Sample Number:	BK-001-01	BK-002-01	BK-003-01	BK-004-01	BK-005-01	BK-006-01	BK-006-04	BK-007-01	BK-008-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]							DUP		
Inorganics-(mg/kg)									
Aluminum	10200 B	16800 B	16300 B	30100 B	8700 B	18800 B	21900	14200 B	13200 B
Antimony	1.4	1	0.99 F	4.5	0.87 U	1.2	0.91 U	1 U	0.92 U
Arsenic	3.8	5.2	4.5	5.2	3	6.6	6.3	4.3	5.3
Barium	37.8 B	55.4 B	87.1 B	128 B	64.8 B	82.4 B	96.4	44.5	86.4
Beryllium	0.26 F	0.48	0.41	0.94	0.28 F	0.6	0.78	0.55	0.78
Cadmium	0.3	0.34	0.33	0.43	0.32	0.38	1.1	0.21	0.28
Calcium	231000 B	188000 B	134000 B	15000 B	223000 B	191000 B	144000	165000 B	111000 B
Chromium	12.3	18.5	14.1	26.8	8.6	19	10.9	6.7	9
Cobalt	1.8	3.8	3.7	6.4	2.5	4.9	6.4	3.9	3.8
Copper	4.4	5.4	6.8	10.5	4.2	5.9	6.1	4.5	7.4
Iron	7410	12000	11600	18500	7030	15800	16200	13200	10200
Lead	9.5	14.3	11.8	19.6	7.6	14	13.9	10.8	13.2
Magnesium	3190 B	3120 B	3060 B	4780 B	2200 B	3520 B	3700	3010 B	2600 B
Manganese	142	220	307	440	332	279	366	158	282
Mercury	0.045 U	0.045 U	0.044 U	0.049 U	0.044 U	0.045 U	0.046 U	0.051 U	0.046 U
Molybdenum	5 B	1.5 B	0.74 B	0.44 B	0.64 B	1.1 B	0.7	1.4	0.52
Nickel	6.4	8.6	9.6	14.9	6.8	10.8	10	6.4	8
Potassium	1930	2800	2270	4420	1220	2460	1650	2590	2650
Selenium	0.75 U	0.72 U	0.71 U	0.78 U	0.71 U	0.74 U	0.94 F	0.96 F	0.74 F
Silver	0.52 U	0.5 U	0.49 U	0.54 U	0.49 U	0.51 U	0.51 U	0.58 U	0.52 U
Sodium	723	636	483	334	684	439	881	1100	1800
Thallium	0.98 U	0.94 U	0.93 U	1 U	0.92 U	0.96 U	0.97 U	1.1 U	0.97 U
Vanadium	24.6	33.7	29.6	40.7	19.6	40.3	30.7	17.4	28.7
Zinc	30.5 B	33.7 B	32.2 B	44 B	24.3 B	25 B	18.2	19.9 B	19.6 B
Semivolatiles-(mg/kg)									
Bis(2-ethylhexyl)phthalate	0.092 U	3.8 E	0.086 U	1	0.087 U	0.09 U	1.3	0.1 U	0.09 U
Volatiles-(mg/kg)									
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	0.0022	0.0015 F
Pesticides/PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).

Table 3-2. Summary of Background Subsurface Soil Sample Results

Location:	BK-002		BK-003	BK-004	BK-005	BK-007		BK-008			
Sample Number:	BK-002-02	BK-002-03	BK-003-02	BK-004-02	BK-005-02	BK-007-02	BK-007-03	BK-008-02	BK-008-05	BK-008-03	BK-008-06
Depth (ft bgs):	0.5 to 2.5	2.5 to 4.0	0.5 to 2.5	0.5 to 2.5	0.5 to 2.5	0.5 to 2.5	2.5 to 4.5	0.5 to 2.5	0.5 to 2.5 DUP	2.5 to 4.5	2.5 to 4.5 DUP
Parameters[a,b]											
Inorganics-(mg/kg)											
Aluminum	3940 B	3110 B	5390 B	21000 B	3250 B	12400 B	7890 B	10500 B	14600 B	14900 B	14600 B
Antimony	0.86 U	0.86 U	0.84 U	0.92 U	0.84 U	0.9 U	0.89 U	0.9 U	0.91 U	0.9 U	0.9 U
Arsenic	4.5	4.2	3	4.4	3.3	4.7	3.8	4.4	5.2	4.6	1.1
Barium	33.2	17.3	52.7	142	17.7	51.5	14.9	85.3	88	65.4	60.9
Beryllium	0.47	0.35	0.39	0.97	0.15 F	0.63	0.41	0.79	0.8	0.66	0.8
Cadmium	0.28	0.18	0.3	0.19	0.17	0.2	0.18	0.26	0.26	0.22	0.31
Calcium	272000 B	270000 B	140000 B	53100 B	315000 B	173000 B	245000 B	167000 B	137000 B	192000 B	211000 B
Chromium	7.3	5.9	4.4	9.7	2.1	6.6	7.6	8.8	9.8	7.6	8.3
Cobalt	2.5	2.3	1.9	4.9	0.92	3.4	0.99	5	3.9	3.9	12.8
Copper	3.4	3.4	4.4	9	4.7	5.4	6.1	6.5	5.9	3.1	5.4
Iron	5190	5110	4580	13800	5500	15400	8960	8570	11500	11200	11600
Lead	5.9	3.9	5.9	10.8	2.4	11.3	5.8	9.3	11.8	8.2	9.9
Magnesium	1900 B	2050 B	1690 B	3320 B	1740 B	2700 B	2890 B	1870 B	2420 B	2290 B	2280 B
Manganese	202	238	198	339	128	144	153	266	214	227	776
Mercury	0.043 U	0.043 U	0.042 U	0.046 U	0.042 U	0.045 U	0.045 U	0.045 U	0.046 U	0.046 U	0.044 U
Molybdenum	0.72	1.1	0.6	1	1.7	1.5	2	0.33 U	0.33 U	0.34 U	1.9
Nickel	5	4.6	4.8	9.4	4.6	7.2	5.3	7.6	7.6	6.3	15.2
Potassium	574	671	720	2270	772	1990	1700	1370	1890	1460	1470
Selenium	0.7 U	0.7 U	0.68 U	1.1	0.68 U	0.73 U	0.72 U	0.73 U	0.74 U	0.73 U	0.74 U
Silver	0.49 U	0.49 U	0.47 U	0.52 U	0.47 U	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.51 U
Sodium	1010 B	1340 B	904 B	818 B	2020 B	1030 B	1270 B	1310 B	1020 B	1700 B	2990 B
Thallium	0.92 U	0.92 U	0.89 U	1.3 F	0.89 U	0.96 U	0.94 U	0.95 U	0.96 U	0.96 U	0.96 U
Vanadium	19.7	11.2	13.4	32.9	11.2	17.9	12.4	30.2	30.3	23.9	36.2
Zinc	12.1 B	12.3 B	18.4 B	22.4 B	9.9 B	22 B	15.3 B	18.5 B	20.1 B	12.4 B	13.3 B
Semivolatiles-(mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Volatiles-(mg/kg)											
Methylene chloride	0.0013 F	0.0012 U	0.0012 F	0.0016 F	0.0011 U	0.0016 F	0.0012 U	0.0012 U	0.0012 U	0.0012 U	0.0012 U
Pesticides/PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Organic Carbon (ug/g)	NA	NA	NA	NA	NA	NA	NA	NA	NA	1970	NA

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).

Table 3-3. Summary of Background Sediment Soil Sample Results

Location:	BK-011	BK-012	BK-013
Sample Number:	BK-011-01	BK-012-01	BK-013-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]			
Inorganics-(mg/kg)			
Aluminum	13600	4000	14200
Antimony	0.94 F	0.83 U	0.99 F
Arsenic	5.8	3.7	5.2
Barium	121	29.7	141
Beryllium	0.88	0.27 F	0.93
Cadmium	0.22	0.14	0.27
Calcium	122000	218000	59400
Chromium	15	6.5	10.4
Cobalt	4.7	1.6	5.6
Copper	10.2	5.6	9.5
Iron	10400	5800	10900
Lead	14	5.9	18.1
Magnesium	2600 J	2090 J	2560 J
Manganese	332	206	404
Mercury	0.047 U	0.041 U	0.046 U
Molybdenum	0.66	1.4	0.58
Nickel	10.9	6.2	10.1
Potassium	1830 J	798 J	2190 J
Selenium	0.76 R	0.67 R	0.74 R
Silver	0.52 U	0.47 U	0.51 U
Sodium	2020	1750	756
Thallium	1 U	0.89 U	0.97 U
Vanadium	38.7	19.2	32
Zinc	28.9	16.4	32.4
Semivolatiles-(mg/kg)	ND	ND	ND
Volatiles-(mg/kg)			
Methylene chloride	0.004	0.0026	0.0053
Toluene	0.0014 F	0.0027 F	0.008
Pesticides/PCBs	ND	ND	ND
Explosives	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).

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Table 3-4. Summary of Background Surface Water Sample Results

Location:	BK-010	BK-011		BK-012	BK-013	
Sample Number:	BK-010-10	BK-011-10	BK-011-13[b]	BK-012-10	BK-013-10	BK-013-13[b]
Parameters[a]						
Inorganics (mg/L)			NA			NA
Aluminum	0.11	0.48		1.5	1.8	
Antimony	0.0078 F	0.0075 U		0.0075 U	0.0075 U	
Arsenic	0.007 U	0.007 U		0.007 U	0.007 U	
Barium	0.056	0.072		0.063	0.097	
Beryllium	0.001 U	0.001 U		0.001 U	0.001 U	
Cadmium	0.0007 U	0.0007 U		0.0007 U	0.0007 U	
Calcium	93.8 B	93.9		100 B	110 B	
Chromium	0.0035 U	0.0035 U		0.0035 U	0.0035 U	
Cobalt	0.002 U	0.002 U		0.002 U	0.002 U	
Copper	0.0035 U	0.0067		0.0035 U	0.0035 U	
Iron	0.045 U	0.28		0.8	1	
Lead	0.004 U	0.004 U		0.004 U	0.004 U	
Magnesium	5	5		4.5	3.4	
Manganese	0.0068	0.01		0.015	0.052	
Mercury	0.00024 U	0.00024 U		0.00024 U	0.0002 U	
Molybdenum	0.02	0.003 U		0.0036 F	0.003 U	
Nickel	0.005 U	0.005 U		0.005 U	0.005 U	
Potassium	1.7	2.1		1.4	1.2	
Selenium	0.01 U	0.01 U		0.01 U	0.01 U	
Silver	0.0045 U	0.0045 U		0.0045 U	0.0045 U	
Sodium	10.3	12.5		9.7	8	
Thallium	0.0085 U	0.0085 U		0.0085 U	0.0085 U	
Vanadium	0.0025 U	0.0036 F		0.0035 F	0.0047 F	
Zinc	0.0066 F	0.0057 F		0.0058 F	0.011 F	
Semivolatiles	ND	ND	NA	ND	ND	NA
Volatile Organics	ND	ND	NA	ND	ND	NA
Pesticides/PCBs	ND	ND	NA	ND	ND	NA
Explosives	R	R	ND	R	R	ND

ND - not detected

F - Compound was positively detected below the PQL

R- Data Rejected

U - Compound was analyzed for, but detected below the method detection limit

[a]Parameters limited to those detected in at least one sample.

[b] These samples were reanalyzed during the May 1998 sampling event, because the original results (Feb. 1998) for the explosives analyses were rejected during data validation.

Table 3-5. Summary of Background Groundwater Detected Results

	Location:	MW-925
	Sample Number:	MW-925-01
Parameters[a,b]		
Inorganics-(mg/L)		
Aluminum		0.068
Antimony		0.0075 U
Arsenic		0.0070 U
Barium		0.11
Beryllium		0.0010 U
Cadmium		0.0007 U
Calcium		76.2
Chromium		0.0035 U
Cobalt		0.0020 U
Copper		0.0035 U
Iron		0.48
Lead		0.0035 U
Magnesium		11.3
Manganese		0.02
Mercury		0.00024 U
Molybdenum		0.0046 F
Nickel		0.0050 U
Potassium		2.4
Selenium		0.01 U
Silver		0.0045 U
Sodium		11.2
Thallium		0.0085 U
Vanadium		0.0025 U
Zinc		0.0047 F
Semivolatiles		ND
Volatiles		ND
Pesticides/PCBs		ND
Explosives		ND

NA - Not analyzed.

ND - Not detected.

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at least one sample (see Appendix E).

Table 3.6. Background Soil, Sediment, and Groundwater Upper Tolerance Limits and Outlier Testing

		Surface Soil and Sediment[a] (0-0.5 ft) (mg/kg)		
Analyte	Distribution[b]	Conc. Range	$UTL_{95,95}$[c]	Outlier?[d]
Aluminum	N	4,000-30,100	36,577	No
Antimony	NI[e]	0.83U-4.5	4.5	Yes
Arsenic	N	3.0-6.45	8.1	No
Barium	LN	29.7-141	388	No
Beryllium	N	0.26-0.94	1.5	No
Cadmium	LN	0.14-0.74	1.2	Yes
Calcium	N	15,000-231,000	373,068	No
Chromium	LN	6.5-26.8	49.0	No
Cobalt	N	1.6-6.4	9.1	No
Copper	LN	4.2-10.5	19.3	No
Iron	LN	5,800-18,500	33,008	No
Lead	N	5.9-19.6	26.0	No
Magnesium	LN	2,090-4,780	8,312[g] (2,600[g])	No
Manganese	N	142-440	598	No
Mercury	NI	0.04U-0.051U	0.051[f]	N/A
Molybdenum	LN	0.44-5.0	9.1	Yes
Nickel	LN	6.2-14.9	21.3	No
Potassium	LN	798-4,420	8,883	No
Selenium	NI	0.67U-0.96	0.96[h]	N/A
Silver	NI	0.47U-0.58U	0.58[f]	N/A
Sodium	LN	334-2,020	5,599	No
Thallium	NI	0.89U-1.1U	1.1[f]	N/A
Vanadium	N	17.4-40.7	55.2	No
Zinc	LN	16.4-44.0	69.5	No

LN - data lognormally distributed.

N - data normally distributed.

N/A - not applicable because frequency of nondetects is greater than 50 percent.

NI - data distribution not identifiable; $UTL_{95,95}$ is the maximum detected concentration for compounds detected at least once and the maximum detection limit for compounds not detected.

U - undetected; value is the detection limit.

UTL - upper tolerance limit.

[a] - Includes background surface soil and drainageway sediment samples unless otherwise noted.

[b] - *Distribution tested using probability plot and Shapiro-Wilk Test of Normality (EPA 1989c, EPA 1992b, Manuguistics 1997).*

[c] - Represents a 95 percent confidence level that the UTL will contain at least 95 percent of the distribution of observations from the background data (calculated using Statgraphics Plus® software [Manuguistics 1997]).

[d] - The maximum detected concentration is a statistical outlier, tested using the T statistic (EPA 1989c).

[e] - Distribution was not identifiable even with outliers excluded (the two highest values were determined to be outliers).

[f] - Maximum detection limit.

[g] - The magnesum $UTL_{95,95}$ of 8,312 mg/kg is based on surface soil background as discussed in Section 3.1.2. Value in parentheses represents UTL for drainage way surface sediment.

[h] - Frequency of nondetects is 27 percent; therefore, $UTL_{95,95}$ was calculated using Cohen's adjustment for nondetects (EPA 1989c, 1992b).

[i] - Frequency of nondetects is > 50 percent; therefore, $UTL_{95,95}$ is the maximum detected concentration.

[j] - Represents the one data point collected for background groundwater.

Table 3.6. Background Soil, Sediment, and Groundwater Upper Tolerance Limits and Outlier Testing, cont'd.

Analyte	Subsurface Soil (0.5-4.5 ft) (mg/kg)				Groundwater (mg/L)
	Distribution[b]	Conc. Range	$UTL_{95,95}$[c]	Outlier?[d]	($UTL_{95,95}$[j])
Aluminum	N	3,110-21,000	29,386	No	0.6800
Antimony	NI	0.84U-0.92U	0.92[f]	No	0.0075[f]
Arsenic	N	3.0-11.0	11.8	Yes	0.007[f]
Barium	LN	14.9-142	516	No	0.11
Beryllium	N	0.15-0.97	1.4	No	0.001[f]
Cadmium	LN	0.17-0.31	0.47	No	0.0007[f]
Calcium	N	53,100-315,000	442,567	No	76.20
Chromium	N	2.1-9.8	14.6	No	0.0035[f]
Cobalt	LN	0.92-12.8	34.8	Yes	0.002[f]
Copper	LN	3.1-9.0	14.2	No	0.0035[f]
Iron	N	4,580-15,400	21,542	No	0.48
Lead	N	2.4-11.8	18.0	No	0.0035[f]
Magnesium	LN	1,690-3,320	4,541	No	11.30
Manganese	LN	128-776	1,140	Yes	0.02
Mercury	NI	0.042U-0.046U	0.046[f]	N/A	0.00024[f]
Molybdenum	N	0.33U-2.0	5.4[h]	No	0.0046
Nickel	LN	4.6-15.2	21.9	Yes	0.005[f]
Potassium	N	574-2,270	3,279	No	2.40
Selenium	NI	0.68U-1.1	1.1[f]	N/A	0.01[f]
Silver	NI	0.47U-0.51U	0.52[f]	N/A	0.0045[f]
Sodium	LN	818-2,990	4,565	No	11.20
Thallium	NI	0.89U-1.3	1.3[f]	N/A	0.0085[f]
Vanadium	LN	11.2-36.2	86.9	No	0.0025[f]
Zinc	LN	9.9-22.4	38.5	No	0.0047

LN - data lognormally distributed.

N - data normally distributed.

N/A - not applicable because frequency of nondetects is greater than 50 percent.

NI - data distribution not identifiable; $UTL_{95,95}$ is the maximum detected concentration for compounds detected at least once and the maximum detection limit for compounds not detected.

U - undetected; value is the detection limit.

UTL - upper tolerance limit.

[a] - Includes background surface soil and drainageway sediment samples unless otherwise noted.

[b] - Distribution tested using probability plot and Shapiro-Wilk Test of Normality (EPA 1989c, EPA 1992b, Manuguistics 1997).

[c] - Represents a 95 percent confidence level that the UTL will contain at least 95 percent of the distribution of observations from the background data (calculated using Statgraphics Plus® software [Manuguistics 1997]).

[d] - The maximum detected concentration is a statistical outlier, tested using the T statistic (EPA 1989c).

[e] - Distribution was not identifiable even with outliers excluded (the two highest values were determined to be outliers).

[f] - Maximum detection limit.

[g] - The magnesum $UTL_{95,95}$ of 8,312 mg/kg is based on surface soil background as discussed in Section 3.1.2. Value in parentheses represents UTL for drainage way surface sediment.

[h] - Frequency of nondetects is 27 percent; therefore, $UTL_{95,95}$ was calculated using Cohen's adjustment for nondetects (EPA 1989c, 1992b).

[i] - Frequency of nondetects is > 50 percent; therefore, $UTL_{95,95}$ is the maximum detected concentration.

[j] - Represents the one data point collected for background groundwater.

Table 3-7. Background Surface Water Upper Tolerance Limits

Analyte[a]	Distribution[b]	Conc. Range (mg/L)	Frequency of Nondetect	$UTL_{95,95}$[c] (mg/L)
Aluminum	N	0.11-1.8	0.0%	5.1
Antimony	N/A	0.0075U-0.0078	75.0%	0.0078
Barium	N	0.056-0.097	0.0%	0.16
Calcium	N	93.8-110	0.0%	139
Copper	N/A	0.0035U-0.0067	75.0%	0.0067
Iron	N	0.045U-1.0	25.0%	10.5[d]
Magnesium	N	3.4-5.0	0.0%	8.4
Manganese	LN	0.0068-0.052	0.0%	12.4
Molybdenum	N/A	0.003U-0.02	50.0%	0.02
Nickel	N/A	0.005U-0.005U	100.0%	0.0051
Potassium	N	1.2-2.1	0.0%	3.6
Sodium	N	8-12.5	0.0%	19.7
Zinc	LN	0.0057-0.011	0.0%	7.0

LN - data lognormally distributed.

N - data normally distributed.

N/A - not applicable because frequency of nondetects is greater than 50 percent; maximum detected concentration, or maximum detection limit for nondetected compounds, is the $UTL_{95,95}$.

U - undetected; value is the detection limit.

UTL - upper tolerance limit.

[a]Analytes include only those that were detected in site seep and drainageway surface water samples.

[b]Distribution tested using probability plot and Shapiro-Wilk Test of Normality (TEC 1998).

[c]Represents a 95 percent confidence level that the UTL will contain at least 95 percent of the distribution of observations from the background data.

[d]Frequency of nondetects is 25 percent; therefore, $UTL_{95,95}$ was calculated using Cohen's adjustment for nondetects (EPA 1989, 1992).

Table 3-8. Facility Surface Residue Background Sample Results

Sample Number:	STI/STE-01-01	STI/STE-01-02	STI/STE-02-01	STI/STE-03-01	Upper Tolerance Limits	
Parameters					**Distribution**	**$UTL_{95,95}$**
Inorganics-(mg/ft²)						
Aluminum	0.75	0.335	1.9	0.95	LN	**32.620**
Antimony	0.0075	0.0017	0.00105	0.0005 U	LN	1.828
Arsenic	0.00095	0.000455	0.00145	0.0006	LN	**0.01080**
Barium	0.028	0.0115	0.0395	0.0105	N	0.0941
Beryllium	0.0001 U	0.0001 U	0.00008	0.0001 U	N/A-NI[e]	0.0001
Cadmium	0.0018	0.000365	0.0011	0.0009	N	0.00410
Calcium	15.2	3.2	17.4	7.25	N	45.06
Chromium	0.0075	0.006	0.0055	0.016	LN	**0.096**
Cobalt	0.00055	0.00014	0.005	0.00038	LN	1.4513
Copper	0.075	0.0095	0.017	0.0105	LN	2.556
Iron	3.9	1.2	2.9	1.25	N	9.11
Lead	0.021	0.0175	0.0215	0.0205	N	0.0294
Magnesium	0.415	0.375	0.6	0.325	LN	**1.606**
Manganese	0.0405	0.0155	0.06	0.0245	LN	**0.6440**
Mercury	0.00004 U	0.00015	0.00004 U	0.00004 U	N/A-NI[d]	0.00015
Molybdenum	0.01	0.0009	0.0009	0.0006	LN	1.1086
Nickel	0.0205	0.002	0.0036	0.00135	LN	1.8116
Potassium	0.55	0.15	1.6	0.7	LN	**85.70**
Selenium	0.00045 U	0.00045 U	0.00036	0.00045 U	N/A-NI[e]	0.00045
Sodium	1.35	1.45	1.65	1.35	LN	**2.35**
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	N/A-NI[e]	0.0002
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	N/A-NI[e]	0.00053
Vanadium	0.00195	0.00065	0.0039	0.00205	N	0.00901
Zinc	0.24	0.48	0.27	0.105	LN	**6.004**
Explosives[f]-(mg/ft²)						
2,4,6-Trinitrotoluene	0.002 U	2.2	0.002 U	0.002 U		

LN - data lognormally distributed.

N - data normally distributed.

N/A - not applicable because frequency of nondetects is greater than 50 percent.

NI - data distribution not identifiable; $UTL_{95,95}$ is the maximum detected concentration for compounds detected at least once and the maximum detection limit for compounds not detected.

U - undetected; value is the detection limit.

UTL - upper tolerance limit.

[a] - Distribution tested using probability plot and Shapiro-Wilk Test of Normality (EPA 1989c, EPA 1992b, Manuguistics 1997).

[b] - Represents a 95 percent confidence level that the UTL will contain at least 95 percent of the distribution of observations from the background data (EPA 1989, 1992).

[c] - Frequency of nondetects is 25 percent; therefore, $UTL_{95,95}$ was calculated using Cohen's adjustment for nondetects (EPA 1989c, 1992b).

[d] - Frequency of nondetects is > 50 percent; therefore, $UTL_{95,95}$ is the maximum detected concentration.

[e] - Defaulted to analytical detection limit (see Section 3.1.2).

[f] - Only detected results are displayed.

Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results

Location:	A1-001	A1-002	A1-003		A1-004			A1-005		
Sample Number:	A1-001-01	A1-002-01	A1-003-01	A1-003-02	A1-004-01	A1-004-02	A1-004-03	A1-005-01	A1-005-02	A1-005-03
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Parameters[a,b]										
Inorganics-(mg/kg)										
Aluminum	1410 B	1060 B	1500 B	1290 J	1860 B	2560 J	4820	2580 B	2420 J	2600
Antimony	0.82 U	0.81 U	0.81 U	1.9	0.82 U	0.88 U	0.99 U	0.81 U	0.86 U	2
Arsenic	1.7 F	1.1 F	1.4 F	3.4	1.4 F	4.8	6.3	2.2	2.4	3.2
Barium	35.7	22.4	22.6	15.8 J	27.7	37.9 J	15.2	29.5	25.6 J	14.7
Beryllium	0.1 U	0.1 U	0.1 U	0.2 F	0.1 U	0.34	0.68	0.1 U	0.24 F	0.35
Cadmium	0.47 M	0.46 M	0.65 M	0.076 U	0.5 M	0.078 U	1.2	0.55 M	0.14	0.52
Calcium	298000 B	339000 B	318000 B	352000 B	327000 B	196000 B	45700	329000 B	284000 B	326000
Chromium	3.2	2.7	4.3	3.6	4	4.3	7.6	4.5	4.8	6.6
Cobalt	0.69	0.53	0.73	1.5	0.6	2.7	4.9	0.98	1.6	1.6
Copper	3.1	2.1	2.7	3 B	2.6	3.9 B	9.5	3.4	14.2 B	4.8
Iron	1860	1080	2110	4100 J	2000	6790 J	9800	2710	3600 J	6020
Lead	4.3 M	2.2 M	18.2 M	2.5	15.3 M	4.4	14.5	32.3 M	7.2	3.5
Magnesium	2120	2130	1830	2410 J	2280	1630 J	2170 J	2110	2040 J	2450 J
Manganese	130 M	130 M	136 M	262 M	142 M	244 M	53.4 M	148 M	172 M	195
Molybdenum	0.56 M	0.3 UM	0.3 UM	2.2 B	0.31 UM	1.4 B	3.3	0.38 M	0.97 B	1.9
Nickel	2.7	2	2.5	3.9	2.9	6.3	17.4	3.4	3.6	6.7
Potassium	429	439	420	564	540	606	1540	563	651	838
Selenium	0.66 U	0.66 U	0.66 U	0.71 U	0.67 U	0.72 U	0.81 U	0.66 U	0.7 U	0.73 U
Sodium	418 B	443 B	419 B	1140	397 B	1120	1140	384 B	714	1560
Vanadium	5.8	4	5.8	10 J	6.2	11.2 J	14.8	8	10.2 J	17.7
Zinc	37.1 M	36.9 M	23.6 M	28.7 B	23.1 M	29 B	43.8	26.9 M	33.1 B	19.1
Semivolatiles-(mg/kg)							NA			NA
Benzo(a)anthracene	0.083 U	0.082 U	0.082 U	0.09 U	0.083 U	0.091 U		0.082 U	0.088 U	
Benzo(a)pyrene	0.083 U	0.082 U	0.082 U	0.09 U	0.083 U	0.091 U		0.082 U	0.088 U	
Bis(2-ethylhexyl) phthalate	0.081 U	0.08 U	0.18 F	0.087 R	0.081 U	0.089 R		0.08 U	0.086 R	
Fluoranthene	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	0.11 U		0.1 U	0.11 U	
Phenanthrene	0.073 U	0.072 U	0.072 U	0.079 U	0.073 U	0.08 U		0.072 U	0.077 U	
Pyrene	0.1 U	0.1 U	0.1 U	0.11 R	0.1 U	0.11 R		0.1 U	0.11 R	
Volatiles-(mg/kg)	NA	NA	NA		NA			NA		
Methylene chloride				0.0011 U		0.0011 U	0.0013 U		0.0016 F	0.0012 U
Toluene				0.001 U		0.001 U	0.0012 U		0.001 U	0.0011 U
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - B[illegible]alues exceed background UTL 95,95.

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Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-006		A1-007		A1-008		A1-009		
Sample Number:	A1-006-01	A1-006-02	A1-007-01	A1-007-02	A1-008-01	A1-008-02	A1-009-01	A1-009-02	A1-009-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Parameters[a,b]									
Inorganics-(mg/kg)									
Aluminum	1110 B	1490 J	7090 B	2560 J	5460 B	1520 J	9040 B	2430 J	4520
Antimony	0.81 U	0.91 U	0.93 U	0.93 U	0.84 U	0.87 U	0.99 F	0.9 U	0.86 U
Arsenic	1.4 F	4.2	4.2	3.8	4.2	3.5	5	5.1	3.2
Barium	35.6	17.7 J	26.6	23.7 J	14.9	12.1 J	32.3	20.7 J	21.9
Beryllium	0.1 U	0.24 F	0.34	0.37	0.25 F	0.24 F	0.37	0.33	0.5
Cadmium	0.57 M	0.08 U	0.13 M	0.081 U	0.073 UM	0.075 U	0.076 UM	0.078 U	0.71
Calcium	299000 B	242000 B	281000 B	263000 B	266000 B	285000 B	270000 B	270000 B	119000
Chromium	3.2	3.3	10.6	5.8	10.5	5.9	12.7	5.4	6.1
Cobalt	0.54	1.5	2.1	1.9	1.4	1.1	2.7	1.9	3.6
Copper	3.1	8.3 B	6.9	7.6 B	2.6	4 B	5.1	10.2 B	32.4
Iron	1410	4560 J	8340	5580 J	6800	4560 J	10000	7050 J	10200
Lead	9.4 M	4.1	12 M	6.6	4.8 M	2.6	7.6 M	4.9	7.9
Magnesium	2000	1910 J	3030	2490 J	3170	2730	3100	2510 J	2140 J
Manganese	128 M	401 M	196 M	204 M	195 M	198 M	223 M	238 M	139
Molybdenum	0.3 UM	1.1 B	1.2 M	1.5 B	1.6 M	1 B	1.5 M	1.4 B	0.57
Nickel	2.2	4.3	6.4	5.1	5.5	4.1	7	5.4	8.2
Potassium	378	683	1580	779	1570	746	1900	881	1560
Selenium	0.65 U	0.75 U	0.76 U	0.75 U	0.68 U	0.7 U	0.71 U	0.72 U	0.7 U
Sodium	342 B	1160	560 B	1360	661 B	1430	660 B	1270	1530
Vanadium	4.5	8.7 J	18.1	10.6 J	15.1	8.6 J	21.8	10.5 J	11.1
Zinc	24.5 M	47.5 B	25.4 M	46.7 B	15.2 M	21.9 B	17.7 M	32 B	36.9
Semivolatiles-(mg/kg)									
Benzo(a)anthracene	0.082 U	0.094 U	0.095 U	0.096 U	0.085 U	0.089 U	0.086 U	0.091 U	NA
Benzo(a)pyrene	0.082 U	0.094 U	0.095 U	0.096 U	0.085 U	0.089 U	0.086 U	0.091 U	
Bis(2-ethylhexyl) phthalate	0.39 F	0.091 R	0.093 U	0.16 R	0.083 U	0.087 R	0.084 U	0.088 R	
Fluoranthene	0.1 U	0.11 U	0.12 U	0.12 U	0.1 U	0.11 U	0.1 U	0.11 U	
Phenanthrene	0.072 U	0.082 U	0.083 U	0.084 U	0.075 U	0.078 U	0.076 U	0.08 U	
Pyrene	0.1 U	0.12 R	0.12 U	0.12 R	0.1 U	0.11 R	0.11 U	0.11 R	
Volatiles-(mg/kg)	NA		NA		NA		NA		
Methylene chloride		0.0012 U		0.0012 U		0.0012 U		0.0012 U	0.0012 U
Toluene		0.0011 U		0.0011 U		0.001 U		0.0011 U	0.0011 U
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL $_{95,95}$.

Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-010						A1-011		A1-012		
Sample Number:	A1-010-01	A1-010-04	A1-010-02	A1-010-05	A1-010-03	A1-010-06	A1-011-01	A1-011-02	A1-012-01	A1-012-02	A1-012-03
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	2.5 to 4.5	2.5 to 4.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Parameters[a,b]		DUP		DUP		DUP					
Inorganics-(mg/kg)											
Aluminum	16800 B	9950 B	4260 J	4690	8630	8740	14600 B	1440 J	17900 B	2560	2130
Antimony	1.1	1.1	0.98 U	0.98 U	0.93 U	1 U	1.2	1 U	1	0.91 U	0.93 U
Arsenic	4.3	5.5	5.9	6.6	5.6	6.6	5.4	3.4	4.9	2.6	1.5 F
Barium	53.4	45.7	41.4 J	19.3	24.6	16.5	48.1	6.1 J	70.8	22.5 J	12.6
Beryllium	0.66	0.51	0.53	0.52	0.8	0.76	0.61	0.22 F	0.36	0.28 F	0.23 F
Cadmium	0.081 UM	0.084 UM	0.086 U	0.087 U	1.1	1.4	0.088 UM	0.09 U	0.95 M	0.079 U	0.34
Calcium	192000 B	253000 B	154000 B	143000	122000	87600	257000 B	279000 B	157000 B	296000 B	327000
Chromium	21	13	6	6.2	10.7	8.5	17.6	3	22.4	5.8	4.2
Cobalt	4	3.9	4	10.4	2.6	2.8	3.9	3	4.2	1.1	0.68
Copper	4.2	4.6	8.3 B	7.5	5.9	11.9	6.1	1.5 B	11.9	3.4 B	1.8
Iron	13900	12000	10000 J	10200	12800	22400	15100	3300 J	12400	3900 J	4260
Lead	8.2 M	7.7 M	6.4	13.1	8.7	12	11.5 M	2.3	42.8 M	4.3	2.1
Magnesium	3390	2780	1880 J	1730	2420 J	2290 J	3160	2210 J	3350	1820 J	2520 J
Manganese	157 M	188 M	172 M	219	87.3	77.8	134 M	202 M	252 M	121 M	161
Molybdenum	0.71 M	0.96 M	0.79 B	8.3	1.2	0.95	0.91 M	0.56 B	0.77 M	1.7 B	0.91
Nickel	9.6	8.1	8.6	13.7	11.9	18.6	10.8	3.1	10.3	4	2.7
Potassium	3150	2000	1040	1370	1720	1790	2320	439	2360	550	602
Selenium	0.76 U	0.78 U	0.81 F	0.98 F	0.75 U	1	0.81 U	0.84 U	0.81 U	0.74 U	0.76 U
Sodium	482 B	703 B	1200	1040	1130	1460	562 B	1110	500 B	1050	1410
Vanadium	35.6	25	12.2 J	12.8	20.6	17.5	32.5	9.5 J	37.2	16.4 J	11.7
Zinc	22.2 M	19.2 M	27.7 B	22.5	19.5	25.4	25.3 M	23.1 B	48.7 M	19.5 B	14.5
Semivolatiles-(mg/kg)					NA	NA					NA
Benzo(a)anthracene	0.094 U	0.096 U	0.098 U	0.1 U			0.1 U	0.11 U	0.1 U	0.094 U	
Benzo(a)pyrene	0.094 U	0.096 U	0.098 U	0.1 U			0.1 U	0.11 U	0.1 U	0.094 U	
Bis(2-ethylhexyl) phthalate	0.091 U	0.093 U	0.096 U	2.3			0.099 U	0.1 U	0.12 F	0.092 U	
Fluoranthene	0.11 U	0.12 U	0.12 U	0.12 U			0.12 U	0.13 U	0.12 U	0.11 U	
Phenanthrene	0.082 U	0.084 U	0.086 U	0.088 U			0.089 U	0.093 U	0.091 U	0.082 U	
Pyrene	0.12 U	0.12 U	0.12 U	0.12 U			0.12 U	0.13 U	0.13 U	0.12 U	
Volatiles-(mg/kg)	NA	NA					NA		NA		
Methylene chloride			0.0018 F	0.0013 U	0.0013 U	0.0014 U		0.0012 U		0.0012 U	0.0013 U
Toluene			0.0011 U	0.0012 U	0.0012 U	0.0012 U		0.0011 U		0.0011 U	0.0012 U
			DL 4.0		DL 4.0						
Pesticides/PCBs	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
Explosives	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - B[illegible]alues exceed background UTL 95,95.

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Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-013		A1-014		A1-015			A1-016		
Sample Number:	A1-013-01	A1-013-02	A1-014-01	A1-014-02	A1-015-01	A1-015-04	A1-015-02	A1-016-01	A1-016-02	A1-016-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0
Parameters[a,b]						DUP				
Inorganics-(mg/kg)										
Aluminum	1970 B	3300 B	11400 B	4430 B	4240 B	5080 B	2840 B	4370 B	6800 B	8640 B
Antimony	0.82 U	0.98 F	1.6	0.88 U	1.5	1.5	0.92 U	1.3	0.92 U	9.1 U
Arsenic	1.5 F	3	5.3	3.3	3.2	2.8	3.1	2.8	4.1	4
Barium	40.7	23.7	20.5	16.8	16.7	20.5	12.2	13.4	19	16.6
Beryllium	0.1 U	0.17 F	0.46	0.32	0.13 F	0.11 U	0.23 F	0.11 U	0.38	0.42
Cadmium	0.45 M	0.16	0.077 UM	0.13	0.26 M	0.18 M	0.12	0.12 M	0.16	0.11
Calcium	294000 B	236000	233000 B	316000	295000 B	291000 B	340000	216000 B	244000	270000
Chromium	3.7	5.6	15.4	8.7	8.5	9.6	5.5	9.2	11.5	12.6
Cobalt	0.74	1.3	3.2	1.6	1.5	2	0.98	1.3	2	2.4
Copper	2.7	16.7	5.9	14.4	3.2	3.9	3.5	2	4.1	3.7
Iron	1810	4490	11600	6360	5930	6500	5060	5620	8410	8530
Lead	5.6 M	3.3	6.9 M	4	5.5 M	7.1 M	2.9	3.8 M	4.7	5
Magnesium	1720	2150 B	3680	3120 B	2770	3120	3210 B	2610	2900 B	3430 B
Manganese	138 M	221	211 M	207	193 M	226 M	219	152 M	152	205
Molybdenum	0.31 UM	1.2	1.1 M	1	0.52 M	0.45 M	0.95	0.76 M	1.2	0.86
Nickel	2.8	4.1	9	4.8	4.5	5.1	3.9	4	6.4	6.4
Potassium	520	840	2850	1360	1080	1240	992	1080	1840	2540
Selenium	0.66 U	0.75 U	0.72 U	0.71 U	0.67 U	0.7 U	0.75 U	0.72 U	0.75 U	0.74 U
Sodium	414 B	851	637 B	1030	663 B	759 B	1030	498 B	1020	1080
Vanadium	6.4	11	21.7	11.2	13.8	15.9	10.9	15.3	16	19
Zinc	15.5 M	14.6	19.3 M	13	26.6 M	64.3 M	8.4	15.7 M	13.3	11.2
Semivolatiles-(mg/kg)										
Benzo(a)anthracene	0.062 U	0.06 U	0.089 U	0.058 U	0.084 U	0.087 U	0.061 U	0.091 U	0.06 U	0.06 U
Benzo(a)pyrene	0.082 U	0.06 U	0.089 U	0.058 U	0.084 U	0.087 U	0.061 U	0.091 U	0.06 U	0.06 U
Bis(2-ethylhexyl) phthalate	0.08 U	0.082 U	0.087 U	0.49 F	0.082 U	0.085 U	0.084 U	0.089 U	0.082 U	0.083 U
Fluoranthene	0.099 U	0.074 U	0.11 U	0.072 U	0.1 U	0.11 R	0.076 U	0.11 R	0.074 U	0.075 U
Phenanthrene	0.072 U	0.052 U	0.078 U	0.05 U	0.074 U	0.076 U	0.053 U	0.08 U	0.052 U	0.052 U
Pyrene	0.1 U	0.071 U	0.11 U	0.068 U	0.1 U	0.11 U	0.072 U	0.11 U	0.071 U	0.072 U
Volatiles-(mg/kg)	NA		NA		NA	NA		NA		
Methylene chloride		0.0011 U		0.0012 U			0.0012 F		0.0014 F	0.0012 U
Toluene		0.001 U		0.0011 U			0.0011 U		0.0011 U	0.0011 U
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL $_{95,95}$.

Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-017			A1-018			A1-019		A1-020	
Sample Number:	A1-017-01	A1-017-02	A1-017-03	A1-018-01	A1-018-02	A1-018-03	A1-019-01	A1-019-02	A1-020-01	A1-020-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5	0.0 to 0.5	0.5 to 2.0	2.5 to 4.5	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 1.5
Parameters[a,b]										
Inorganics-(mg/kg)										
Aluminum	7210 B	8480 B	6020	14400 B	23700 B	9480	1350 B	5390 B	7480 B	7310 B
Antimony	0.87 U	9.5 U	0.99 U	0.96 F	1.5	0.92 U	0.82 U	0.89 U	1.2	1.1 U
Arsenic	3.4	3.8	6.1	4.4	4.6	5.4	1.3 F	3.2	4.3	3.6
Barium	29.5	34.6	11.7	58.5	65	192	17.1	17.7	14.1	16.3
Beryllium	0.14 F	0.37	0.62	0.49	0.69	0.85	0.1 U	0.26 F	0.35	0.4
Cadmium	0.15 M	0.19	0.9	0.15 M	0.34	0.9	0.65 M	0.19	0.088 M	0.15
Calcium	234000 B	296000	107000	168000 B	157000	144000	293000 B	299000	211000 B	359000
Chromium	10.8	11.6	6.9	16.9	25.1	10.2	4	8.7	10.6	11.8
Cobalt	2.3	1.5	3.3	3.8	3.9	13.4	0.72	1.4	2.5	1.9
Copper	2.7	6	8.9	5.2	11	9.5	2.6	12.2	5.6	6.5
Iron	7520	9130	15300	12200	13200	11800	1800	5910	8890	10100
Lead	7.8 M	5.3	10.3	12.8 M	10.3	11.7	16.9 M	3.9	6.2 M	4.8
Magnesium	2350	2650 B	1800 J	2870	3340 B	1970 J	1670	2600 B	2700	4050 B
Manganese	154 M	139	97.7	203 M	161	642	132 M	217	159 M	253
Molybdenum	0.53 M	0.67	1.1	0.36 M	0.4 F	1.3	0.31 UM	0.92	4.3 M	0.97
Nickel	5	6	12.2	8.9	11.1	12.7	2.2	4.2	6.9	5.8
Potassium	1350	1680	1520	1710	2120	1000	366	1360	1920	1970
Selenium	0.7 U	0.77 U	1.2	0.75 U	0.74 U	2	0.66 U	0.72 U	0.72 U	0.89 U
Sodium	538 B	930	1940	676 B	1290	2280	379 B	1070	540 B	1160
Vanadium	18.6	20.1	14.2	32.6	42.8	29.1	5.7	14.3	16.1	16.4
Zinc	28.5 M	14	23.2	33.3 M	28	20.2	28 M	21.7	24.4 M	25.8
Semivolatiles-(mg/kg)			NA							
Benzo(a)anthracene	0.088 U	0.062 U		0.095 U	0.059 U	0.092 R	0.091 F	0.059 U	0.087 U	0.071 U
Benzo(a)pyrene	0.088 U	0.062 U		0.095 U	0.059 U	0.092 R	0.086 F	0.059 U	0.087 U	0.071 U
Bis(2-ethylhexyl) phthalate	0.086 U	0.086 U		0.093 U	0.088 F	0.09 R	0.082 U	0.082 U	0.085 U	0.098 U
Fluoranthene	0.11 R	0.078 U		0.12 R	0.073 U	0.11 R	0.24 F	0.074 U	0.11 R	0.089 U
Phenanthrene	0.078 U	0.054 U		0.083 U	0.051 U	0.081 R	0.12 F	0.052 U	0.077 U	0.082 U
Pyrene	0.11 U	0.074 U		0.12 U	0.07 U	0.11 R	0.18 F	0.07 U	0.11 U	0.084 U
Volatiles-(mg/kg)	NA			NA			NA		NA	
Methylene chloride		0.0012 F	0.0012 U		0.0014 U	0.0014 U		0.0011 U		0.0011 U
Toluene		0.0011 U	0.0011 U		0.0012 U	0.0012 U		0.001 U		0.001 U
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - B[illegible]alues exceed background UTL 95,95.

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Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-021			A1-022			A1-023			A1-024	
Sample Number:	A1-021-01	A1-021-02	A1-021-05	A1-022-01	A1-022-02	A1-022-03	A1-023-01	A1-023-02	A1-023-03	A1-024-01	A1-024-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]			DUP								
Inorganics-(mg/kg)											
Aluminum	7540 B	5980 B	6310 B	8100 B	9840 B	3810	13400 B	9580 B	6920	1130 B	1900 B
Antimony	0.9 U	0.8 U	0.97 F	0.87 U	0.97 F	0.9 U	1.2	0.89 R	0.87 U	0.82 U	0.86 R
Arsenic	3.5	2.9	5.1	4.2	4.6	3.5	4.6	4.5	5.4	1.6 F	3.2
Barium	38.8	11.1	14.9	42.6	38.3	18.5	79.1	51.1	27.3	14.2	15.7
Beryllium	0.29 F	0.25 F	0.25 F	0.38	0.33	0.37	0.52	0.6	0.68	0.1 U	0.26 F
Cadmium	0.079 UM	0.16	0.12	0.076 UM	0.17	0.48	0.088 M	0.078 U	1.1	0.54 M	0.075 U
Calcium	173000	222000	261000	234000 B	264000	282000	228000 B	250000 B	59400	338000 B	244000 B
Chromium	9.8	8.7	10.1	10.8	13	7.4	15	11.7	8.1	3.4	3.9
Cobalt	3.2	1	1.5	2.8	2.4	1.1	3.9	2.5	4.1	0.58	0.92
Copper	2.9	4.8	4.8	2.8	3.2	7.2	4.2	2.2 B	13.7	2	7.6 B
Iron	7530	5060	5900	8770	7220	4840	11700	8660	12300	1260	4660
Lead	7 M	3.4	4.3	7.9 M	6.5	3.3	12.1 M	4.8	10.7	16.4 M	3.1
Magnesium	2210	2750 B	2770 B	2220	2530 B	2540 J	2500	1920	1900 J	1500	2030
Manganese	193 M	164	155	161 M	156	155	210 M	136	55	124 M	191
Molybdenum	0.74 M	0.87	1.3	0.72 M	0.8	1.1	0.55 M	0.67	0.97	2.6 M	1.1
Nickel	5.8	4.7	5.6	5.9	5.9	4	7.9	5.2	14.3	1.7	3.6
Potassium	1290	1610	1620	1130	1200	944	1420	1140	1640	309	647
Selenium	0.73 U	0.65 U	0.66 U	0.71 U	0.72 U	0.73 U	0.72 U	0.96 F	1.2	0.66 U	0.7 U
Sodium	444 B	944	948	610 B	816	1450	433 B	875	1280	416 B	987
Vanadium	18.9	13.9	16.2	21.8	25.9	12	32.3	22.9	16.3	4.6	7.9
Zinc	14.8 M	26.9	16.1	14.4 M	27.4	15.6	26.1 M	28.7 B	36.6	10.2 M	22.8 B
Semivolatiles-(mg/kg)						NA			NA		
Benzo(a)anthracene	0.089 U	0.052 U	0.053 U	0.09 U	0.058 U		0.09 U	0.058 U		0.083 U	0.056 U
Benzo(a)pyrene	0.089 U	0.052 U	0.053 U	0.09 U	0.058 U		0.09 U	0.058 U		0.083 U	0.056 U
Bis(2-ethylhexyl) phthalate	0.087 U	0.072 U	0.074 U	0.088 U	0.079 U		0.088 U	0.08 U		0.081 U	0.078 U
Fluoranthene	0.11 U	0.065 U	0.066 U	0.11 U	0.072 U		0.11 U	0.072 U		0.19 F	0.07 U
Phenanthrene	0.078 U	0.046 U	0.046 U	0.079 U	0.05 U		0.079 U	0.05 U		0.13 F	0.049 U
Pyrene	0.11 U	0.062 U	0.063 U	0.11 U	0.068 U		0.11 U	0.069 U		0.15 F	0.067 U
Volatiles-(mg/kg)	NA			NA			NA			NA	
Methylene chloride		0.0013 F	0.0013 U		0.0012 U	0.0018 F		0.0012 U	0.0019 F		0.0012 F
Toluene		0.0011 U	0.0017 F		0.0011 U	0.0012 U		0.0011 U	0.0012 U		0.001 U
		DL 4.0	DL 4.0								
Pesticides/PCBs	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL $_{95,95}$.

Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-025				A1-026		A1-027		A1-028		
Sample Number:	A1-025-01	A1-025-04	A1-025-02	A1-025-05	A1-026-01	A1-026-02	A1-027-01	A1-027-02	A1-028-01	A1-028-02	A1-028-03
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Parameters[a,b]		DUP		DUP							
Inorganics-(mg/kg)											
Aluminum	5760 B	5920 B	1610 B	1610 B	10900 B	10500 B	13500 B	9760 B	21800 B	9570 B	8500
Antimony	0.85 F	0.84 U	0.89 R	0.91 R	1	0.93 R	0.93 F	0.91 R	0.89 U	1 R	0.95 U
Arsenic	3	2.8	2.9	4.1	4.1	5.3	4.9	7.6	4	5.6	3.7
Barium	17.9	16.8	14	12.2	43.9	27.6	91.2	95.5	76	112	47.5
Beryllium	0.28 F	0.26 F	0.27 F	0.28 F	0.4	0.69	0.6	0.71	0.49	0.93	0.7
Cadmium	0.072 UM	0.073 UM	0.079 U	0.079 U	0.077 UM	0.082 U	0.08 UM	0.08 U	0.2 M	0.088 U	0.71
Calcium	294000 B	311000 B	303000 B	345000 B	224000 B	241000 B	144000 B	226000 B	181000 B	184000 B	151000
Chromium	9.4	9.6	5.5	5.2	13.9	15	15.1	11.8	31.6	11.7	8
Cobalt	1.4	1.1	1	1.4	3.2	1.1	5.5	8.2	4.7	2.3	2.9
Copper	2.2	1.9	2.9 B	2.7 B	4.2	2.5 B	5.5	4 B	11.1	5.8 B	2.9
Iron	5710	5350	4090	4720	10500	10500	12300	11000	13000	10700	11100
Lead	3.5 M	3.1 M	2	2.4	10 M	4.5	12.9 M	8	13.9 M	8.6	4.2
Magnesium	2820	2830	2630	3000	2820	2750	2590	1940	3610	2850	2790 J
Manganese	203 M	190 M	208	250	190 M	102	250 M	649	236 M	112	58.5
Molybdenum	1.4 M	1.2 M	0.89	0.95	0.97 M	2	0.52 M	1.2	0.73 M	0.74	0.83
Nickel	4.2	3.9	3.7	4.8	7.2	7	8.8	10	514	7.4	6.8
Potassium	1350	1380	742	776	1690	2170	1380	1060	2310	871	1260
Selenium	0.67 U	0.68 U	0.73 U	0.73 U	0.72 U	1.4	0.74 U	1.1	0.72 U	1.1	1.2
Sodium	632 B	499 B	987	1120	426 B	1060	403 B	872	503 B	791	1670
Vanadium	12.8	12.8	7.9	9	26.8	24.4	36.1	29.5	41.5	32.6	16.8
Zinc	8.8 M	33 M	39.1 B	15.9 B	16.1 M	30.3 B	22.4 M	23 B	31.7 M	30.8 B	15.8
Semivolatiles-(mg/kg)											
Benzo(a)anthracene	0.084 U	0.084 U	0.059 U	0.06 U	0.09 U	0.061 U	0.095 U	0.06 U	0.093 U	0.066 U	0.096 R
Benzo(a)pyrene	0.084 U	0.084 U	0.059 U	0.06 U	0.09 U	0.061 U	0.095 U	0.06 U	0.093 U	0.066 U	0.096 R
Bis(2-ethylhexyl) phthalate	0.18 F	0.082 U	0.081 U	0.29 F	0.088 U	0.084 U	0.092 U	0.082 U	0.09 U	0.092 F	0.094 U
Fluoranthene	0.1 U	0.1 U	0.073 U	0.075 U	0.11 U	0.076 U	0.12 U	0.074 U	0.14 F	0.082 U	0.12 U
Phenanthrene	0.074 U	0.073 U	0.051 U	0.052 U	0.08 U	0.053 U	0.083 U	0.052 U	0.1 F	0.057 U	0.084 U
Pyrene	0.1 U	0.1 U	0.07 U	0.072 U	0.11 U	0.072 U	0.12 U	0.071 U	0.11 F	0.079 U	0.12 U
Volatiles-(mg/kg)	NA	NA			NA		NA		NA		
Methylene chloride			0.0013 U	0.0014 F		0.0011 U		0.0012 U		0.0012 U	0.0014 F
Toluene			0.0034 F	0.0011 U		0.001 U		0.0011 U		0.0011 U	0.0012 U
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - B[illegible]alues exceed background UTL 95,95.

Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-029		A1-030		A1-031		A1-032		A1-033		A1-034	
Sample Number:	A1-029-01	A1-029-02	A1-030-01	A1-030-02	A1-031-01	A1-031-02	A1-032-01	A1-032-02	A1-033-01	A1-033-02	A1-034-01	A1-034-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 2.5
Parameters[a,b]												
Inorganics-(mg/kg)												
Aluminum	3070 B	2580 B	10500 B	7210 B	2610 B	3020 B	2010 B	2770 B	2170 B	3240 B	1580 B	2340 B
Antimony	0.82 U	0.83 U	0.84 U	0.94 U	0.82 U	0.85 U	0.82 U	0.92 U	0.83 U	1	0.8 U	1 U
Arsenic	1.8 F	2.3	4.1	3.7	1.8 F	3.6	2	2.6	2.4	3.5	1.9 F	2.8
Barium	31.1	17.9	23.1	22.4	39.6	29.2	45.1	21.8	30.4	26.6	34.8	21.5
Beryllium	0.1 U	0.1 U	0.27 F	0.23 F	0.1 U	0.15 F	0.1 U	0.15 F	0.1 U	0.12 F	0.1 U	0.12 U
Cadmium	0.56 M	0.26	0.073 UM	0.12	0.49 M	0.2	0.53 M	0.17	0.76 M	0.16	0.75 M	0.14
Calcium	329000 B	270000	302000 B	288000	330000 B	277000	213000 B	308000	222000 B	258000	314000 B	329000
Chromium	4.8	5.6	14.6	14.8	4.6	5.3	5.1	4.8	4.7	4.7	3.7	3.8
Cobalt	1	0.72	2.2	1	0.88	1.5	0.92	1.2	1.1	1.6	0.83	1.1
Copper	3.4	14.1	2.6	12.2	2.9	4.5	3.7	10.8	6.3	6	3.5	8.4
Iron	2830	2940	8170	5070	2390	4950	3120	3900	2920	4380	2130	4820
Lead	10.2 M	2.1	6.4 M	3.6	10.1 M	3.5	20.9 M	2.8	33 M	3.8	14.3 M	3.2
Magnesium	2260	2100 B	3260	3260 B	2600	1940 B	2160	2380 B	2130	2110 B	1900	2100 B
Manganese	149 M	175	224 M	207	146 M	244	137 M	320	155 M	250	146 M	202
Molybdenum	0.41 M	0.7	1.9 M	1.6	0.31 UM	0.75	0.64 M	0.42 F	0.48 M	0.89	0.3 UM	0.81
Nickel	3.3	4.2	6.4	6.7	2.8	14.4	3.2	3.1	3.7	4	2.8	2.5
Potassium	622	739	1960	1740	593	719	481	692	463	643	421	616
Selenium	0.66 U	0.67 U	0.68 U	0.76 U	0.67 U	0.69 U	0.67 U	0.74 U	0.67 U	0.79 U	0.65 U	0.81 U
Sodium	381 B	874	519 B	1020	373 B	1020	415 B	750	386 B	1140	361 B	1340
Vanadium	8.3	9.1	22.4	17.9	7.7	11.4	8.2	10.9	7.7	12.5	6.2	8.8
Zinc	23 M	25.8	14.2 M	20.2	18.8 M	35.4	23.4 M	22.1	43.3 M	18	24.6 M	15.5
Semivolatiles-(mg/kg)												
Benzo(a)anthracene	0.082 U	0.053 U	0.086 U	0.06 U	0.082 U	0.056 U	0.085 U	0.06 U	0.083 U	0.063 U	0.08 U	0.066 U
Benzo(a)pyrene	0.082 U	0.053 U	0.086 U	0.06 U	0.082 U	0.056 U	0.085 U	0.06 U	0.083 U	0.063 U	0.08 U	0.066 U
Bis(2-ethylhexyl) phthalate	0.08 U	0.074 U	0.084 U	0.083 U	0.08 U	0.077 U	0.082 U	0.083 U	0.38 F	0.087 U	0.078 U	0.091 U
Fluoranthene	0.1 U	0.066 U	0.1 U	0.075 U	0.1 U	0.069 U	0.1 U	0.075 U	0.1 U	0.079 U	0.098 U	0.082 U
Phenanthrene	0.072 U	0.046 U	0.076 U	0.052 U	0.072 U	0.048 U	0.074 U	0.052 U	0.073 U	0.055 U	0.07 U	0.057 U
Pyrene	0.1 U	0.064 U	0.11 U	0.072 U	0.1 U	0.066 U	0.1 U	0.071 U	0.1 U	0.075 U	0.099 U	0.078 U
Volatiles-(mg/kg)	NA		NA		NA		NA		NA		NA	
Methylene chloride		0.0011 F		0.0014 F		0.0014 F		0.0011 U		0.0011 U		0.0012 F
Toluene		0.001 U		0.001 U		0.001 U		0.001 U		0.001 U		0.001 U
Pesticides/PCBs	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL $_{95,95}$.

Table 3-9. Summary of Outdoor Materiel Storage/Maintenance Area A-1 Soil Sample Detected Results, cont'd.

Location:	A1-100	A1-101	A1-102	A1-103	A1-104	A1-110	A1-111	A1-112	A1-113	A1-114	
Sample Number:	A1-100-01	A1-101-01	A1-102-01	A1-103-01	A1-104-01	A1-110-01	A1-111-01	A1-112-01	A1-113-01	A1-114-01	A1-114-04
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5 DUP
Parameters[a,b]											
Inorganics-(mg/kg)											
Aluminum	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	9.8	8.5	10	6.5	7.2	7.9
Potassium	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--
Semivolatiles-(mg/kg)						NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.17 U	0.18 U	0.18 U	0.19 U	0.21 U						
Benzo(a)pyrene	0.17 U	0.17 U	0.17 U	0.19 U	0.2 U						
Bis(2-ethylhexyl) phthalate	0.18 U	0.18 U	0.18 U	0.2 U	0.21 U						
Fluoranthene	0.18 U	0.19 U	0.19 U	0.21 U	0.22 U						
Phenanthrene	0.17 U	0.17 U	0.17 U	0.19 U	0.2 U						
Pyrene	0.16 U	0.16 U	0.16 U	0.17 U	0.18 U						
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride											
Toluene											
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Bo[illegible]ues exceed background UTL $_{95,95}$.

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Table 3-10. Anthropogenic Background Soil Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs)

	Concentrations (mg/kg)		
Compound	Rural Soil	Agricultural Soil	Urban Soil
Acenaphthylene	0.0017	0.006	NA
Acenapthene	NA	0.005	NA
Anthracene	NA	0.011-0.013	NA
Benzo(a)anthracene	0.005-0.02	0.056-0.11	0.169-59
Benzo(a)pyrene	0.002-1.3	0.0046-0.9	0.165-0.22
Benzo(b)fluoranthene	0.02-0.03	0.058-0.22	15-62
Benzo(e)pyrene	NA	0.053-0.13	0.06-14
Benzo(g,h,i)perylene	0.01-0.07	0.066	0.9-47
Benzo(k)fluoranthene	0.01-0.11	0.058-0.25	0.3-26
Chrysene	0.038	0.078-0.12	0.251-0.64
Fluoranthene	0.0003-0.04	0.12-0.21	0.2-166
Fluorene	NA	0.0097	NA
Ideno(1,2,3-c,d)pyrene	0.01-0.015	0.063-0.1	8-61
Phenanthrene	0.03	0.048-0.14	NA
Pyrene	0.001-0.0197	0.099-0.15	0.145-147

Source: ATSDR, 1995
NA - not available

Table 3-11. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Outdoor Materiel Storage/Maintenance Area (A-1).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:		84			37			47	
Antimony	26%	8%	2.0	41%	0%	1.60	15%	15%	2.0
Cadmium	64%	11%	1.4	65%	0%	0.95	64%	19%	1.4
Chromium	100%	4%	31.6	100%	0%	31.60	100%	6%	25.1
Copper	100%	4%	32.4	100%	0%	11.90	100%	6%	32.4
Iron	100%	1%	22,400.0	100%	0%	15,100	100%	2%	22,400.0
Lead	100%	4%	42.8	100%	8%	42.80	100%	0%	14.5
Molybdenum	90%	1%	8.3	78%	0%	4.30	100%	2%	8.3
Nickel	100%	1%	514.0	100%	3%	514.00	100%	0%	18.6
Selenium	13%	6%	2.0	0%	0%	N/A	23%	11%	2.0
Zinc	100%	5%	64.3	100%	0%	64.30	100%	9%	47.5
Semivolatiles									
No. of Samples:		75			37			38	
Benzo(a)anthracene	1%	1%	0.091	3%	3%	0.091	0%	0%	N/A
Benzo(a)pyrene	1%	1%	0.086	3%	3%	0.086	0%	0%	N/A
Fluoranthene	4%	4%	0.240	8%	8%	0.240	0%	0%	N/A
Phenanthrene	4%	4%	0.130	8%	8%	0.130	0%	0%	N/A
Pyrene	4%	4%	0.180	8%	8%	0.180	0%	0%	N/A
Volatiles									
No. of Samples:		47			0			47	
Toluene	4%	4%	0.00340	0%	0%	N/A	4%	4%	0.00340

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.
Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.
N/A - Not applicable.

Table 3-12. Summary of Outdoor Materiel Storage/Maintenance Area A-2 Soil Sample Detected Results

Location:	A2-001		A2-002		A2-003			A2-004		
Sample Number:	A2-001-01	A2-001-02	A2-002-01	A2-002-02	A2-003-01	A2-003-04	A2-003-02	A2-004-01	A2-004-02	A2-004-05
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.2	0.0 to 0.5	0.5 to 1.0	0.0 to 0.5	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 1.5	0.5 to 1.5
Parameters[a,b]						DUP				DUP
Inorganics-(mg/kg)										NA
Aluminum	7500 B	2620 B	7740 B	4000	10800 B	10600 B	3420 B	8450 B	6890	
Antimony	1.1	0.84 U	1.2	1.4 J	0.86 U	0.84 U	0.86 U	0.98 F	0.9 F	
Arsenic	4.3	1.9 F	3.6	2.8	7.4	8.3	3.7	4	3	
Barium	36.8	15.7	44.3	34.2	56.7	61.1	33.9	58.4	66.4	
Beryllium	0.12 U	0.1 U	0.16 F	0.16 F	0.27 F	0.27 F	0.11 U	0.28 F	0.29 F	
Cadmium	0.34	0.33	0.49	0.25	0.34	0.44	0.27	0.3	0.26	
Calcium	234000 B	346000	250000 B	266000 B	197000 B	175000 B	319000	182000 B	224000 B	
Chromium	10.6	5.6	10.4	6.4	13	12.7	4.8	11	8.2	
Cobalt	2.4	0.73	2.5	1.8	3.3	3.7	3.1	3.2	3.3	
Copper	6	6.2	6.2	7.9 B	6.5	6.2	7.8	5.6	5.3 B	
Iron	8160	4710	9640	5900	10700	10400	3150	9330	6480	
Lead	15.3	2	16.1	7.7	12.1	12.1	3.7	21.6	9.7	
Magnesium	2520	2420 B	2690	2480	2840	2700	1820 B	2470	2320	
Manganese	216	192	225	219	279	288	260	271	298	
Molybdenum	1.7	1.8	1.9	8.7 B	1.4	0.86	0.89	1	1.7 B	
Nickel	7.2	3.6	7.2	5.7	8.9	10	6.9	7.9	8.1	
Potassium	1460	655	1500	658	1780	1670	494	1470	827	
Selenium	0.77 U	0.69 U	0.78 U	0.71 U	0.7 U	0.68 U	0.7 U	0.73 U	0.73 U	
Sodium	574 B	782	594 B	1230 B	500 B	403 B	1180	480 B	984 B	
Vanadium	25.8	18.2	28.8	22.1	30.8	28.3	24.8	28.2	31.3	
Zinc	36.4	20.7 M	65.3	31.1	46.1	38	21.6 M	43	17.5	
Semivolatiles-(mg/kg)										NA
Bis(2-ethylhexyl) phthalate	1	0.11 F	0.31 F	0.08 U	0.083 U	0.083 U	0.078 U	0.088 U	0.082 F	
Volatiles-(mg/kg)	NA		NA		NA	NA		NA		
Methylene chloride		0.0012 U		0.0024 B			0.0029 B		0.0021	0.0022
Toluene		0.0011 U		0.0012 U			0.0011 U		0.0011 U	0.001 F
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL 95,95.

Table 3-12. Summary of Outdoor Materiel Storage/Maintenance Area A-2 Soil Sample Detected Results, cont'd.

Location:	A2-005		A2-006			A2-007		A2-008	
Sample Number:	A2-005-01	A2-005-02	A2-006-01	A2-006-02	A2-006-05	A2-007-01	A2-007-02	A2-008-01	A2-008-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 1.5
Parameters[a,b]					DUP				
Inorganics-(mg/kg)									
Aluminum	9460 B	5720 B	8500 B	6670 B	4940 B	11400 B	3850	7640 B	3500
Antimony	1.4	0.92 U	2.4	1	0.87 U	1.1	0.88 U	1.1	0.87 F
Arsenic	5.4	3	8 U	3.8	3.3	5.6	2	4.4	3.9
Barium	44.5	39.7	48.8	53.8	35.9	54.6	30.4	53.3	24.8
Beryllium	0.31	0.18 F	1.1 U	0.26 F	0.15 F	0.36	0.2 F	0.14 F	0.1 U
Cadmium	0.42	0.26	0.35	0.27	0.22	0.42	0.13	0.58	0.18
Calcium	129000 B	259000	144000 B	217000	302000	141000 B	249000 B	158000 B	310000 B
Chromium	13.3	8.3	10.5	8.5	7.2	14.2	5	10	4.9
Cobalt	3.7	2	3.9	2.7	1.7	4.2	1.6	3.5	1.6
Copper	8.1	5.1	6.3	16	4.8	9.6	7 B	7.3	7.2 B
Iron	12400	7560	9650	5990	5970	13300	4000	12600	7850
Lead	24.9	6.2	22.2	8.2	5.4	18.8	4.5	27.3	4.9
Magnesium	2560	2260 B	2530	2050 B	2360 B	2650	1850	2380	2000
Manganese	216	188	192	220	216	220	191	292	154
Molybdenum	1	1.1	2.2	3	1.9	1.2	1.2 B	1.3	2.4 B
Nickel	9	6.4	10	8.4	6.3	11.9	4.7	9.1	7.7
Potassium	2210	994	2070	1180	813	2450	777	1380	577
Selenium	0.77 U	0.74 U	0.74 U	0.72 U	0.71 U	0.92 F	0.73 U	0.73 U	0.67 U
Sodium	454 B	930	464 B	874	1100	507 B	1020 B	566 B	1400 B
Vanadium	26.8	23.9	25.8	24.2	22	29.1	11.3	36.8	23.4
Zinc	71.8	23.3 M	62.9	31.1 M	17.5 M	70	31.2	53.3	21.5
Semivolatiles-(mg/kg)									
Bis(2-ethylhexyl) phthalate	0.094 U	0.084 U	0.09 U	0.079 U	0.079 U	0.094 U	0.08 U	0.087 U	0.074 U
Volatiles-(mg/kg)	NA		NA			NA		NA	
Methylene chloride		0.0014 U		0.0026 B	0.002 B		0.0016 F		0.0012 U
Toluene		0.0013 U		0.0011 U	0.001 U		0.001 U		0.001 U
									DL 4.0
Pesticides/PCBs	NA	NA	NA	NA	NA	NA	NA	ND	ND
Explosives	NA	NA	NA	NA	NA	NA	NA	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL 95,95.

Table 3-13. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Outdoor Materiel Storage/Maintenance Area (A-2).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:	18			9			9		
Antimony	61%	11%	2.4	78%	0%	2.4	44%	22%	1.4
Arsenic	95%	6%	8.3	89%	11%	8.3	100%	0%	3.9
Copper	100%	6%	16.0	100%	0%	9.6	100%	11%	16
Lead	100%	6%	27.3	100%	11%	27.3	100%	0%	9.7
Molybdenum	100%	6%	8.7	78%	0%	2.2	100%	11%	8.7
Zinc	100%	11%	71.8	100%	22%	71.8	100%	0%	31.2
Volatiles									
No. of Samples:	10			0			10		
Toluene	10%	10%	0.0010	0%	0%	N/A	10%	10%	0.0010

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.
Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.
N/A - Not applicable.

Table 3-14. Summary of Building 8503 and SWMU 59 Area A-3 Soil Sample Detected Results

Location:	A3-001			A3-002			A3-003		A3-004		A3-005	
Sample Number:	A3-001-01	A3-001-02	A3-001-03	A3-002-01	A3-002-20	A3-002-02	A3-003-01	A3-003-02	A3-004-01	A3-004-02	A3-005-01	A3-005-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.8	0.0 to 0.5	0.0 to 0.5	0.5 to 1.8	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 2.5
Parameters[a,b]												
Inorganics-(mg/kg)												
Aluminum	4690	5330	2820	4080	10000	3190	4490	6690	11100	6590	7770	3640
Antimony	1.4	0.9 U	0.86 U	0.84 U	1 U	0.9 U	1	0.95 U	0.97 U	0.92 U	0.88 U	0.91 F
Arsenic	4.8	5	5.5	8.5	6.8	4.9	22.9	4.2	9.8	4.2	5.4	3.8
Barium	34.8	31.5	16.6	26.3	37.1	22.4	40.3	22.2	42.7	14	42.9	20
Beryllium	0.17 F	0.3	0.36	0.22 F	0.66	0.24 F	0.38	0.44	0.46	0.38	0.35	0.24 F
Cadmium	2.3	0.36	0.75	2.1	0.089 U	0.63	1.6	0.14	1.5	0.14	1.2	0.13
Calcium	220000	267000 B	298000	280000	135000	249000 B	217000	211000 B	186000	213000 B	246000	314000 B
Chromium	24.8	10.2	7.1	22.8	28.1	9.3	27.9	11.2	25.6	10.6	31.1	7.3
Cobalt	2	1.8	2	1.7	3.8	3	2.2	1.9	3	2	2.5	1.6
Copper	24.8	9.3 B	4.4	19.6	14.8	9.2 B	46.3	8.6 B	16.9	7 B	27	9.8 B
Iron	7670	7760	13800	6280	11200	6420	8320	8400	11800	8500	10700	7010
Lead	96 M	12.2	7.9	34 M	33.7	14	22.9	5.6	31.6 M	5.4	49.6 M	4.8
Magnesium	2180	2520	2870 J	2740	2550	2480	3440	3070	3270	3170	3160	2810
Manganese	168	200	205	200	193	167	164	150	181	144	186	198
Mercury	0.042 U	0.045 U	0.044 U	0.042 U	0.051 U	0.046 U	0.048 U	0.048 U	0.049 U	0.047 U	0.044 U	0.046 U
Molybdenum	2.3	1.5 B	3.1	1.7	2.8	1.6 B	1.5	1.4 B	2.6	1.4 B	2.9	1.4 B
Nickel	5.1	5.7	7.3	5.4	8.4	7.3	7.6	7.7	8.8	7.5	7.5	5
Potassium	1090	916	945	1400	2230	553	2370	1820	2350	1700	2110	836
Selenium	0.68 U	0.74 U	0.7 U	0.68 U	0.83 U	0.73 U	0.8 U	0.77 U	0.79 U	0.74 U	0.72 U	0.72 U
Sodium	756	1160 B	1520	525	1310	952 B	739	1260 B	775	1510 B	676	1230 B
Vanadium	13.4	17.5	11.8	14.8	22.9	14	21.8	17	22.8	17.3	22.8	12.2
Zinc	61.1 M	20.1	12.6	99.1 M	71.8	23.9	129	21.9	66.7 M	20.9	65.2 M	18.3
Semivolatiles-(mg/kg)	DL 5.0			DL 5.0								
Acenaphthene	0.85 D	0.052 U	0.07 U	0.94 D	0.4 F	0.05 U	0.12 F	0.055 U	0.077 U	0.053 U	0.15 F	0.051 U
Anthracene	0.94 D	0.057 U	0.079 U	1.1 D	0.61 F	0.055 U	0.15 F	0.059 U	0.087 U	0.058 U	0.2 F	0.056 U
Benzo(a)anthracene	3.8 D	0.06 U	0.091 U	4.8 D	2.1	0.069 F	0.67 F	0.063 U	0.34 F	0.062 U	0.83	0.059 U
Benzo(a)pyrene	3.3 D	0.06 U	0.091 U	4.1 D	2	0.062 F	0.62 F	0.063 U	0.3 F	0.062 U	0.73	0.059 U
Benzo(b)fluoranthene	4.6 D	0.11 U	0.17 U	5.6 D	2.8	0.12 F	0.86	0.12 U	0.42 F	0.12 U	1	0.11 U
Benzo(ghi)perylene	2.5 D	0.11 U	0.11 U	3 D	1.3	0.11 U	0.42 F	0.12 U	0.19 F	0.12 U	0.51 F	0.11 U
Bis(2-ethylhexyl)phthalate	0.61 DF	0.083 U	0.088 U	0.83 U	0.64 F	0.08 U	0.22 F	0.14 F	0.76	0.085 U	0.15 F	0.081 U
Butyl benzyl phthalate	0.41 U	0.06 U	0.086 U	0.81 U	0.38 U	0.058 U	0.094 U	0.063 U	0.096 U	0.062 U	0.085 U	0.059 U
Chrysene	3.7 D	0.083 U	0.11 U	4.6 D	2.3	0.082 F	0.8	0.065 U	0.34 F	0.064 U	0.92	0.061 U
Dibenzofuran	0.48 DF	0.06 U	0.075 U	0.71 U	0.29 F	0.058 U	0.082 U	0.063 U	0.083 U	0.062 U	0.074 U	0.059 U
Fluoranthene	11 D	0.079 F	0.11 U	13 D	5.5	0.24 F	1.8	0.15 F	1	0.077 U	2.2	0.073 U
Fluorene	0.68 DF	0.067 U	0.08 U	0.79 D	0.32 U	0.065 U	0.087 U	0.07 U	0.088 U	0.068 U	0.12 F	0.066 U
Indeno(1,2,3-cd)pyrene	2.1 D	0.12 U	0.1 U	2.5 D	1.7	0.12 U	0.36 F	0.13 U	0.16 F	0.12 U	0.43 F	0.12 U
Phenanthrene	8.2 D	0.052 U	0.08 R	9.9 D	4.2	0.18 F	1.3	0.095 F	0.67 F	0.053 U	1.6	0.051 U
Pyrene	7.8 D	0.072 U	0.11 U	10 D	3.9	0.15 F	1.4	0.097 F	0.71	0.073 U	1.6	0.07 U
Volatiles-(mg/kg)	NA			NA	NA		NA		NA		NA	
1,4-Dichlorobenzene		0.00072 U	0.00072 U			0.00071 U		0.00077 U		0.00079 U		0.00007 U
cis-1,2-Dichloroethene		0.00091 U	0.00091 U			0.00089 U		0.00097 U		0.001 U		0.00008 U
Methylene chloride		0.0014 BF	0.0018 F			0.0023		0.0026 B		0.0023		0.0002 BF
Toluene		0.0011 U	0.0011 U			0.0011 U		0.0012 U		0.0012 U		0.00011 U
Trichloroethene		0.0011 U	0.0011 U			0.0011 U		0.0012 U		0.0012 U		0.00011 U
Pesticides/PCBs-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	DL 2.0	DL 4.0	NA	NA
4,4'-DDE									0.0061 F	0.0039 U		
4,4'-DDT									0.0037 F	0.0043 U		
beta-BHC									0.0049 F	0.0017 U		
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA

-- /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Param[illegible]nited to those detected in at least one sample (see App. E).
Note - Bo[illegible]s exceed background UTL 95,95.

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Table 3-14. Summary of Building 8503 and SWMU 59 Area A-3 Soil Sample Detected Results, cont'd.

Location:	A3-006		A3-007			A3-008			A3-009					
Sample Number:	A3-006-01	A3-006-20	A3-006-02	A3-007-01	A3-007-02	A3-008-01	A3-008-02	A3-008-03	A3-009-01	A3-009-04	A3-009-02	A3-009-05	A3-009-03	A3-009-06
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5	0.0 to 0.5	0.0 to 0.5 DUP	0.5 to 2.5	0.5 to 2.5 DUP	6.5 to 8.5	6.5 to 8.5 DUP
Parameters[a,b]														
Inorganics-(mg/kg)														
Aluminum	8100	7410	8520	10500	3500	13200	9650	3540	10600	12500	9590	11800	3390	4740
Antimony	0.96 F	0.98 F	1.1 J	0.94 F	0.92 U	0.92 U	0.9 U	0.9 U	0.88 U	0.93 U	0.91 U	0.92 U	0.9 U	0.96 U
Arsenic	14.4	16	3.3	4.8	2.8	7.2	3.2	1.9 F	5.7	7.7	4	4.2	4.4	3.7
Barium	47.4	47.7	52.5	62.5	20.4	69	62.5	13.1	60.6	59.3	58.4	80.2	32.5	26.9
Beryllium	0.25 F	0.58	0.29 F	0.36	0.14 F	0.41	0.37	0.25 F	0.4	0.31	0.36	0.37	0.42	0.44
Cadmium	4.6	0.082 U	0.35	3.8	0.24	0.58	0.17	0.33	0.77	0.96	0.16	0.2	0.75	0.59
Calcium	247000	205000	245000 B	194000	324000 B	207000	213000 B	332000	224000	230000	264000 B	232000 B	282000	190000
Chromium	26	19.5	11.5	43.8	6.5	22.2	10.9	3.4	18.2	15.1	11.3	13.5	4.4	5.5
Cobalt	2.9	2.8	2.7	3.9	1	4.2	3.1	0.79	2.9	3.7	3.2	3.8	2.2	1.9
Copper	21.7	16.4	5.1 B	12.4	5.2 B	6.1	11.1 B	1.4	6	6.7	5.7 B	6.7 B	3.9	36.8
Iron	7380	7180	7640	9940	4830	11900	8530	5310	9240	10500	8720	10300	9900	6370
Lead	41.7 M	28.8	9.6	153 M	4.1	25.6 M	6.9	2.5	16.6 M	18.1 M	6.7	7.9	7.1	4.6
Magnesium	2600	1980	2530	2920	2610	3280	2450	2220 J	3070	2820	2550	3060	1930 J	1680 J
Manganese	152	138	171	196	136	246	196	147	192	266	219	281	289	136
Mercury	10.9	0.079	0.045 U	0.047 U	0.046 U	0.046 U	0.045 U	0.046 U	0.044 U	0.047 U	0.046 U	0.046 U	0.046 U	0.048 U
Molybdenum	3	3.8	0.96 B	5.7	0.9 B	4.6	0.71 B	0.56	1.5	0.95	0.75 B	0.99 B	1.1	0.69
Nickel	7.6	7	7.3	8.4	4.3	9.8	7.8	2.6	8.4	7.9	7.9	9.6	6.8	8.3
Potassium	1400	975	863	2150	540	2610	913	627	2430	1920	982	1320	1000	1160
Selenium	0.73 U	0.76 U	0.72 U	0.75 U	0.75 U	0.76 U	0.73 U	0.73 U	0.72 U	0.77 U	0.74 U	0.75 U	0.73 U	0.78 U
Sodium	445	943	925 B	430	1050 B	459	989 B	1360	420	474	872 B	976 B	1250	1400
Vanadium	29.9	24.2	27.2	29.7	17	38.1	29.2	7.7	33	30	29.5	35.5	10.1	11.8
Zinc	80.2 M	49.5	15.7	85.4 M	20.9	38.3 M	25.7	9.2	51 M	62.2 M	16.3	19.2	14.7	29.1
Semivolatiles-(mg/kg)	DL 5.0	NA						NA					NA	NA
Acenaphthene	0.19 DF		0.051 U	0.1 F	0.051 U	0.072 U	0.052 U		0.2 F	0.073 U	0.052 U	0.052 U		
Anthracene	0.33 DF		0.056 U	0.16 F	0.056 U	0.11 F	0.056 U		0.31 F	0.083 U	0.057 U	0.056 U		
Benzo(a)anthracene	1.1 D		0.059 U	0.62 F	0.059 U	0.41 F	0.06 U		0.92	0.16 F	0.06 U	0.06 U		
Benzo(a)pyrene	1 D		0.059 U	0.62 F	0.059 U	0.35 F	0.06 U		0.78	0.13 F	0.06 U	0.06 U		
Benzo(b)fluoranthene	1.4 D		0.11 U	0.81	0.11 U	0.47 F	0.11 U		1	0.18 F	0.11 U	0.11 U		
Benzo(ghi)perylene	0.8 D		0.11 U	0.8	0.11 U	0.24 F	0.11 U		0.52 F	0.11 U	0.11 U	0.11 U		
Bis(2-ethylhexyl)phthalate	2.1 D		0.081 U	0.51 F	0.081 U	0.16 F	0.082 U		0.087 U	0.093 U	0.083 U	0.082 U		
Butyl benzyl phthalate	0.2 DF		0.059 U	0.091 U	0.059 U	0.088 U	0.06 U		0.085 U	0.091 U	0.06 U	0.06 U		
Chrysene	1.3 D		0.061 U	0.63 F	0.061 U	0.36 F	0.062 U		0.84	0.14 F	0.062 U	0.062 U		
Dibenzofuran	0.15 U		0.059 U	0.079 U	0.059 U	0.077 U	0.06 U		0.074 U	0.079 U	0.06 U	0.06 U		
Fluoranthene	3.3 D		0.073 U	1.4	0.074 U	0.96	0.074 U		2.4	0.36 F	0.075 U	0.074 U		
Fluorene	0.19 DF		0.066 U	0.084 U	0.066 U	0.082 U	0.066 U		0.17 F	0.084 U	0.067 U	0.066 U		
Indeno(1,2,3-cd)pyrene	0.65 DF		0.12 U	0.52 F	0.12 U	0.2 F	0.12 U		0.44 F	0.11 U	0.12 U	0.12 U		
Phenanthrene	2.3 D		0.051 U	0.98	0.051 U	0.61 F	0.052 U		1.8	0.19 F	0.052 U	0.052 U		
Pyrene	2.3 D		0.07 U	1	0.07 U	0.71	0.071 U		1.7	0.26 F	0.072 U	0.071 U		
Volatiles-(mg/kg)	NA			NA		NA			NA	NA				
1,4-Dichlorobenzene			0.00069 U		0.00069 U		0.00077 U	0.00075 U			0.0008 U	0.0008 U	0.0008 U	0.0007 U
cis-1,2-Dichloroethene			0.00087 U		0.00087 U		0.00097 U	0.00094 U			0.0009 U	0.001 U	0.029	0.0084
Methylene chloride			0.0018 F		0.0018 F		0.0029	0.002			0.0024	0.0016 F	0.0019 F	0.0018 F
Toluene			0.0011 U		0.001 U		0.0012 U	0.0011 U			0.0011-U	0.0012 U	0.0013 U	0.0011 U
Trichloroethene			0.0011 U		0.001 U		0.0012 U	0.0011 U			0.0011 U	0.0012 U	0.056	0.024
Pesticides/PCBs-(mg/kg)	NA		NA	NA	NA	NA	NA	NA	DL 2.0	DL 2.0	DL 4.0	DL 4.0	NA	NA
4,4'-DDE									0.0018 U	0.002 U	0.0038 U	0.004 U		
4,4'-DDT									0.002 U	0.0022 U	0.0042 U	0.0044 U		
beta-BHC									0.016 F	0.015 F	0.0017 U	0.0018 U		
Explosives	NA		NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND

-- /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL 95,95.

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Table 3-14. Summary of Building 8503 and SWMU 59 Area A-3 Soil Sample Detected Results, cont'd.

Location:	A3-010			A3-011			A3-012			A3-013		
Sample Number:	A3-010-01	A3-010-02	A3-010-03	A3-011-01	A3-011-02	A3-011-03	A3-012-01	A3-012-02	A3-012-03	A3-013-01	A3-013-02	A3-013-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	6.5 to 8.5	0.0 to 0.5	0.5 to 2.5	8.5 to 10.5	0.0 to 0.5	0.5 to 2.5	8.5 to 10.5	0.0 to 0.5	0.5 to 2.5	7.0 to 9.0
Parameters[a,b]												
Inorganics-(mg/kg)												
Aluminum	6020	14500	5690	8250	13900	6950	6660	10200	5550	15200	12000	6720
Antimony	0.88 U	0.93 U	0.97 U	0.9 U	0.98 F	0.98 U	1.2	1.2 J	0.98 U	1 U	0.95 F	0.99 U
Arsenic	6.4	4.7	1.3 F	7	5.2	4.5	3.4	3.2	2	4.8	4.3	1.3 F
Barium	55.2	67.6	11.4	71	63.6	25.2	45.1	55	43	69.6	54.2	48.4
Beryllium	0.35	0.46	0.22 F	0.64	0.5	0.81	0.23 F	0.3	0.53	0.41	0.39	0.43
Cadmium	0.98	0.17	0.22	0.8	0.21	1.2	3.7	0.51	0.95	2.6	0.22	0.33
Calcium	199000	205000 B	345000	149000	215000 B	49700	63200	271000 B	156000	115000	249000 B	245000
Chromium	20.7	16	2.7	23.1	16.3	9	25.9	15.5	8.7	36.7	14.3	4.6
Cobalt	2.9	3.3	0.78	7	3.3	24.4	3.2	4.4	1.7	4.1	3	1.7
Copper	9	8 B	3.2	10.2	8.8 B	8.8	13.3	6.7 B	12.1	14	6 B	3.7
Iron	7210	11300	11900	65200	12600	13000	7450	9440	10400	12400	9540	10300
Lead	37.8 M	8.2	3	35.1 M	18.4	12.7	67.3 M	10.5	12.8	57.1 M	7.4	4.2
Magnesium	2730	3010	1620 J	2400	3030	1780 J	1360	2930	1820 J	2260	2650	1830 J
Manganese	191	191	125	357	205	260	165	362	143	260	208	133
Mercury	0.044 U	0.046 U	0.048 U	0.046 U	0.046 U	0.051 U	0.047 U	0.046 U	0.049 U	0.051 U	0.045 U	0.049 U
Molybdenum	1.6	0.81 B	0.36 U	1	1.4 B	0.88	3	1.1 B	0.66	2.7	0.77 B	0.37 U
Nickel	8.3	9	1.8	15.4	9.3	18.2	6.1	9	5.5	9.1	7.3	2.9
Potassium	1750	1400	447	1690	1510	1830	883	1070	810	1460	1190	488
Selenium	0.7 U	0.75 U	0.86 F	0.74 U	0.76 U	0.86 F	0.77 U	0.73 U	0.8 U	0.81 U	0.73 U	0.81 U
Sodium	419	708 B	1250	447	1020 B	1430	403	921 B	1710	450	919 B	1860
Vanadium	28.6	35.5	5.9	42.7	31.7	17.5	17.5	31	11.1	26.3	28.5	8.7
Zinc	44.5 M	22.3	9.1	49.9 M	17	30.5	75.6 M	38.7	29.1	127 M	32.5	12.1
Semivolatiles-(mg/kg)	DL 5.0		NA			NA	DL 5.0		NA	DL 5.0		
Acenaphthene	0.35 DF	0.054 U		0.072 U	0.052 U		0.37 U	0.052 U		0.48 DF	0.11 F	0.077 U
Anthracene	0.52 DF	0.058 U		0.081 U	0.057 U		0.42 U	0.057 U		0.71 D	0.17 F	0.086 U
Benzo(a)anthracene	1.6 D	0.062 U		0.19 F	0.06 U		1.4 D	0.06 U		2.8 D	0.49 F	0.1 U
Benzo(a)pyrene	1.2 D	0.062 U		0.18 F	0.06 U		1.3 D	0.06 U		2.2 D	0.42 F	0.1 U
Benzo(b)fluoranthene	1.6 D	0.12 U		0.26 F	0.11 U		1.8 D	0.11 U		3 D	0.52 F	0.18 U
Benzo(ghi)perylene	0.78 D	0.12 U		0.13 F	0.11 U		1 D	0.11 U		1.6 D	0.19 F	0.12 U
Bis(2-ethylhexyl)phthalate	0.34 U	0.085 U		0.16 F	0.083 U		1.2 D	0.083 U		2.1 D	0.08 U	0.097 U
Butyl benzyl phthalate	0.33 U	0.062 U		0.089 U	0.06 U		0.46 U	0.06 U		0.48 U	0.058 U	0.095 U
Chrysene	1.4 D	0.064 U		0.22 F	0.062 U		1.7 D	0.062 U		2.4 D	0.48 F	0.12 U
Dibenzofuran	0.29 U	0.062 U		0.078 U	0.06 U		0.4 U	0.06 U		0.42 U	0.058 U	0.083 U
Fluoranthene	4.2 D	0.077 U		0.52 F	0.075 U		3.9 D	0.075 U		7.2 D	1.4	0.12 U
Fluorene	0.35 DF	0.069 U		0.082 U	0.067 U		0.42 U	0.067 U		0.44 U	0.065 U	0.088 U
Indeno(1,2,3-cd)pyrene	0.66 DF	0.12 U		0.11 F	0.12 U		0.84 D	0.12 U		1.3 D	0.19 F	0.11 U
Phenanthrene	3 D	0.054 U		0.3 F	0.052 U		2.6 D	0.052 U		4.7 D	1.1	0.088 R
Pyrene	3.1 D	0.074 U		0.39 F	0.071 U		3 D	0.072 U		5.1 D	0.92	0.12 U
Volatiles-(mg/kg)	NA			NA			NA			NA		
1,4-Dichlorobenzene		0.00075 U	0.00082 U		0.0012 F	0.00083 U		0.00075 R	0.00083 U		0.00076 U	0.00084 U
cis-1,2-Dichloroethene		0.00094 U	0.001 U		0.00093 U	0.001 U		0.00094 R	0.0045 F		0.00096 U	0.0011 U
Methylene chloride		0.0029	0.0022		0.003	0.0026		0.0022 R	0.0016 F		0.002	0.003
Toluene		0.0011 U	0.0013 U		0.0028 F	0.0013 U		0.0012 R	0.0013 U		0.0012 U	0.0013 U
Trichloroethene		0.0011 U	0.0092 F		0.0011 U	0.0057 F		0.0012 R	0.0013 U		0.0012 U	0.0013 U
Pesticides/PCBs-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE												
4,4'-DDT												
beta-BHC												
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

-- /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parame[illegible]ted to those detected in at least one sample (see App. E).
Note - Box[illegible]s exceed background UTL 95.95.

Table 3-14. Summary of Building 8503 and SWMU 59 Area A-3 Soil Sample Detected Results, cont'd.

Location:	A3-014			A3-015			A3-016			A3-017			A3-018	
Sample Number:	A3-014-01	A3-014-02	A3-014-03	A3-015-01	A3-015-02	A3-016-01	A3-016-02	A3-016-03	A3-017-01	A3-017-02	A3-017-03	A3-018-02	A3-018-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	7.0 to 9.0	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5	1.2 to 3.2	5.2 to 7.2
Parameters[a,b]													
Inorganics-(mg/kg)													
Aluminum	12400	11800	9810 J	7900	5420	10300	8620	3020	13700	13900	2250	19700	7870
Antimony	1.3	0.92 U	0.97 U	0.97 U	1.4	0.82 U	0.89 U	0.93 F	0.9 U	1.2	0.9 U	1.1	0.94 F
Arsenic	5	5.6	3.5	8.5	3.2	3.5	3.7	1.4 F	5.9	5.1	1.6 F	5.6	3.4
Barium	54.7	42	85.8	26.5	15.4	69.4	38.1	15.1	65	66.3	14	66.3	35.4
Beryllium	0.35	0.61	0.83	0.12 U	0.28 F	0.16 F	0.43	0.21 F	0.39	0.71	0.22 F	0.88	0.41
Cadmium	3.4	0.58	0.28	6.3	0.22	0.5	0.3	0.25	0.45	0.45	0.26	0.4	0.27
Calcium	177000	253000 B	142000	292000	298000 B	269000	270000 B	303000	225000	241000 B	326000	237000 B	283000 B
Chromium	30.2	12.6	11.1	30.1	5	14	7.8	5.8	18.2	15.4	4.7	20	8.7
Cobalt	3	2.8	5.6	1.9	0.95	6	2.5	1.9	4	3.1	1.1	3.2	1.1
Copper	13	7.5	17.2	17.6	3.8	4.8	4.6	2.6	6.6	7.9	13.7	6.9	3.8
Iron	10400	10500	11200	7060	6580	13500	6750	5260	18200	8880	4170	12400	6940
Lead	129 M	10	9.6 J	50.5 M	5.4	16.3 M	4.1	3.2	15 M	6.3	2.6	8	4.6
Magnesium	2580	2460	2220	2680	2480	2940	2210	2160 J	3100	2480	2190 J	3290	2400
Manganese	215	225 B	255 J	165	150 M	442	165 M	134 J	234	207 M	130 J	192 M	105 M
Mercury	0.047 U	0.047 U	0.047 U	0.1	0.046 U	0.042 U	0.044 U	0.043 U	0.044 U	0.046 U	0.045 U	0.05 U	0.046 U
Molybdenum	1.7	7.4	1.4	9.9	1.2	1.1	2.3	0.76	0.97	2.3	0.61	2.6	1.4
Nickel	8	7.6	11	5.1	4.4	9	6	5	9.9	8.8	3.7	10	5.8
Potassium	1960	2110	939	1100	937	1620	1010	438	2400	2280	493	3220	1520
Selenium	0.76 U	0.75 U	0.78 U	0.78 U	0.75 U	0.67 U	0.71 U	0.7 U	0.72 U	0.75 U	0.74 U	0.79 U	0.76 U
Sodium	467	1430	1500	535	1720	452	1470	1330	436	1090	1480	1450	1490
Vanadium	25	22.6	25.4	19.2	13.7	36.4	24.2	11.4	35.9	35.2	9.3	34.2	21
Zinc	81.9 M	43.9 B	39.1	87.4 M	26.7 B	27.3 M	28.3 B	21.3	33.9 M	28.5 B	23.3	26.6 B	29.5 B
Semivolatiles-(mg/kg)	DL 5.0		NA					NA	DL 5.0		NA		
Acenaphthene	0.54 DF	0.052 U		0.12 F	0.052 U	0.065 U	0.05 U		0.93 D	0.052 U		0.057 U	0.052 U
Anthracene	0.78 D	0.057 U		0.21 F	0.056 U	0.073 U	0.054 U		1.3 D	0.057 U		0.062 U	0.057 U
Benzo(a)anthracene	2.7 D	0.06 U		0.96	0.059 U	0.16 F	0.058 U		3.6 D	0.06 U		0.065 U	0.06 U
Benzo(a)pyrene	2.3 D	0.06 U		1	0.059 U	0.16 F	0.058 U		2.7 D	0.06 U		0.065 U	0.06 U
Benzo(b)fluoranthene	3 D	0.11 U		1.5	0.11 U	0.22 F	0.11 U		3.5 D	0.11 U		0.12 U	0.11 U
Benzo(ghi)perylene	1.7 D	0.11 U		0.88	0.11 U	0.13 F	0.11 U		1.8 D	0.11 U		0.12 U	0.11 U
Bis(2-ethylhexyl)phthalate	0.51 DF	0.083 U		0.59 F	0.082 U	0.31 F	0.08 U		0.44 U	0.083 U		0.09 U	0.083 U
Butyl benzyl phthalate	0.44 U	0.06 U		0.24 F	0.059 U	0.08 U	0.058 U		0.43 U	0.06 U		0.065 U	0.06 U
Chrysene	2.9 D	0.063 U		1.2	0.062 U	0.17 F	0.06 U		2.9 D	0.062 U		0.068 U	0.062 U
Dibenzofuran	0.39 U	0.06 U		0.082 U	0.059 U	0.07 U	0.058 U		0.39 DF	0.06 U		0.065 U	0.06 U
Fluoranthene	7.1 D	0.075 U		3.1	0.074 U	0.35 F	0.072 U		6.8 D	0.075 U		0.081 U	0.075 U
Fluorene	0.48 DF	0.067 U		0.1 F	0.066 U	0.074 U	0.064 U		0.77 D	0.067 U		0.073 U	0.067 U
Indeno(1,2,3-cd)pyrene	1.4 D	0.12 U		0.73	0.12 U	0.11 F	0.12 U		1.5 D	0.12 U		0.13 U	0.12 U
Phenanthrene	5.1 D	0.052 U		1.7	0.052 U	0.19 F	0.05 U		6.8 D	0.052 U		0.057 U	0.052 U
Pyrene	5.5 D	0.072 U		2.1	0.07 U	0.26 F	0.069 U		6.5 D	0.072 U		0.076 U	0.072 U
Volatiles-(mg/kg)	NA			NA		NA			NA				
1,4-Dichlorobenzene		0.00076 U	0.00088 U		0.00074 U		0.00073 U	0.00074 U		0.0007 U	0.00075 U	0.00076 U	0.00074 U
cis-1,2-Dichloroethene		0.00096 U	0.0011 U		0.00094 U		0.00093 U	0.00093 U		0.0009 R	0.00095 U	0.00095 U	0.00093 U
Methylene chloride		0.0023	0.0034		0.0019 F		0.0019 F	0.0016 F		0.0027	0.0017 F	0.0018 F	0.0022
Toluene		0.0012 U	0.0014 U		0.0011 U		0.0011 U	0.0011 U		0.0011 U	0.0012 U	0.0012 U	0.0011 U
Trichloroethene		0.0012 U	0.0014 U		0.0011 U		0.0011 U	0.0011 U		0.0011 R	0.0012 U	0.0012 U	0.0013 F
Pesticides/PCBs-(mg/kg)	NA	NA	NA	DL 4.0	DL 4.0	NA	NA	NA	NA	NA	NA	DL 4.0	DL 4.0
4,4'-DDE				0.004 U	0.0039 U							0.0042 U	0.004 U
4,4'-DDT				0.0044 U	0.0043 U							0.0047 U	0.0044 U
beta-BHC				0.018 F	0.0017 U							0.0019 U	0.0018 U
Explosives	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	ND	ND

– /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL 95,95.

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Table 3-14. Summary of Building 6503 and SWMU 59 Area A-3 Soil Sample Detected Results, cont'd.

Location:	A3-019		A3-020		A3-021			A3-024		A3-025		
Sample Number:	A3-019-02	A3-019-03	A3-020-02	A3-020-03	A3-021-02	A3-021-03	A3-021-06	A3-024-01	A3-024-02	A3-025-01	A3-025-02	A3-025-03
Depth (ft bgs):	1.0 to 3.0	5.0 to 7.0	3.1 to 5.1	5.1 to 7.1	1.2 to 3.2	5.2 to 7.2	5.2 to 7.2 DUP	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Parameters[a,b]												
Inorganics-(mg/kg)												
Aluminum	12500	9960	8050	5480	18200	7380	2850	5090 B	6450	6140 B	13400	5080
Antimony	1300	5	13.7	1.8	1.1	0.95 F	1.3	0.81 U	0.91 U	0.81 U	0.94 U	0.91 U
Arsenic	5	3.9	4.8	4.8	5.5	4.4	3.1	2.6	4.2	3.4	4.3	3.3
Barium	141	36.6	26	19.3	61.5	15.6	17.5	46.4	36.6	58.2	58.2	30
Beryllium	0.62	0.41	0.36	0.36	0.64	0.26 F	0.28 F	0.46	0.43	0.56	0.58	0.36
Cadmium	0.39	0.3	1.9	0.26	0.76	0.71	0.33	0.071 U	0.25	0.071 U	0.31	0.23
Calcium	241000 B	267000 B	296000 B	298000 B	182000 B	302000 B	329000 B	268000 B	280000 B	201000 B	227000 B	282000
Chromium	13	9.4	8.4	6.9	9.2	7.9	5.8	8.1	9.4	8.6	10	7.3
Cobalt	2.8	1.6	1.7	2	4.9	1.2	0.96	3.1	1.6	2.9	2.7	1.8
Copper	6.7	3.2	4.4	9.5	112	5.7	2.8	4.1	3.4	6.5	5	3.2
Iron	9480	7230	6040	6140	19400	6010	4630	6010 B	6010	6910 B	10600	6080
Lead	9.1	4.3	3.6	3.5	8.4	3.4	2.9	9.1	3.7	9.8	6.6	3.8
Magnesium	2600	2500	2250	2340	2910	2270	2090	2090 B	1690	2090 B	2140	2120 J
Manganese	212 M	112 M	107 M	149 M	400 M	133 M	140 M	262 B	142 M	192 B	143 M	120 J
Mercury	0.049 U	0.045 U	0.045 U	0.045 U	0.048 U	0.044 U	0.047 U	0.04 U	0.046 U	0.041 U	0.047 U	0.045 U
Molybdenum	1	1.3	1.3	1.7	4.8	1.7	1.3	0.69	0.84	0.6	0.66	0.86
Nickel	7.6	6.8	5.8	6.2	12.2	4.8	4.5	5.5	4.8	6.3	6.8	5.4
Potassium	1800	1890	1440	1430	863	1040	1050	706	1140	1350	1330	1020
Selenium	0.79 U	0.73 U	0.72 U	0.74 U	0.94 F	0.73 U	0.76 U	0.66 U	0.73 U	0.66 U	0.76 U	0.74 U
Sodium	1380	1460	1680	1650	1300	1930	1530	800	1410	840	1240	1360
Vanadium	28.5	22	20.2	18.4	86.3	14.7	15.4	22.5	20.8	23.7	26.7	17.4
Zinc	28.2 B	24.3 B	27.8 B	33.8 B	74.5 B	50.2 B	20.8 B	13.2	30.2 B	18.4	24 B	20.4
												NA
Semivolatiles-(mg/kg)												
Acenaphthene	0.055 U	0.051 U	0.05 U	0.052 U	0.053 U	0.051 U	0.053 U	0.063 U	0.051 U	0.066 U	0.053 U	
Anthracene	0.059 U	0.055 U	0.055 U	0.056 U	0.058 U	0.055 U	0.058 U	0.071 U	0.056 U	0.074 U	0.057 U	
Benzo(a)anthracene	0.063 U	0.059 U	0.058 U	0.06 U	0.061 U	0.059 U	0.061 U	0.082 U	0.059 U	0.086 U	0.061 U	
Benzo(a)pyrene	0.063 U	0.059 U	0.058 U	0.06 U	0.061 U	0.059 U	0.061 U	0.082 U	0.059 U	0.086 U	0.061 U	
Benzo(b)fluoranthene	0.12 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.15 U	0.11 U	0.16 U	0.11 U	
Benzo(ghi)perylene	0.12 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.096 U	0.11 U	0.1 U	0.11 U	
Bis(2-ethylhexyl)phthalate	0.087 U	0.081 U	0.08 U	0.082 U	0.084 U	0.081 U	0.084 U	0.08 U	0.082 U	0.084 U	0.084 U	
Butyl benzyl phthalate	0.063 U	0.059 U	0.058 U	0.06 U	0.061 U	0.059 U	0.061 U	0.078 U	0.059 U	0.082 U	0.061 U	
Chrysene	0.065 U	0.061 U	0.06 U	0.062 U	0.063 U	0.061 U	0.064 U	0.1 U	0.061 U	0.11 U	0.063 U	
Dibenzofuran	0.063 U	0.059 U	0.058 U	0.06 U	0.061 U	0.059 U	0.061 U	0.068 U	0.059 U	0.071 U	0.061 U	
Fluoranthene	0.078 U	0.073 U	0.072 U	0.074 U	0.076 U	0.073 U	0.076 U	0.1 U	0.074 U	0.1 U	0.076 U	
Fluorene	0.07 U	0.065 U	0.065 U	0.067 U	0.068 U	0.065 U	0.068 U	0.072 U	0.066 U	0.076 U	0.068 U	
Indeno(1,2,3-cd)pyrene	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.094 U	0.12 U	0.099 U	0.12 U	
Phenanthrene	0.055 U	0.051 U	0.05 U	0.052 U	0.053 U	0.051 U	0.053 U	0.072 U	0.051 U	0.076 U	0.053 U	
Pyrene	0.075 U	0.07 U	0.069 U	0.071 U	0.073 U	0.07 U	0.073 U	0.1 U	0.07 U	0.11 U	0.072 U	
								NA		NA		
Volatiles-(mg/kg)												
1,4-Dichlorobenzene	0.00079 U	0.00073 U	0.00074 U	0.00072 U	0.00078 U	0.00075 U	0.00076 U		0.00072 U		0.00072 U	0.00069 U
cis-1,2-Dichloroethene	0.001 U	0.00092 U	0.00093 U	0.00091 U	0.00098 U	0.00095 U	0.00096 U		0.00091 U		0.00091 U	0.00087 U
Methylene chloride	0.0026	0.0018 F	0.0022	0.0028	0.003	0.0021	0.0022		0.0024		0.0019 F	0.0015 F
Toluene	0.0012 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0012 U	0.0012 U		0.0011 U		0.0011 U	0.001 U
Trichloroethene	0.0012 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0012 F	0.0012 U		0.0011 U		0.0011 U	0.001 U
								NA		NA		NA
Pesticides/PCBs-(mg/kg)	DL 4.0	DL 4.0	DL 4.0	DL 4.0	DL 4.0	DL 4.0	DL 4.0		DL 4.0		DL 4.0	
4,4'-DDE	0.0041 U	0.0038 U	0.0038 U	0.0039 U	0.004 U	0.0038 U	0.004 U		0.0038 U		0.0039 U	
4,4'-DDT	0.0045 U	0.0042 U	0.0042 U	0.0043 U	0.0044 U	0.0042 U	0.0044 U		0.0042 U		0.0043 U	
beta-BHC	0.0018 U	0.0017 U	0.0017 U	0.0017 U	0.0018 U	0.0017 U	0.0018 U		0.0017 U		0.0017 U	
								NA		NA		NA
Explosives	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND

-- /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Paramet[illegible]ed to those detected in at least one sample (see App. E).
Note - Boxe[illegible] exceed background UTL [illegible].

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Table 3-14. Summary of Building 8503 and SWMU 59 Area A-3 Soil Sample Detected Results, cont'd.

Location:	A3-100	A3-101		A3-102	A3-103		A3-104	A3-105		A3-106		A3-107	A3-110	A3-111	A3-112	A3-113
Sample Number:	A3-100-01	A3-101-01	A3-101-02	A3-102-01	A3-103-01	A3-103-04	A3-104-01	A3-105-01		A3-106-01	A3-106-02	A3-107-01	A3-110-01	A3-111-01	A3-112-01	A3-113-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 3.0	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5 DUP	0.0 to 0.5	0.0 to 0.5		0.0 to 0.5	0.5 to 3.0	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]																
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
Aluminum																
Antimony																
Arsenic																
Barium																
Beryllium																
Cadmium																
Calcium																
Chromium																
Cobalt																
Copper																
Iron																
Lead																
Magnesium																
Manganese																
Mercury																
Molybdenum																
Nickel																
Potassium																
Selenium																
Sodium																
Vanadium																
Zinc																
Semivolatiles-(mg/kg)																
Acenaphthene	0.12 U	0.13 U	0.13 U	0.15 U	0.14 U	0.14 U	0.13 U	0.22 F	0.22 F	0.13 U	0.16 F	0.13 U	0.13 U	0.13 U	0.13 U
Anthracene	0.17 U	0.18 U	0.18 U	0.2 U	0.18 U	0.18 U	0.18 U	0.35 F	0.35 F	0.18 U	0.25 F	0.17 U	0.18 U	0.17 U	0.17 U
Benzo(a)anthracene	0.33 F	0.19 U	0.19 U	0.3 F	0.2 U	0.2 U	0.19 U	1.4	1.4	0.19 U	1.1	0.19 U	0.19 U	0.19 U	0.18 U
Benzo(a)pyrene	0.23 F	0.19 U	0.19 U	0.23 F	0.19 U	0.19 U	0.19 U	1	0.87	0.19 U	0.68 F	0.18 U	0.19 U	0.18 U	0.18 U
Benzo(b)fluoranthene	0.3 F	0.23 F	0.17 U	0.33 F	0.17 U	0.17 U	0.17 U	1.4	1.2	0.16 U	0.95	0.16 U	0.17 U	0.16 U	0.16 U
Benzo(ghi)perylene	0.16 R	0.17 R	0.17 U	0.19 R	0.18 R	0.18 R	0.17 R	0.52 R	0.41 R	0.17 U	0.33 R	0.16 R	0.17 R	0.16 R	0.16 R
Bis(2-ethylhexyl)phthalate	0.22 F	0.2 U	0.2 U	0.26 F	0.2 U	0.2 U	0.2 U	1.1	0.29 F	0.2 U	0.21 U	0.19 U	0.2 U	0.19 U	0.19 U
Butyl benzyl phthalate	0.17 U	0.18 U	0.18 U	0.2 U	0.18 U	0.18 U	0.18 U	0.18 U	0.2 U	0.18 U	0.19 U	0.17 U	0.18 U	0.17 U	0.17 U
Chrysene	0.39 F	0.21 F	0.16 U	0.45 F	0.17 U	0.17 U	0.16 U	1.5	1.4	0.16 U	1.1	0.16 U	0.16 U	0.16 U	0.16 U
Dibenzofuran	0.13 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.14 U	0.14 U	0.15 U	0.14 U	0.15 U	0.13 U	0.14 U	0.13 U	0.13 U
Fluoranthene	0.88	0.45 F	0.21 U	0.93	0.21 U	0.21 U	0.24 F	3.2	3.1	0.2 U	2.5	0.2 U	0.21 U	0.3 F	0.2 U
Fluorene	0.14 U	0.15 U	0.15 U	0.17 U	0.16 U	0.16 U	0.15 U	0.16 F	0.17 U	0.15 U	0.16 U	0.15 U	0.15 U	0.14 U	0.14 U
Indeno(1,2,3-cd)pyrene	0.18 U	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U	0.2 U	0.6 F	0.45 F	0.2 U	0.36 F	0.19 U	0.2 U	0.19 U	0.19 U
Phenanthrene	0.45 F	0.25 F	0.19 U	0.56 F	0.2 U	0.19 U	0.19 U	2.5	2.1	0.19 U	2.1	0.18 U	0.19 U	0.18 F	0.18 U
Pyrene	0.66 F	0.36 F	0.18 U	0.74	0.18 U	0.18 U	0.17 F	2.9	2.6	0.17 U	2.2	0.17 U	0.18 U	0.22 F	0.17 U
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene															
cis-1,2-Dichloroethene															
Methylene chloride															
Toluene															
Trichloroethene															
Pesticides/PCBs-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE															
4,4'-DDT															
beta-BHC															
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

-- /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see App. E).
Note - Boxed values exceed background UTL 95,95.

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Table 3-14. Summary of Building 8503 and SWMU 59 Area A-3 Soil Sample Detected Results, cont'd.

Location:	A3-114	A3-115	A3-120	A3-121	A3-122	A3-123	A3-130		A3-131			A3-132		A3-133	
Sample Number:	A3-114-01	A3-115-01	A3-120-01	A3-121-01	A3-122-01	A3-123-01	A3-130-02	A3-130-03	A3-131-02	A3-131-03	A3-131-06	A3-132-02	A3-132-03	A3-133-02	A3-133-03
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	1.2 to 3.7	6.2 to 7.2	1.0 to 3.0	5.5 to 7.0	5.5 to 7.0 DUP	1.0 to 2.8	4.0 to 5.3	1.0 to 3.0	4.5 to 6.5
Parameters[a,b]															
Inorganics-(mg/kg)	NA	NA													
Aluminum			--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony			--	--	--	--	1 U	0.94 U	0.99 U	0.92 U	0.92 U	0.97 U	0.93 U	0.96 U	0.93 U
Arsenic			--	--	--	--	--	--	--	--	--	--	--	--	--
Barium			--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium			--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium			--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium			--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium			--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt			--	--	--	--	--	--	--	--	--	--	--	--	--
Copper			--	--	--	--	--	--	--	--	--	--	--	--	--
Iron			--	--	--	--	--	--	--	--	--	--	--	--	--
Lead			--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium			--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese			--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury			0.32	0.06 F	0.15	0.38	--	--	--	--	--	--	--	--	--
Molybdenum			--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel			--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium			--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium			--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium			--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium			--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc			--	--	--	--	--	--	--	--	--	--	--	--	--
Semivolatiles-(mg/kg)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	0.66 U	0.66 U													
Anthracene	0.89 U	0.89 U													
Benzo(a)anthracene	0.96 U	0.97 U													
Benzo(a)pyrene	0.93 U	0.94 U													
Benzo(b)fluoranthene	0.82 U	0.83 U													
Benzo(ghi)perylene	0.85 U	0.85 U													
Bis(2-ethylhexyl)phthalate	0.97 U	0.98 U													
Butyl benzyl phthalate	0.88 U	0.89 U													
Chrysene	0.81 U	0.82 U													
Dibenzofuran	0.68 U	0.68 U													
Fluoranthene	1 U	1 U													
Fluorene	0.75 U	0.76 U													
Indeno(1,2,3-cd)pyrene	0.98 U	0.98 U													
Phenanthrene	0.94 U	0.95 U													
Pyrene	0.87 U	0.87 U													
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene															
cis-1,2-Dichloroethene															
Methylene chloride															
Toluene															
Trichloroethene															
Pesticides/PCBs-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE															
4,4'-DDT															
beta-BHC															
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

-- /NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Paramet[illegible]ted to those detected in at least one sample (see App. E).
Note - Boxe[illegible] exceed background UTL [illegible].

Table 3-15. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Building 8503 and SWMU 59 Area (A-3).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:		6.1			2.0			4.1	
Antimony	38%	26%	1300.0	30%	0%	1.4	41%	39%	1300.0
Arsenic	100%	8%	22.9	100%	25%	22.9	100%	0%	5.6
Cadmium	97%	34%	6.3	90%	50%	6.3	100%	27%	1.9
Chromium	100%	8%	43.8	100%	0%	43.8	100%	12%	20.0
Copper	100%	13%	112.0	100%	25%	46.3	100%	7%	112.0
Iron	100%	2%	65,200.0	100%	5%	65,200.0	100%	0%	19,400
Lead	100%	21%	153.0	100%	60%	153.0	100%	2%	18.4
Mercury	3%	3%	10.9	10%	10%	10.9	0%	0%	N/A
Molybdenum	97%	3%	9.9	100%	5%	9.9	95%	2%	7.4
Zinc	100%	21%	129.0	100%	40%	129.0	100%	12%	74.5
Semivolatiles									
No. of Samples:		5.1			2.0			3.1	
Acenaphthene	25%	25%	0.94	57%	60%	0.94	3%	3%	0.11
Anthracene	27%	27%	1.30	62%	65%	1.30	3%	3%	0.17
Benzo(a)anthracene	39%	39%	4.80	86%	90%	4.80	7%	6%	0.49
Benzo(a)pyrene	39%	39%	4.10	86%	90%	4.10	7%	6%	0.42
Benzo(b)fluoranthene	39%	39%	5.60	86%	90%	5.60	7%	6%	0.52
Benzo(ghi)perylene	35%	35%	3.00	81%	85%	3.00	3%	3%	0.19
Butyl benzyl phthalate	4%	4%	0.24	10%	10%	0.24	0%	0%	N/A

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.
Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.
N/A - Not applicable.

Table 3-15. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Building 8503 and SWMU 59 Area (A-3).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Semivolatiles cont.									
No. of Samples:		51			20			31	
Chrysene	39%	39%	4.60	86%	90%	4.60	7%	6%	0.48
Dibenzofuran	4%	4%	0.48	10%	10%	0.48	0%	0%	N/A
Fluoranthene	43%	43%	13.00	86%	90%	13.00	13%	13%	1.40
Fluorene	18%	18%	0.79	43%	45%	0.79	0%	0%	N/A
Indeno(1,2,3-cd)pyrene	35%	35%	2.50	81%	85%	2.50	3%	3%	0.19
Phenanthrene	41%	41%	9.90	86%	90%	9.90	10%	10%	1.10
Pyrene	41%	41%	10.00	86%	90%	10.00	10%	10%	0.92
Volatiles									
No. of Samples:		41			0			41	
1,4-Dichlorobenzene	2%	2%	0.0012	N/A	N/A	N/A	2%	2%	0.0012
cis-1,2-Dichloroethene	7%	7%	0.0290	N/A	N/A	N/A	7%	7%	0.0290
Toluene	2%	2%	0.0028	N/A	N/A	N/A	2%	2%	0.0028
Trichloroethene	15%	15%	0.0560	N/A	N/A	N/A	15%	15%	0.0560
Pesticides/PCBs									
No. of Samples:		19			4			15	
4,4'-DDE	5%	5%	0.0061	25%	25%	0.0061	0%	0%	N/A
4,4'-DDT	5%	5%	0.0037	25%	25%	0.0037	0%	0%	N/A
beta-BHC	21%	21%	0.0180	100%	100%	0.0180	0%	0%	N/A

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.
Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.
N/A - Not applicable.

Table 3-16. Summary of Disturbed Surface Area A-5 Soil Sample Detected Results

Location:	A5-001			A5-002		A5-003				A5-004	
Sample Number:	A5-001-01	A5-001-02	A5-001-03	A5-002-01	A5-002-02	A5-003-01	A5-003-02	A5-003-05	A5-003-03	A5-004-01	A5-004-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5 DUP	2.5 to 4.5	0.0 to 0.5	0.5 to 1.7
Parameters[a,b]											
Inorganics (mg/kg)											
Aluminum	11600 B	9910	9480	8610 B	3940	5490 B	7080	7750	5830	7170 B	1870 B
Antimony	0.87 U	1 U	0.98 U	0.92 F	0.89 U	0.87 U	0.93 U	2.5	0.94 U	0.94 F	1.2
Arsenic	6.7	5.4	6.8	2.9	2.8	3.8	3	3.8	8.2	4	3.9
Barium	25.3 B	30.3	73.7	38.8 B	40.4	31.6 B	23.4	31.8	21	39.3 B	20.4
Beryllium	0.37	0.59	0.68	0.2 F	0.38	0.17 F	0.52	0.48	0.58	0.23 F	0.28 F
Cadmium	0.24	1	0.21	0.19	0.39	0.21	0.6	0.66	0.32	0.26	0.2
Calcium	273000 B	92800 B	190000	303000 B	259000 B	282000 B	110000 B	168000 B	208000	260000 B	307000 B
Chromium	13.8	5.9	14.1	9.5	5.3	7.1	6.1	6.1	8.9	8.6	4.4
Cobalt	2.6	13.4	12.8	1.8	2.2	1.9	1.8	2.9	3	2.1	1.2
Copper	4	6.7 B	9.7	2.9	5.5 B	3.2	5.7 B	34.6 B	8.8	3.6	2.6
Iron	11700	19600	13700	6430	7810	6060	9780	14700	11900	7790	4470
Lead	6.1	12.9	7.4	4.4	4.4	5.4	5	8.2	6.7	6.5	2.8
Magnesium	2830 B	2000	2000 J	2440 B	2410	2170 B	2220	2360	2200 J	2260 B	2290
Manganese	209	121	106 J	130	158	139	79.5	87.6	151 J	200	159
Molybdenum	0.45 B	7.3	1.3	0.49 B	0.75	0.62 B	0.95	0.98	2.2	0.49 F	2.4
Nickel	8.4	14.8	16.7	5.5	4.4	5.4	8	8.5	10.5	5.8	3.4
Potassium	2210	2600	2180	1510	1090	1200	2110	2240	1640	1300	585
Selenium	0.71 U	1.2	0.79 U	0.74 U	0.72 U	0.71 U	0.76 U	0.75 U	0.76 U	0.68 U	0.69 U
Sodium	452	1250	1490	436	1130	441	940	963	1490	378	1440 B
Vanadium	28.4	11.1	24.4	22	13.6	19.3	13.5	14	21.9	22.9	13.7
Zinc	16.4 B	21.5	55.7	18.3 B	12.6	15.2 B	13.4	28.4	26.4	16.5	13
Semivolatiles	ND	ND	NA	ND	ND	ND	ND	ND	NA	ND	ND
Volatiles (mg/kg)	NA		NA	NA		NA			NA	NA	
Methylene chloride		0.0034			0.0015 F		0.0024	0.0016 F			0.0016 BF
Pesticides/PCBs	ND	ND	NA	ND	ND	ND	ND	ND	NA	ND	ND
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL $_{95,95}$.

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Table 3-17. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Disturbed Surface Area (A-5).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:	11			4			7		
Antimony	36%	18%	2.5	50%	0%	0.94	29%	829	2.5
Cadmium	100%	27%	1.0	100%	0%	0.26	100%	43%	1.0
Copper	100%	9%	34.6	100%	0%	4.00	100%	14%	34.6
Molybdenum	100%	9%	7.3	100%	0%	0.62	100%	14%	7.3
Selenium	9%	9%	1.2	0%	0%	N/A	14%	14%	1.2
Zinc	100%	9%	55.7	100%	0%	18.30	100%	14%	55.7

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.
Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.

Table 3-18. Summary of Explosive Ordnance Deposition Range (EOD) Soil Sample Detected Results, cont'd.

Location:	EOD-005			EOD-006		EOD-007		EOD-008		
Sample Number:	EOD-005-01	EOD-005-02	EOD-005-03	EOD-006-01	EOD-006-02	EOD-007-01	EOD-007-02	EOD-008-01	EOD-008-02	A1-008-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.0	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Parameters[a,b]										
Inorganics-(mg/kg)										
Aluminum	4130	3950 B	2550	5070	2430 B	16200	6070 B	18100	3450 B	3400
Antimony	0.83 U	0.88 U	0.96 U	1.4	0.93 U	0.93 U	0.88 U	0.88 U	0.91 U	0.98 U
Arsenic	3.7	6.6	3.2	3.1	6.2	3.5	6	4.6	4.8	5.5
Barium	25.7	50	10	46.3	32.8	76.3	120	56.9	24.9	18
Beryllium	0.1 U	0.62	0.41	0.13 U	0.45	0.41	0.57	0.45	0.37	0.38
Cadmium	0.23	0.16	0.17	0.71	0.65	0.34	0.3	0.18	0.22	0.24
Calcium	276000	135000 B	310000	256000	162000 B	188000	196000 B	229000	293000 B	290000
Chromium	7.4	5.8	5.9	8.6	6.2	16.7	7.1	19.3	5.9	6.9
Cobalt	2.6	3.2	4.9	3.3	3.4	2.8	4.5	3.4	1.5	1.1
Copper	4.5	5	4.3	8.4	14.8	7.8	4.9	5.1	1.9	3.5
Iron	6810	6740	6870	7650	3690	11000	7260	12900	5010	6510
Lead	7.5	6.5	5	15.4	14	12.9	8.7	9.2	4.4	3.9
Magnesium	2210	2660 B	1910 J	2450	1870 B	3080	2140 B	3130	1980 B	2180 J
Manganese	169	54.3	188 J	401	131	170	426	116	117	127 J
Molybdenum	0.55	0.78	1	0.83	1.3	0.6	1.4	0.86	1.3	1.3
Nickel	5.3	8	7.7	6.7	9.9	8.6	7.4	9	5.8	5.4
Potassium	753	895	1070	907	742	2120	747	1930	616	1110
Selenium	0.67 U	0.71 U	0.78 U	0.86 U	0.75 U	0.75 U	0.72 U	0.71 U	0.74 U	0.8 U
Silver	0.47 U	0.49 U	0.54 R	1.5	0.52 U	0.52 U	0.5 U	0.49 U	0.51 U	0.55 R
Sodium	425	830 B	1720	556	1120 B	478	990 B	471	1620 B	1860
Thallium	0.88 U	0.93 U	1 U	1.1 U	0.98 U	0.99 U	0.94 U	0.93 U	0.96 U	1 U
Vanadium	28.8	14.8	11.7	24.1	12.6	32.1	31.4	40.2	17.1	16
Zinc	20.4	12.8 B	27.2	28.7	33.6 B	35.2	13.3 B	18.1	19.6 B	36
Explosives-(mg/kg)										
2,4,6-Trinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.32	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
2,4-Dinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	26 D[c]	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
2,6-Dinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	1.9	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA- Not analyzed.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
c - DL 10.0.
Note - Boxed values exceed background UTL 95,95.

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Table 3-18. Summary of Explosive Ordnance Deposition Range (EOD) Soil Sample Detected Results

Location:	EOD-001		EOD-002		EOD-003			EOD-004		
Sample Number:	EOD-001-01	EOD-001-02	EOD-002-01	EOD-002-02	EOD-003-01	EOD-003-02	EOD-003-03	EOD-004-01	EOD-004-02	EOD-004-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	6.5 to 8.0	0.0 to 0.5	0.5 to 2.5	4.5 to 5.0
Parameters[a,b]										
Inorganics-(mg/kg)										
Aluminum	9550	2800 B	10600	9350 B	11400	11400 B	4640	8890	12600 B	2330
Antimony	0.86 U	0.82 U	0.88 U	0.89 U	1.1	0.91 U	0.97 U	1	0.93 U	0.92 U
Arsenic	4.7	4.3	4.9	3	4.4	5.6	5.6	10.6	5.4	6.7
Barium	53.7	38.1	77.2	48.9	54.9	49.9	29.2	48.9	63.3	12.7
Beryllium	0.3	0.34	0.34	0.48	0.37	0.58	0.55	0.11 U	0.67	0.51
Cadmium	0.14	0.32	0.24	0.22	0.22	0.26	0.23	0.25	0.16	0.16
Calcium	207000	301000 B	219000	225000 B	193000	184000 B	158000	281000	213000 B	246000
Chromium	17	6	14.7	7.4	13.2	7.7	6.5	11.8	6.7	5.9
Cobalt	3.6	4.4	5.1	1.5	4.3	2.7	4	5.6	1.9	1.3
Copper	5	3.8	8.8	20.6	7.5	6	6.8	3.8	3.5	6.8
Iron	9380	5630	10500	6290	10500	11300	11800	14500	21100	5840
Lead	10.4	6.5	16.8	5.6	12.9	10.5	6.1	9.1	5.8	4.4
Magnesium	3260	2500 B	2700	2320 B	2580	2490 B	1580 J	2740	2600 B	2200 J
Manganese	211	437	288	117	161	127	183 J	245	52	136 J
Molybdenum	0.89	0.99	1.2	0.64	1.4	1.5	0.78	1.7	1	2
Nickel	8.9	7.8	8.7	5.7	8.5	7	11.6	10	6.1	4.2
Potassium	2730	589	1790	964	1560	1320	1750	1180	1840	1080
Selenium	0.7 U	0.66 U	0.73 U	0.72 U	0.71 U	0.74 U	0.79 U	0.71 U	0.94 F	0.75 U
Silver	0.48 U	0.46 U	0.73	0.5 U	0.67	1.9	0.55 R	0.49 U	0.52 U	0.52 R
Sodium	448	1050 B	498	962 B	414	1070 B	2330	429	1340 B	1880
Thallium	0.91 U	0.87 U	0.96 U	0.94 U	0.93 U	0.96 U	1.1 U	0.93 U	0.99 U	0.98 U
Vanadium	34.6	38.8	32.4	19.3	28.2	22.7	14.7	69.6	16.5	12.5
Zinc	25.9	11.8 B	66.4	29.3 B	27.5	19.4 B	54.4	18	11.6 B	44.7
Explosives-(mg/kg)										
2,4,6-Trinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.190 U	0.190 U	0.200 U	0.200 U	0.200 U
2,4-Dinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.190 U	0.190 U	0.200 U	0.200 U	0.200 U
2,6-Dinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.190 U	0.190 U	0.200 U	0.200 U	0.200 U
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA- Not analyzed.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
c - DL 10.0.
Note - Boxed values exceed background UTL $_{95,95}$.

Table 3-18. Summary of Explosive Ordnance Deposition Range (EOD) Soil Sample Detected Results, cont'd.

Location:	EOD-009			EOD-010					EOD-011		
Sample Number:	EOD-009-01	EOD-009-04	EOD-009-02	EOD-010-01	EOD-010-02	EOD-010-05	EOD-010-03	EOD-010-06	EOD-011-01	EOD-011-02	EOD-011-03
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	4.5 to 6.5	4.5 to 6.5	0.0 to 0.5	0.5 to 2.5	5.5 to 7.5
Parameters[a,b]		DUP				DUP		DUP			
Inorganics-(mg/kg)											
Aluminum	14000	17200	2740 B	15100	4230 B	4590 B	7640	4850	14400	2740 B	3680
Antimony	1.4	0.89 U	2.2	0.88 U	1	0.98 F	0.98 U	0.95 U	0.86 U	1	1 U
Arsenic	3.7	3.9	7.6	5.3	7.2	4.5	5.5	7.2	3.4	2.3	6.8
Barium	56.8	57.2	25.4	41.8	31.8	33	17.1	14.2	53.1	23.6	43
Beryllium	0.35	0.33	0.45	0.43	0.52	0.46	0.95	0.8	0.23 F	0.31	0.98
Cadmium	0.28	0.26	0.33	0.11	0.28	0.27	0.31	0.28	0.14	0.22	0.48
Calcium	176000	169000	298000 B	191000	312000 B	274000 B	138000	189000	241000	294000 B	112000
Chromium	15	17.2	5.7	16.8	5.9	6.1	9.4	6.8	14.8	5.3	5.8
Cobalt	2.7	2.6	2.7	3.1	4.4	1.4	2.9	3.1	3.2	0.58	5
Copper	7.7	7.4	10	5.2	3.4	2.3	7.2	6.8	4	3.5	7.9
Iron	9890	10500	3740	12700	7670	5740	20100	14200	9220	4190	19400
Lead	11.6	10.9	5.1	11	5.3	4.4	12.8	10.1	8.9	3.8	12.5
Magnesium	3220	3560	2340	3110	2180	1720	1960 J	1870 J	2870	2100	2420 J
Manganese	194	188	166	115	152	75.2	56.1 J	94.4 J	198	81	171 J
Molybdenum	0.86	0.76	1.5	2.5	1.6	0.87	2.4	2.2	0.87	1.1	5.2
Nickel	8.4	8.9	5	8.9	5.9	4.4	17.8	12.3	8.4	3.8	16.2
Potassium	2850	3140	709	2520	663	534	3180	2540	1650	498	2710
Selenium	0.71 U	0.72 U	5	0.72 U	0.79 U	0.71 U	0.8 U	0.77 U	0.7 U	0.69 U	0.84 U
Silver	0.49 U	0.5 U	0.48 U	0.5 U	0.55 U	0.49 U	0.55 R	0.53 R	0.48 U	0.48 U	0.58 R
Sodium	408	396	1010 B	490	1550 B	1550 B	1820	1520	395	1110 B	1320
Thallium	0.92 U	0.95 U	4.1	0.94 U	1 U	0.93 U	1 U	0.99 U	0.92 U	0.9 U	1.1 U
Vanadium	33.4	35.6	19	34.7	20.2	14.4	26.9	20.9	32	14.7	26.7
Zinc	33.3	32.2	16.4	18.8	15.2	8.3	38.6	37.6	20.8	14.8	65.1
Explosives-(mg/kg)											
2,4,6-Trinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
2,4-Dinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
2,6-Dinitrotoluene	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1520

--/NA- Not analyzed.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
c - DL 10.0.
Note - Boxed values exceed background UTL $_{95,95}$.

Table 3-18. Summary of Explosive Ordnance Deposition Range (EOD) Soil Sample Detected Results, cont'd.

Location:	EOD-100		EOD-101		EOD-102		EOD-103		EOD-104		
Sample Number:	EOD-100-01	EOD-100-02	EOD-101-01	EOD-101-02	EOD-102-01	EOD-102-02	EOD-103-01	EOD-103-02	EOD-104-01	EOD-104-04	EOD-104-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.8	0.0 to 0.5	0.5 to 1.4	0.0 to 0.5	0.5 to 1.9	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.0 to 0.5	0.5 to 1.4
Parameters[a,b]											
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium											
Manganese											
Molybdenum											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Explosives-(mg/kg)											
2,4,6-Trinitrotoluene	0.370 U	0.25 U	0.370 U	0.370 U	0.370 U	0.370 U	0.37 U	0.370 U	0.36 U	0.370 U	37.000 U
2,4-Dinitrotoluene	0.260 U	0.25 U	0.260 U	0.260 U	0.260 U	0.260 U	0.26 U	0.260 U	0.26 U	0.260 U	0.260 U
2,6-Dinitrotoluene	0.470 U	0.26 U	0.470 U	0.470 U	0.470 U	0.470 U	0.47 U	0.470 U	0.46 U	0.470 U	0.470 U
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA- Not analyzed.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
c - DL 10.0.
Note - Boxed values exceed background $UTL_{95,95}$.

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Table 3-18. Summary of Explosive Ordnance Deposition Range (EOD) Soil Sample Detected Results, cont'd.

Location:	EOD-110		EOD-111	EOD-112		EOD-113		
Sample Number:	EOD-110-01	EOD-110-02	EOD-111-01	EOD-112-01	EOD-112-02	EOD-113-01	EOD-113-04	EOD-113-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.7	0.0 to 0.5	0.0 to 0.5	0.5 to 1.3	0.0 to 0.5	0.0 to 0.5	0.5 to 0.75
Parameters[a,b]								
Inorganics-(mg/kg)								
Aluminum	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--
Molybdenum	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--
Thallium	0.68 U	0.57 U	0.67 U	0.71 U	0.64 U	0.65 U	0.62 U	0.55 U
Vanadium	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--
Explosives-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene								
2,4-Dinitrotoluene								
2,6-Dinitrotoluene								
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA

--/NA- Not analyzed.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
c - DL 10.0.
Note - Boxed values exceed background $UTL_{95,95}$.

Table 3-19. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Explosive Ordnance Deposition Range (EOD).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:	31			12			19		
Antimony	26%	13%	2.20	36%	0%	1.4	21%	21%	2.20
Arsenic	100%	3%	10.60	100%	8%	10.6	100%	0%	7.60
Cadmium	100%	6%	0.71	100%	0%	0.71	100%	11%	0.65
Copper	100%	6%	20.60	100%	0%	8.8	100%	11%	20.60
Selenium	6%	3%	5.00	0%	0%	N/A	11%	5%	5.00
Silver	13%	13%	1.90	27%	25%	1.5	5%	5%	1.90
Thallium	3%	3%	4.1	0%	0%	N/A	5%	5%	4.1
Vanadium	100%	3%	69.60	100%	8%	69.6	100%	0%	38.80
Zinc	100%	13%	66.40	100%	0%	66.4	100%	21%	65.10
Explosives									
No. of Samples:	31			12			19		
2,4,6-Trinitrotoluene	3%	3%	0.330	0%	0%	N/A	3%	3%	0.330
2,4-Dinitrotoluene	3%	3%	26.000[1]	0%	0%	N/A	3%	3%	26.000[1]
2,6-Dinitrotoluene	3%	3%	1.900	0%	0%	N/A	3%	3%	1.900

[1] - Dilution Factor of 10.0

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.

Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.

N/A - Not applicable.

Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results.

Location:	BD-001		BD-002		BD-003			BD-004		
Sample Number:	BD-001-01	BD-001-02	BD-002-01	BD-002-02	BD-003-01	BD-003-02	BD-003-03	BD-004-01	BD-004-02	BD-004-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	4.5 to 6.0	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Parameters[a,b]										
Inorganics-(mg/kg)										
Aluminum	5400 B	5680	8100 B	8740	13100 B	11600	8150	8130 B	9740	6860
Antimony	1.2	0.86 U	0.8 U	0.89 U	0.86 U	0.94 U	1 U	0.82 U	0.9 U	0.97 U
Arsenic	3.6 M	4.2	4.2 M	4.5	4.9 M	4.7	10	5 M	4.8	12
Barium	60.5	17	237	36.3	86.3	85.5	12.1	52	41.6	11.3
Beryllium	0.48	0.49	0.53	0.65	0.82	0.94	0.86	0.68	0.76	0.55
Cadmium	0.069 F	0.076 U	8	0.24	0.61	0.082 U	0.34	9.7	0.079 U	0.29
Calcium	186000 B	258000 B	169000 B	231000 B	138000 B	179000 B	37700	146000 B	199000 B	155000
Chromium	13.4 M	11	7.9 M	11.9	13.4 M	15.4	12.5	11 M	13.5	10.6
Cobalt	2.6	1.4	5.6	2.9	4.7	3.5	7	3.5	5.5	6
Copper	5.9	2.2	9	6.1	11.8	5.1	12	11.1	4.2	8.4
Iron	7170 B	6330	7240 B	9430	10600 B	14400	24500	9430 B	12000	14800
Lead	47.4 M	6.7	30.8 B	10.7	99.8 M	9.4	17.8	23.1 M	8.1	7.2
Magnesium	1960 B	2280	2020 B	2240	2520 B	1870	2040 J	2370 B	2000	1920 J
Manganese	270 B	191 B	515 B	280 B	283 B	177 B	103 J	304 B	245 B	117 J
Mercury	0.057 F	0.043 U	0.2	0.046 U	0.043 U	0.046 U	0.051 U	0.042 U	0.045 U	0.048 U
Molybdenum	4.6	1.4	1.3	1.4	0.96	1.1	2.5	1.7	1.3	2.5
Nickel	6.2	4.6	9.9	4.8	10.4	8.5	23.5	9	7.5	17.1
Potassium	1260	972	1390	1060	2240	1490	2280	1880	1470	1360
Selenium	0.64 U	0.7 U	0.65 U	0.72 U	0.7 U	0.77 F	1.1	0.67 U	0.76 F	0.79 U
Sodium	853	1250 B	829	1310 B	757	1080 B	1340	799	1010 B	1480
Vanadium	17.6	15.9	21.7	23.5	28.3	30.2	25.1	23	24.3	20.3
Zinc	43.4 M	13.4 B	44 M	48.2 B	199 M	24.8 B	40.9	355 M	14.9 B	50.2
Explosives	ND	ND	ND	ND	ND	ND	NA	ND	ND	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL$_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-005			BD-006			BD-007			BD-008		
Sample Number:	BD-005-01	BD-005-02	BD-005-03	BD-006-01	BD-006-02	BD-006-03	BD-007-01	BD-007-02	BD-007-03	BD-008-01	BD-008-02	BD-008-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Parameters[a,b]												
Inorganics-(mg/kg)												
Aluminum	8620 B	8930	3840	3240 B	8200	10000	7520 B	7640	18700	5890 B	7140	10400
Antimony	0.82 U	0.9 U	0.91 U	0.82 U	0.89 U	0.94 U	0.84 U	0.9 U	0.91 U	0.83 U	0.92 U	0.95 U
Arsenic	4.4 M	4	3.2	4.2 M	5.8	4.8	3.5 M	5.9	5.6	4.2 M	5.9	5.5
Barium	49.5	54.8	32.8	49.8	85.5	64.4	84.2	83	135	82.4	72.4	89.2
Beryllium	0.63	0.63	0.39	1	0.76	0.65	0.81	0.75	1.1	0.88	0.69	0.81
Cadmium	0.67	0.88	0.41	0.26	0.13	0.39	1.3	0.079 U	0.41	1.8	2.2	0.34
Calcium	105000 B	198000 B	134000	52000 B	185000 B	252000	12300 B	204000 B	126000	124000 B	19300 B	149000
Chromium	16.8 M	39	7.2	15.6 M	12.7	12.7	26.2 M	9.9	18.8	18.2 M	25.3	11.7
Cobalt	3.5	4.7	2.5	7.6	4.1	4.1	4.7	3.6	6.1	6.3	4.4	5
Copper	10.8	8	166	10.6	9.3	5.4	18.5	5.4	8.4	91.4	55	10.9
Iron	8130 B	9310	9150	27300 B	9020	11100	8840 B	8010	13700	15600 B	7520	8970
Lead	49.5 M	200	8	22.5 M	19.8	7.2	65.9 M	8	10.5	29 M	49.8	10.4
Magnesium	2060 B	2340	1480 J	1210 B	2190	2140 J	2220 B	2310	2660 J	1680 B	2150	2020 J
Manganese	246 B	319 B	179 J	387 B	219 B	211 J	264 B	242 B	393 J	393 B	305 B	270 J
Mercury	0.041 U	0.046 U	0.045 U	0.072 F	0.044 U	0.046 U	0.044 F	0.046 U	0.046 U	0.042 U	0.046 U	0.047 U
Molybdenum	1.4	0.66	0.86	0.54	0.69	0.62	1.2	0.34 U	0.4 F	0.43 F	1.2	0.68
Nickel	7.9	6.4	6.2	16.5	9.5	8.5	9.2	10.1	13	13.6	9.3	8.9
Potassium	1650	1390	850	957	1940	1180	2550	1930	2230	1620	2130	1950
Selenium	0.66 U	0.89 F	0.74 U	0.66 U	0.94 F	0.76 U	0.68 U	0.74 U	0.74 U	0.67 U	0.95 F	0.77 U
Sodium	684	997 B	1230	701	907	1450	704	949	913	803	905	1100
Vanadium	18.4	23.9	17.9	30.8	27.2	30	24.6	23.9	45.1	27.9	21.3	36.3
Zinc	97.7 M	145 B	30.8	112 M	25.4	27.1	347 M	31.6	37.4	224 M	61.5	25.7
Explosives	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-009		BD-010				BD-011		BD-012	
Sample Number:	BD-009-01	BD-009-02	BD-010-01	BD-010-04	BD-010-02	BD-010-05	BD-011-01	BD-011-02	BD-012-01	BD-012-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.5
Parameters[a,b]				DUP		DUP				
Inorganics-(mg/kg)										
Aluminum	7440 B	6240	4090 B	3520 B	8690	7440	11100 B	12400	4040 B	11700
Antimony	0.82 U	0.86 U	0.8 U	0.81 U	0.86 U	0.87 U	0.94 U	0.93 U	0.81 U	0.87 U
Arsenic	4.9 M	4.2	5.6 M	8.8 M	5.4	6.2	5 M	6	7.3 M	7.4
Barium	96.5	71.8	64.2	92.9	87	91.9	123	152	83.7	99.6
Beryllium	0.74	0.59	1.1	1.4	0.71	0.59	0.98	0.96	1.5	0.98
Cadmium	0.72	0.22	2.6	4.5	0.076 U	0.076 F	1.1	0.79	0.071 U	2.4
Calcium	103000 B	234000 B	52400 B	48100 B	184000 B	197000 B	49400 B	92300 B	51200 B	55400 B
Chromium	26.2 M	11.4	27.8 M	28.5 M	10.6	10.7	34.8 M	16.1	33.2 M	25.3
Cobalt	4.4	3.8	8.7	11.5	3.8	2.9	6.3	5.2	11.4	6.5
Copper	15.2	6.1	19	20.7	6.2	5.1	40.6	13	39.1	27
Iron	9730 B	6820	36700 B	53400 B	8740	8130	13400 B	9900	48700 B	15700
Lead	44 M	11.9	29.2 M	79.3 M	8.9	12.3	60.5 M	28.3	45.3 M	71.2
Magnesium	2380 B	2060	1240 B	1370 B	2030	1750	2660 B	2200	1530 B	1560
Manganese	324 B	288 B	423 B	603 B	407 B	246 B	380 B	368 B	555 B	440 B
Mercury	0.056 F	0.044 U	0.04 U	0.041 U	0.044 U	0.044 U	0.048 U	0.046 U	0.041 U	0.043 U
Molybdenum	1.4	0.66	0.36 F	0.36 F	0.51	0.68	0.89	0.36 F	0.3 U	1.1
Nickel	10	8.3	20.9	25	8.2	7.3	14.1	14.1	27.5	10.8
Potassium	2020	1500	947	1020	1640	638	2290	1920	1080	1540
Selenium	0.66 U	0.7 U	0.65 U	0.66 U	0.88 F	0.78 F	0.76 U	0.95 F	0.68 U	1.2
Sodium	753	951	710	636	902	888	722	759	649	797
Vanadium	23.5	20.5	40.1	49.8	22.1	19.5	28.2	33.2	48.9	33.3
Zinc	134 M	23	166 M	142 M	36.3	22.3	250 M	55	160 M	71.1
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-013		BD-014		BD-015		BD-016		BD-017		
Sample Number:	BD-013-01	BD-013-02	BD-014-01	BD-014-02	BD-015-01	BD-015-02	BD-016-01	BD-016-02	BD-017-01	BD-017-02	BD-017-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.2	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Parameters[a,b]											
Inorganics-(mg/kg)											
Aluminum	10900 B	14000	9070 B	6010	3160 B	7410	7560 B	10700	5680 B	13100	7580
Antimony	0.9 U	0.9 U	0.85 U	0.84 U	0.96 F	0.88 U	0.83 U	0.9 U	0.86 U	0.93 U	0.81 U
Arsenic	4.1 M	5.3	4.2 M	5.6	4.3 M	5.4	4 M	4.8	5.2 M	5.1	3.8
Barium	104	107	73.4	39.7	60.6	71.1	83.7	79.1	72.4	108	86.9
Beryllium	0.88	0.93	0.72	0.38	1.1	0.52	0.72	0.65	1	0.8	0.62
Cadmium	2.5	1.1	4.5	1.4	0.4	0.61	3.5	0.6	1.4	0.62	0.31
Calcium	65000 B	56200	87100 B	250000	43000 B	224000	104000 B	188000	80500 B	105000	145000
Chromium	18.7 M	15.2	16.8 M	8.4	27.4 M	8.9	28.1 M	13	25.5 M	13.1	7.6
Cobalt	5.8	5.4	4.5	2.3	8.2	3.3	5	3.7	7.4	4.6	2.9
Copper	30.4	12.8	26.7	9.2	14.6	7	31.5	7	29.7	8.4	5.3
Iron	13300 B	13200	11300 B	8270	30500 B	8180	12200 B	8930	23100 B	10000	7010
Lead	69.4 M	45.3	62.3 M	21.2	80 M	12.4	43.9 M	13.3	68.3 M	23.6 M	4.9
Magnesium	2590 B	2060 J	2400 B	1690 J	1060 B	2100 J	2060 B	2170 J	1470 B	2660 J	1930 J
Manganese	409 B	398	353 B	205	452 B	281	364 B	279	428 B	380 M	268 J
Mercury	0.045 U	0.045 U	0.044 U	0.042 U	0.041 U	0.044 U	0.042 U	0.046 U	0.043 U	0.047 U	0.04 U
Molybdenum	0.86	2	1.6	2.4	4.6	1.7	1.5	1.1	1.3	0.82	0.5
Nickel	14.6	13.4	12	9.3	17.9	8.2	13.1	9.2	15.5	10.7	8.5
Potassium	2550	2410	2690	1790	884	1720	2100	2160	1500	2080	1560
Selenium	0.73 U	0.91 F	0.69 U	0.69 U	0.66 U	0.72 U	0.67 U	0.73 U	0.7 U	0.76 UM	0.66 U
Sodium	841	585	786	1240	637	1000	710	784	638	654	953
Vanadium	26	33.5	20.6	22	31	23.6	20.9	27.5	29.1	32.5	31.8
Zinc	142 M	38.4	101 M	27.9	201 M	22.5	160 M	26.3	192 M	26.1	18.1
Explosives	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-018			BD-019		BD-020				BD-021		BD-022	
Sample Number:	BD-018-01	BD-018-02	BD-018-03	BD-019-01	BD-019-02	BD-020-01	BD-020-04	BD-020-02	BD-020-05	BD-021-01	BD-021-02	BD-022-01	BD-022-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]							DUP		DUP				
Inorganics-(mg/kg)							NA						
Aluminum	5780 B	4840	4360	7460 B	13900	2820 B		10200	5450	3960 B	3670	3040 B	3970
Antimony	0.85 U	1.5	2	0.86 U	0.98 U	0.82 U		0.92 F	0.86 U	1.1	0.85 U	0.84 U	0.84 U
Arsenic	3.4 M	3.6	3	6.7 M	7.2	3 M		7.2	4.8	7.4 M	4.3	2.7 M	3.3
Barium	62.4	29.8	29.5	75.8	72.8	32.6		52.2	32.5	35.2	21.2	38	23.3
Beryllium	0.64	0.31	0.29 F	1.2	0.7	0.31		0.67	0.39	0.74	0.41	0.31	0.34
Cadmium	1.5	0.52	0.32	3.7	0.79	1.1		0.88	0.69	1.3	0.7	1.2	0.75
Calcium	61900 B	165000	326000	53800 B	171000	166000 B		223000	268000	170000 B	271000	182000 B	271000
Chromium	30.8 M	7.3	6.7	28.4 M	15.8	24.5 M		13	9.5	25.4 M	8.4	17 M	8.5
Cobalt	4.9	2	2.6	10.1	4	2.3		3.7	2.8	6.6	1.6	2.2	1.1
Copper	30.1	4.2	3.2	32.5	9.2	18.7		6.8	11.8	43.8	13.1	19.5	68.2
Iron	10600 B	5910	5160	37500 B	13500	3820 B		16800	10400	25900 B	9840	4750 B	5790
Lead	67.9 M	9.7	11.3	43 M	9.7	63.5 M		58.6	12.1	79.5 M	6.8	32.2 M	10.4
Magnesium	1770 B	1510 J	2150 J	1710 B	2540 J	1470 B		2260 J	1870 J	1620 B	2080 J	1590 B	2130 J
Manganese	306 B	230	308 J	524 B	271	178 B		262	302	328 B	172	151 B	167
Mercury	0.14	0.042 U	0.048 U	0.044 U	0.049 U	0.041 U		0.046 U	0.042 U	0.042 U	0.042 U	0.042 U	0.043 U
Molybdenum	0.82	1.3	1.6	0.79	1.5	1.8		1.3	1.3	1.4	2.8	2.6	1.8
Nickel	10	5	5.9	22.2	10.5	4.3		9.7	6.8	16.4	7.3	5.2	4.5
Potassium	1760	1180	720	1490	2320	918		1890	1100	759	1110	769	1250
Selenium	0.69 U	0.68 U	0.78 U	0.7 U	0.8 U	0.66 U		0.74 U	0.7 U	0.69 U	0.69 U	0.68 U	0.68 U
Sodium	714	664	1360	705	827	846		792	1010	949	1000	1020	897
Vanadium	20.7	17.7	22.3	44.6	45.2	12.5		39	22.4	31.7	23.9	13.4	19.6
Zinc	179 M	19.7	24.3	187 M	28.2	143 M		32	26.5	285 M	22.8	149 M	242
Explosives	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL$_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-100		BD-101		BD-102			BD-103		BD-104	BD-105	BD-106	BD-107-01	BD-108
Sample Number:	BD-100-01	BD-100-04	BD-101-01	BD-102-01	BD-102-04	BD-102-02	BD-103-01	BD-103-02	BD-104-01	BD-105-01	BD-106-01	BD-107-01	BD-108-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.2	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]		DUP			DUP								
Inorganics-(mg/kg)													
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	6.2	7.4	7.6
Calcium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	10.4	10.8	3.2	18	3.0	--	--	4.8	6	7
Iron	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	13.3	18.6	40.4
Magnesium	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	0.2	0.2	1.2	--	--	--	--	--	0.04 U	0.34	--	--	--
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	25.4	32.2	64.6
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-109	BD-110	BD-111	BD-112	BD-113	BD-114	BD-115	BD-116	BD-117	BD-118	BD-119	BD-120	BD-121
Sample Number:	BD-109-01	BD-110-01	BD-111-01	BD-112-01	BD-113-01	BD-114-01	BD-115-01	BD-116-01	BD-117-01	BD-118-01	BD-119-01	BD-120-01	BD-121-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]													
Inorganics-(mg/kg)													
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	9	8.6	7.5	7.6	9.5	9.6	7.8	6.7	6.9	5.6	7.8	7.4 M	7.4 M
Calcium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	8.9	6.7	7.4	6.6	8.6	8.6	8.2	6.9	7.3	6.2	6.6	8.1	9.8
Iron	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	33.2	13.1	16.9	14.2	14.7	13.8	24.6	22.6	31.3	32.9	19.5	30.7 M	20.1 M
Magnesium	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	53.9	26.6	29.9	30	28.2	30.6	46.7	35.1	39.2	25.3	32.3	77.8 M	39.4 M
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL$_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-122	BD-123	BD-124		BD-125	BD-126	BD-127	BD-128	BD-129	BD-130	BD-131	BD-132	BD-133
Sample Number:	BD-122-01	BD-123-01	BD-124-01	BD-124-04	BD-125-01	BD-126-01	BD-127-01	BD-128-01	BD-129-01	BD-130-01	BD-131-01	BD-132-01	BD-133-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]													
Inorganics-(mg/kg)													
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	8.6 M	8 M	8.8 M	8.3 M	8.4 M	9.6 M	8.2 M	8.5 M	9.1 M	23.7 M	0.12 M	0.39 M	5.4
Calcium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	10.8	11.3	9.6	10.1	11.2	11.8	11	10.1	11.2	9.9	6.6	6.3	6
Iron	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	16.8 M	30.8 M	35.1 M	21.4 M	19.4 M	16.4 M	19.6 M	23.9 M	20.8 M	14.6 M	13.3	21.3	18
Magnesium	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	34 M	83.3 M	43.4 M	82.8 M	90.6 M	38.2 M	35.8 M	63 M	38.3 M	34.9 M	47.6 B	48 B	38.8
Explosives	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

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Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-134	BD-135	BD-136	BD-137	BD-138	BD-139	BD-140	BD-141	BD-142	BD-143	BD-144		BD-145
Sample Number:	BD-134-01	BD-135-01	BD-136-01	BD-137-01	BD-138-01	BD-139-01	BD-140-01	BD-141-01	BD-142-01	BD-143-01	BD-144-01	BD-144-04	BD-145-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]													
Inorganics-(mg/kg)													
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	7.6	6.3	8	51.4	26.3	9.6	9.4	7.8 M	10.8 M	6.9 M	6.1 M	6.1 M	6 M
Calcium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	5.6	5.8	8.5	18.2	12	10.3	20.4	11.2	9.2	9.8	13.4	16.9	7.3
Iron	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	15.9	19.9	22	36	19.1	24.1	35	27 M	27.9 M	17.7 M	24.7 M	17.5 M	12.1 M
Magnesium	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	32.1	37.4	40.1	73.2	48.9	53.2	62.7	42.2 M	47.6 M	33.7 M	56.7 M	112 M	24.2 M
Explosives	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

Table 3-20. Summary of Bunker Floor Drains Soil Sample Detected Results, cont'd.

Location:	BD-147	BD-148	BD-149-01	BD-150	
Sample Number:	BD-147-01	BD-148-01	BD-149-01	BD-150-01	BD-150-04
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]					
Inorganics-(mg/kg)					
Aluminum	--	--	--	--	--
Antimony	--	--	--	--	--
Arsenic	--	--	--	--	--
Barium	--	--	--	--	--
Beryllium	--	--	--	--	--
Cadmium	0.072 UM	0.13 M	1.8 M	0.073 UM	0.073 UM
Calcium	--	--	--	--	--
Chromium	--	--	--	--	--
Cobalt	--	--	--	--	--
Copper	10	8.2	11.4	7.3	8.3
Iron	--	--	--	--	--
Lead	20.4	19	26.2	12.2	13.1
Magnesium	--	--	--	--	--
Manganese	--	--	--	--	--
Mercury	--	--	--	--	--
Molybdenum	--	--	--	--	--
Nickel	--	--	--	--	--
Potassium	--	--	--	--	--
Selenium	--	--	--	--	--
Sodium	--	--	--	--	--
Vanadium	--	--	--	--	--
Zinc	51.5 B	42.5 B	55.9 B	34 B	66.6 B
Explosives	NA	NA	NA	NA	

--/NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background $UTL_{95,95}$

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Table 3-21. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Bunker Drains.

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:		56			23			33	
Antimony	11%	4%	2.00	13%	0%	1.20	9%	6%	2.0
Arsenic	100%	4%	12.00	100%	4%	8.80	100%	3%	12.0
Cadmium	89%	51%	9.70	96%	57%	9.70	84%	47%	2.4
Chromium	100%	15%	39.00	100%	0%	34.80	100%	25%	39.0
Cobalt	100%	5%	11.50	100%	13%	11.50	100%	0%	7.0
Copper	100%	29%	166.00	100%	52%	91.40	100%	13%	166.0
Iron	100%	9%	53,400.00	100%	17%	53,400.00	100%	3%	24,500.0
Lead	100%	55%	200.00	100%	91%	99.80	100%	28%	200.0
Manganese	100%	2%	603.00	100%	4%	603.00	100%	0%	440.0
Mercury	11%	9%	0.20	26%	22%	0.20	0%	0%	N/A
Nickel	100%	7%	27.50	100%	13%	27.50	100%	3%	23.5
Selenium	20%	2%	1.20	0%	0%	N/A	34%	3%	1.2
Zinc	100%	53%	355.00	100%	91%	355.00	100%	25%	242.0

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the same area.

Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.

NA – Not Applicable

Table 3-22. Summary of Former Underground Storage Tank Areas Soil Sample Detected Results

Building:	8503		8514		8500			8505				8507	
Location:	Tank UST-001	Pipe UST-010	Tank UST-002		Tank UST-003	Pipe UST-004	Pipe UST-005	Tank UST-006	Pipe UST-007		Pipe UST-008	Tank UST-009	
Sample Number:	UST-001-01	UST-010-01	UST-002-01	UST-002-02	UST-003-01	UST-004-01	UST-005-01	UST-006-01	UST-007-01	UST-007-04	UST-008-01	UST-009-01	UST-009-02
Depth (ft bgs):	0.0 to 2.0	0.0 to 2.0	0.0 to 2.0	6.0 to 8.0	0.0 to 1.0	5.0 to 7.0	5.0 to 7.0	6.0 to 8.0	0.0 to 2.0	0.0 to 2.0	0.0 to 2.0	2.0 to 4.0	4.0 to 6.0
Parameters[a,b]										DUP			
TPH-(ug/g)													
Total Recoverable Petroleum Hydrocarbons	29.6	12.5 U	160	63.7	333	1150	244	179	12.5 U	17.5	19	420	1160
BTEX-(mg/kg)													
Toluene	0.001 U	0.0009 U	0.00088 U	0.00089 U	0.00095 F	0.00097 U	0.0011 U	0.0011 U	0.00098 U	0.00089 U	0.00098 U	0.00099 U	0.0011 U
PAH-(mg/kg)													
Benzo(a)anthracene	0.0099 U	0.012	0.0098 U	0.01 U	0.650	1.100	0.210	0.082	0.190	0.036	0.810 0	0.028	0.046
Benzo(a)pyrene	0.017 U	0.042	0.041	0.017 U	1.600	1.300	0.480	0.280	0.480	0.100	1.800 0	0.099	0.160
Benzo(b)fluoranthrene	0.013 U	0.013	0.013 U	0.014 U	0.640	0.990	0.180	0.110	0.220	0.043	0.760 0	0.035	0.061
Benzo(ghi)perylene	0.056 U	0.056 U	0.056 U	0.058 U	0.630	0.860	0.360	0.130	0.200	0.058	0.710 0	0.060 U	0.062
Benzo(k)fluoranthrene	0.012 U	0.012 U	0.012 U	0.012 U	0.360	0.590	0.120	0.058	0.120	0.025	0.430 0	0.019	0.029
Chrysene	0.11 U	0.11 U	0.11 U	0.11 U	0.660	1.200	0.600 U	0.120 U	0.210	0.110 U	0.820 0	0.120 U	0.120 U
Dibenzo(a,h)anthracene	0.022 U	0.022 U	0.022 U	0.023 U	0.110 U	0.150	0.120 U	0.024 U	0.028	0.022 U	0.110 U	0.024 U	0.023 U
Fluoranthene	0.15 U	0.15 U	0.15 U	0.16 U	1.700	4.500	5.600	0.180	0.540	0.150 U	2.100 0	0.170 U	0.360
Fluorene	0.15 U	0.15 U	0.15 U	0.16 U	0.740 U	0.960	3.100	0.170 U	0.150 U	0.150 U	0.750 U	0.170 U	0.160 U
Indeno(1,2,3-cd)pyrene	0.032 U	0.032 U	0.032 U	0.033 U	0.500	0.780	0.200	0.099	0.170	0.040	0.600 0	0.034	0.042
Phenanthrene	0.47 U	0.47 U	0.47 U	0.48 U	2.300 U	5.700	13.000	0.520 U	0.470 U	0.460 U	2.300 U	0.510 U	0.500 U
Pyrene	0.2 U	0.2 U	0.2 U	0.2 U	1.200	2.500	1.400	0.220 U	0.380	0.190 U	1.500 0	0.210 U	0.210 U

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL 95,95.

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Table 3-23. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Removed Underground Storage Tank Areas.

Sample Interval:	Combined			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
BTEX						
No. of Samples:	13			13		
Toluene	8%	8%	0.00095	8%	8%	0.00095
PAH						
No. of Samples:	13			13		
Benzo(a)anthracene	77%	77%	1.100	77%	77%	1.100
Benzo(a)pyrene	85%	85%	1.800	85%	85%	1.800
Benzo(b)fluoranthene	77%	77%	0.990	77%	77%	0.990
Benzo(ghi)perylene	62%	62%	0.860	62%	62%	0.860
Benzo(k)fluoranthrene	69%	69%	0.590	69%	69%	0.590
Chrysene	31%	31%	1.200	31%	31%	1.200
Dibenzo(a,h)anthracene	15%	15%	0.150	15%	15%	0.150
Fluoranthene	54%	54%	5.600	54%	54%	5.600
Fluorene	15%	15%	3.100	15%	15%	3.100
Indeno(1,2,3-cd)pyrene	69%	69%	0.780	69%	69%	0.780
Phenanthrene	15%	15%	13.000	15%	15%	13.000
Pyrene	38%	38%	2.500	38%	38%	2.500

Note: Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.

NA – Not Applicable

Table 3-24. Summary of Vehicle Fueling Area A-4 Soil Sample Detected Results

Location:	A4-001		A4-002		A4-003			A4-004	
Sample Number:	A4-001-01	A4-001-02	A4-002-01	A4-002-02	A4-003-01	A4-003-04	A4-003-02	A4-004-01	A4-004-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 1.5
						DUP			
Parameters[a,b]									
TPH (ug/g)									
Total Recoverable Petroleum Hydrocarbons	227	34.5	177	40.7	93.2	107	26.3	88.4	26.1
BTEX-(mg/kg)									
Toluene	0.012	0.00098 U	0.03	0.0011 U	0.011	0.0063	0.00099 U	0.014	0.001 U
PAH (mg/kg)									
Benzo(a)anthracene	0.027	0.011 U	0.019	0.010 U	0.013	0.010	0.010 U	0.028	0.011 U
Benzo(a)pyrene	0.036	0.018 U	0.027	0.017 U	0.016	0.015 U	0.016 U	0.038	0.018 U
Benzo(b)fluoranthrene	0.041	0.014 U	0.030	0.013 U	0.016	0.015	0.013 U	0.043	0.014 U
Benzo(k)fluoranthrene	0.022	0.013 U	0.017	0.012 U	0.011 U	0.011 U	0.012 U	0.024	0.013 U
Indeno(1,2,3-cd)pyrene	0.090	0.034 U	0.048	0.032 U	0.029 U	0.029 U	0.031 U	0.042	0.035 U

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTL $_{95,95}$.

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Table 3-25. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Vehicle Fueling Area (A-4).

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
BTEX									
No. of Samples:	9			5			4		
Toluene	56%	44%	0.0300	100%	80%	0.0300	0%	0%	N/A
PAH									
No. of Samples:	9			5			4		
Benzo(a)anthracene	56%	56%	0.028	100%	100%	0.028	0%	0%	N/A
Benzo(a)pyrene	44%	44%	0.038	80%	80%	0.038	0%	0%	N/A
Benzo(b)fluoranthene	56%	56%	0.043	100%	100%	0.043	0%	0%	N/A
Benzo(k)fluoranthene	33%	33%	0.024	60%	60%	0.024	0%	0%	N/A
Indeno (1,2,3-cd)pyrene	33%	33%	0.090	60%	60%	0.090	0%	0%	N/A

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.
N/A - Not applicable.

Table 3-26. Summary of Electrical Transformer Areas Soil Sample Detected Results

Location:	TRF-001	TRF-002	TRF-003		TRF-004		TRF-005	
Sample Number:	TRF-001-01	TRF-002-01	TRF-003-01	TRF-003-02	TRF-004-01	TRF-004-02	TRF-005-01	TRF-005-02
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5
Parameters[a,b]								
Pesticides/PCB's-(mg/kg) DL 4.0								
4,4'-DDE	0.0042 U	0.0110 F	0.0039 U	0.0044 U	0.0039 U	0.0039 U	0.0037 U	0.0038 U
TOC (ug/g)	NA	NA	NA		NA	NA	NA	
Leachable Total Organic Carbon				1800				1380

Location:	TRF-006		TRF-007		TRF-008		TRF-009		
Sample Number:	TRF-006-01	TRF-006-02	TRF-007-01	TRF-007-02	TRF-008-01	TRF-008-02	TRF-009-01	TRF-009-02	TRF-009-05
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 1.7	0.5 to 1.7 DUP
Parameters[a,b]									
Pesticides/PCB's-(mg/kg) DL 4.0									
4,4'-DDE	0.0040 U	0.0041 U	0.0040 U	0.0042 U	0.0041 U	0.0042 U	0.0038 U	0.0039 U	0.0040 U
TOC (ug/g)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Leachable Total Organic Carbon									

Location:	TRF-010		TRF-011		TRF-012		TRF-013	
Sample Number:	TRF-010-01	TRF-010-02	TRF-011-01	TRF-011-02	TRF-012-01	TRF-012-02	TRF-013-01	TRF-013-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 10.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]								
Pesticides/PCB's-(mg/kg) DL 4.0								
4,4'-DDE	0.0038 U	0.0039 U	0.0037 U	0.0036 U	0.0038 U	0.0042 U	0.0036 U	0.0035 U
TOC (ug/g)	NA	NA	NA	NA	NA	NA	NA	NA
Leachable Total Organic Carbon								

Location:	TRF-014		TRF-015		TRF-016	
Sample Number:	TRF-014-01	TRF-014-02	TRF-015-01	TRF-015-02	TRF-016-01	TRF-016-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.2	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]						
Pesticides/PCB's-(mg/kg) DL 4.0						
4,4'-DDE	0.0038 U	0.0038 U	0.0035 U	0.0036 U	0.0037 U	0.0044 U
TOC (ug/g)	NA	NA	NA	NA	NA	NA
Leachable Total Organic Carbon						

NA - Not analyzed.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background values UTL 95,95.

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Table 3-28. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for Leach Field Area.

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detection	Percent > UTL	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples	6			2			4		
Antimony	3	50%	1.3	0	0%	NA	3	75%	1.3
Cadmium	3	50%	0.66	0	0%	NA	3	75%	0.66
Semivolatiles									
No. of Samples	6			2			4		
2-Methylnaphthalene	4	67%	0.35	1	50%	0.32	3	75%	0.35
Naphthalene	5	83%	2.3	1	50%	2.2	4	100%	2.3
Volatiles									
No. of Samples	6			2			4		
Tetrachloroethene	5	83%	0.0084	2	100%	0.0084	3	75%	0.0076

Note - Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.

Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.

N/A - Not applicable.

Table 3-27. Summary of Leach Field Soil Sample Detected Results

Location:	LCH-001		LCH-002			LCH-003		LCH-100	LCH-101
Sample Number:	LCH-001-01	LCH-002-01	LCH-002-02	LCH-002-03	LCH-003-01	LCH-003-02		LCH-100-03	LCH-101-03
Depth (ft bgs):	2.8 to 3.0	0.0 to 0.6	1.0 to 2.5	1.0 to 2.5	0.0 to 0.5	1.0 to 2.5		1.0 to 2.25	0.15 to 0.75
Parameters[a,b]				DUP					
Inorganics (mg/kg)									
Aluminum	1740	7240	6170	7680	7410	6890		--	--
Antimony	0.86 U	1	1.3	0.98 F	1.1	0.93 F		0.88 U	0.94 U
Arsenic	2.3 J	2.6	4.5	3	2.8	2.8		--	--
Barium	16.9 J	43.8	37.3	44.1	62.4	39.7		--	--
Beryllium	0.1 R	0.26 F	0.24 F	0.3	0.32	0.22 F		--	--
Cadmium	0.46 J	0.68	0.66	0.64	0.69	0.57		0.068 U	0.074 U
Calcium	338000	237000	277000	241000	224000	294000		--	--
Chromium	3.3	8.6	8.6	10	9.8	7.9		--	--
Cobalt	0.84 J	2.4	2	2.4	2.9	2.1		--	--
Copper	4.1	6.2	6.3	5.9	7.1	4.8		--	--
Iron	5040 J	7040	8460	7720	8010	6850		--	--
Lead	3.2 J	11.4	7.9	9	13.8	6.7		--	--
Magnesium	1880 J	2310	2230	2300	2250	2130		--	--
Manganese	169	250 M	211 M	225 M	324 M	217 M		--	--
Molybdenum	3.2	1.3	3	1.7	2.4	2.1		--	--
Nickel	6.7	7.8	9.4	9.2	9.1	8.5		--	--
Potassium	980	1740	1540	1780	1820	1450		--	--
Selenium	0.62 R	0.74 F	0.7 F	0.63 U	0.83 F	0.73 F		--	--
Sodium	2240	1130	1760	1540	1150	1380		--	--
Vanadium	10.3	23.4	27	25.5	26.6	22.5		--	--
Zinc	25.7 J	30.1	16	15.4	27	15.8		--	--
Semivolatiles (mg/Kg)									
2-Methylnaphthalene	0.110 F	0.32 F	0.25 F	0.35 F	0.1 U	0.1 U		0.1 U	0.11 U
Naphthalene	0.800	2.2	1.8	2.3	0.12 U	0.35 F		0.12 U	0.13 U
Volatiles (mg/kg)								NA	NA
Tetrachloroethene	0.00072 U	0.0059 F	0.0058 F	0.0076	0.0084	0.0069 F			
Pesticides/PCBs (mg/Kg)	ND	ND	ND	ND	ND	ND		NA	NA
Explosives	ND	ND	ND	ND	ND	ND		NA	NA

--/NA - Not analyzed

ND - not detected

F - Compound was positively detected below the PQL

U - Compound was analyzed for, but detected below the method detection limit

[a]Parameters limited to those detected in at least one sample.

Table 3-29. Summary of DW-1 Soil Sample Detected Results

Location:	DW1-001		DW1-002		DW1-003			
Sample Number:	DW1-001-01	DW1-001-02	DW1-002-01	DW1-002-02	DW1-003-01	DW1-003-20	DW1-003-02	DW1-003-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0
Parameters[a,b]								
Inorganics-(mg/kg)								
Aluminum	4720 B	4580	3990	3340	4490	10800	27.10	4020
Antimony	1.2 U	0.95 U	1.1 U	0.97 U	0.86 U	1.3 U	1.3	0.91 U
Arsenic	24.6	11.1	5.3	3.2	8.6	6.5	3.7	3.9
Barium	64.1	25.3	37.6	18.1	41.4	39.6	20	14
Beryllium	0.53	0.4	0.39	0.28 F	0.41	0.54	0.36	0.44
Cadmium	0.71	0.75	2.3	0.9	4.9	0.11 U	0.51	0.28
Calcium	182000 B	280000 B	212000 B	268000 B	236000 B	213000	318000 B	297000 B
Chromium	18.1	11.4	35.4	19.6	41.3	24.1	16.8	10.6
Cobalt	8.4	1.7	1.8	0.96	3	2.7	1.4	2.8
Copper	23.2	18	26.4	7.2	60.1	8.5	5.5 M	10.1 M
Iron	8710 B	5730	4950 B	5940	6320 B	9050	5060	6730
Lead	15.8	4	35.8	6.8	31.2	24.5	7.4	6
Magnesium	2150 B	2840	2140 B	2250	2170 B	2650	2400	2290
Manganese	359 B	194 M	121 B	144 M	199 B	196	193 B	242 B
Mercury	0.058 U	0.048 U	0.12	0.048 U	0.054 F	0.064 U	0.047 U	0.046 U
Molybdenum	1.9	1.8	6.3	2.2	14.7	4.4	4.3	4.9
Nickel	8.5 M	6.1	5.6 M	4	6.2 M	6.9	4.1	4.2
Potassium	1100	1560	816	942	900	1570	918	1170
Selenium	0.94 U	0.76 U	0.91 U	0.78 U	0.7 U	1 U	0.76 U	0.74 U
Sodium	1690	1510	1860	1730	1270	1390	927 B	1190 B
Vanadium	16.8	15.8	12.4	11.7	15.2	27.4	11	13.3
Zinc	74.9	42.5 B	85.5	82.8 B	98.1	40.5	17.7 B	18.4 B
Semivolatiles-(mg/kg)			DL 20.00			NA		
Anthracene	0.094 U	0.058 U	2 U	0.059 U	0.078 U		0.059 U	0.058 U
Benzo(a)anthracene	0.11 U	0.14 F	2.2 U	0.062 U	0.44 F		0.062 U	0.061 U
Benzo(a)pyrene	0.11 UM	0.11 F	2.2 U	0.062 U	0.29 M		0.062 U	0.061 U
Benzo(b)fluoranthene	0.2 U	0.22 F	4.1 U	0.12 U	0.55 F		0.12 U	0.11 U
Benzo(ghi)perylene	0.13 U	0.11 U	2.6 U	0.12 U	0.29 F		0.12 U	0.11 U
Bis(2-ethylhexyl) phthalate	0.1 UM	0.085 U	41 M	0.086 U	0.42 M		0.086 U	0.084 U
Butyl benzyl phthalate	0.1 U	0.062 U	2.1 U	0.062 U	0.086 U		0.062 U	0.061 U
Chrysene	0.13 U	0.15 F	2.8 U	0.064 U	0.45 F		0.065 U	0.063 U
Fluoranthene	0.13 UM	0.47 F	2.7 U	0.077 U	1.2 M		0.078 U	0.076 U
Indeno(1,2,3-cd)pyrene	0.12 U	0.12 U	2.6 U	0.12 U	0.24 F		0.12 U	0.12 U
Phenanthrene	0.095 U	0.24 F	2 U	0.054 U	0.62 F		0.054 U	0.053 U
Pyrene	0.13 U	0.29 F	2.8 U	0.074 U	0.81		0.074 U	0.072 U
Volatiles-(mg/kg)						NA		
cis-1,2-Dichloroethene	0.0011	0.0011	0.0012 U	0.001 U	0.00096 U		0.00099 U	0.00099 U
Methylene chloride	0.0015 U	0.0019 F	0.0016 U	0.0016 F	0.0013 U		0.0024	0.0018 F
Toluene	0.0014 U	0.0013 U	0.0014 U	0.0012 U	0.0012 U		0.0012 U	0.0012 U
Trichloroethene	0.0014 U	0.0013 U	0.0014 U	0.0012 U	0.0012 U		0.0012 U	0.0012 U
Pesticides/PCBs-(mg/kg)						NA		
(DL 4.0)								
4,4'-DDE	0.0046 U	0.004 U	0.0046 U	0.004 U	0.0038 U		0.0039 U	0.0039 U
4,4'-DDT	0.005 U	0.0044 U	0.0051 U	0.0045 U	0.0042 U		0.0043 U	0.0043 U
beta-BHC	0.002 UM	0.0018 U	0.002 UM	0.0018 U	0.0017 M		0.0017 U	0.0017 U
Endosulfan Sulfate	0.0082 F	0.0037 U	0.0042 U	0.0037 U	0.0035 U		0.0036 U	0.0036 U
Explosives	ND	ND	ND	ND	ND	NA	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-29. Summary of DW-1 Soil Sample Detected Results, cont'd.

Location:	DW1-004			DW1-005		DW1-006		
Sample Number:	DW1-004-01	DW1-004-02	DW1-004-03	DW1-005-01	DW1-005-02	DW1-006-01	DW1-006-04	DW1-006-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.7	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5
Parameters[a,b]							DUP	
Inorganics-(mg/kg)								
Aluminum	4300 B	3770	3120	4230 B	2920	9530	8220 B	5570
Antimony	0.85 U	0.88 U	0.9 U	0.83 U	0.91 U	0.85 U	0.82 U	0.95 F
Arsenic	9.9	4.9	3	7.9	4.1	11	11.5	5.3
Barium	43.7	26.1	12.3	43.7	18.5	54.6	56	30.4
Beryllium	0.67	0.43	0.42	0.77	0.36	0.66	0.7	0.44
Cadmium	2.6	0.88	0.27	2.1	0.17	1.2	0.58	0.47
Calcium	156000 B	280000 B	293000 B	174000 B	309000 B	189000 B	176000 B	284000 B
Chromium	185	32.9	22	46.4	8.9	25.5	21.8	14.2
Cobalt	4.7	2.7	1.8	4.9	1.6	4.5	4.2	2.4
Copper	15.8	5.6 M	4.2 M	18.9	5 M	16.2	13.1	6.6 M
Iron	15700 B	6630	6360	11900 B	5460	11700 B	21900 B	6170
Lead	22.7	7.9	6.4	20.3	4	19.3	15.7	6.9
Magnesium	1660 B	2050	2330	1770 B	2200	2440 B	2300 B	2270
Manganese	278 B	180 B	246 B	286 B	157 B	308 B	336 B	172 B
Mercury	0.064 F	0.045 U	0.045 U	0.043 U	0.045 U	0.042 U	0.042 U	0.045 U
Molybdenum	9.2	4.2	2.3	5.1	1.7	2.8	2.1	2.5
Nickel	10.5 M	4.6 M	3.3	11.3 M	4.6	9.7 M	8.4 M	5.5
Potassium	701	837	688	744	741	1590	1430	1020
Selenium	0.69 U	0.72 U	0.73 U	0.68 U	0.74 U	0.69 U	0.67 U	0.72 U
Sodium	852	1270 B	933 B	1030	1050 B	807	835	988 B
Vanadium	23.6	13.2	11.2	21.5	14	29.7	26.3	17.9
Zinc	287	51 B	30 B	114	18 B	72.2	65.7	23.1 B
Semivolatiles-(mg/kg)	DL 10.00			DL 10.00				
Anthracene	0.76 U	0.056 U	0.056 U	0.75 U	0.057 U	0.075 U	0.075 U	0.056 U
Benzo(a)anthracene	0.88 U	0.059 U	0.059 U	0.86 U	0.06 U	0.17 F	0.3 F	0.059 U
Benzo(a)pyrene	0.88 U	0.059 U	0.059 U	0.86 U	0.06 U	0.15 M	0.24 M	0.059 U
Benzo(b)fluoranthene	1.6 U	0.11 U	0.11 U	1.6 U	0.11 U	0.28 F	0.43 F	0.11 U
Benzo(ghi)perylene	1 U	0.11 U	0.11 U	1 U	0.11 U	0.18 F	0.29 F	0.11 U
Bis(2-ethylhexyl) phthalate	14 M	0.23 F	0.16 F	8.5 M	0.083 U	0.25 M	0.3 M	0.081 U
Butyl benzyl phthalate	0.84 U	0.059 U	0.059 U	0.82 U	0.06 U	0.083 U	0.083 U	0.059 U
Chrysene	1.1 U	0.062 U	0.061 U	1.1 U	0.062 U	0.22 F	0.32 F	0.061 U
Fluoranthene	1.1 D	0.074 U	0.073 U	2 D	0.075 U	0.45 M	0.85 M	0.074 U
Indeno(1,2,3-cd)pyrene	1 U	0.12 U	0.12 U	0.99 U	0.12 U	0.15 F	0.23 F	0.12 U
Phenanthrene	0.84 DF	0.052 U	0.051 U	1.3 D	0.052 U	0.2 F	0.51 F	0.051 U
Pyrene	1.1 U	0.071 U	0.07 U	1.8 D	0.072 U	0.34 F	0.59 F	0.07 U
Volatiles-(mg/kg)								
cis-1,2-Dichloroethene	0.00089 U	0.00091 U	0.00091 U	0.00085 R	0.00091 U	0.00086 R	0.0009 U	0.00088 U
Methylene chloride	0.0029	0.0016 F	0.0018 F	0.0011 R	0.0018 F	0.0032 R	0.002	0.0027 B
Toluene	0.0034 F	0.0011 U	0.0011 U	0.0086 J	0.0011 U	0.021 R	0.006	0.0011 U
Trichloroethene	0.0011 U	0.0011 U	0.0011 U	0.001 R	0.0011 U	0.001 R	0.0011 U	0.0011 U
Pesticides/PCBs-(mg/kg)								
(DL 4.0)								
4,4'-DDE	0.0036 U	0.0038 U	0.0039 U	0.0036 U	0.0039 U	0.0037 U	0.0037 U	0.0037 U
4,4'-DDT	0.004 U	0.0042 U	0.0043 U	0.004 U	0.0043 U	0.0041 U	0.0041 U	0.0041 U
beta-BHC	0.0016 UM	0.0017 U	0.0017 U	0.032 M	0.0017 U	0.0016 UM	0.0016 UM	0.0016 U
Endosulfan Sulfate	0.0033 U	0.0035 U	0.0035 U	0.0032 U	0.0035 U	0.0034 U	0.0033 U	0.0034 U
Explosives	ND	ND	ND	ND	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-29. Summary of DW-1 Soil Sample Detected Results, cont'd.

Location:	DW1-006		DW1-007			DW1-008	
Sample Number:	DW1-006-05	DW1-007-01	DW1-007-02	DW1-007-03	DW1-008-01	DW1-008-02	DW1-008-03
Depth (ft bgs):	0.5 to 2.5	0.0 to 0.5	0.5 to 2.5	8.0 to 10.0	0.0 to 0.5	0.5 to 2.5	6.5 to 8.5
Parameters[a,b]	DUP						
Inorganics-(mg/kg)							
Aluminum	9540	11300 B	8530	13100	12200 B	11700	6680
Antimony	0.89 U	0.82 U	0.93 F	1 U	0.82 U	0.95 U	1 U
Arsenic	4.5	13.1	5.1	6.1	11.7	8.4	5.4
Barium	20.1	50.6	39.5	19.7	59.5	58.9	17.8
Beryllium	0.6	0.66	0.57	1.1	0.67	0.62	0.52
Cadmium	3.8	2.1	0.83	0.091 U	1.2	0.13	0.087 U
Calcium	228000 B	204000 B	272000 B	45900 B	193000 B	179000 B	289000 B
Chromium	43.3	27.4	19.8	18.2	27.5	15.3	11.4
Cobalt	2.5	3.5	3	9	4.6	4.2	2.4
Copper	13 M	14.6	7.7 M	13.9 M	18	9.8 M	6.2 M
Iron	7870	12000 B	7740	26000	11600 B	10400	8340
Lead	23.7	21.4	10	22.5	20.5	11.4	6.6
Magnesium	2320	2830 B	1880	1330	2810 B	2460	2870
Manganese	153 B	258 B	191 B	74.6 B	324 B	273 B	157 B
Mercury	0.044 U	0.041 U	0.046 U	0.051 U	0.041 U	0.1	0.05 U
Molybdenum	13.5	6.9	3.7	3.7	2.8	0.91	1.9
Nickel	5	8.8 M	5.6	10.1	9.4 M	6.8	5.6
Potassium	826	1950	962	1250	2240	1230	1080
Selenium	0.72 U	0.67 U	0.75 U	1.7	0.66 U	0.77 U	0.81 U
Sodium	1020 B	829	1070 B	1150 B	938	963 B	1160 B
Vanadium	22.5	29.5	23.6	31.1	30.4	24.1	23
Zinc	24 B	75.4	33.6 B	26.1 B	73.3	27.1 B	13.1 B
Semivolatiles-(mg/kg)							
Anthracene	0.054 U	0.076 U	0.057 U	0.064 U	0.077 U	0.059 U	0.06 U
Benzo(a)anthracene	0.058 U	0.087 U	0.061 U	0.067 U	0.39 F	0.062 U	0.064 U
Benzo(a)pyrene	0.058 U	0.087 M	0.061 U	0.067 U	0.28 M	0.062 U	0.064 U
Benzo(b)fluoranthene	0.11 U	0.16 U	0.11 U	0.13 U	0.51 F	0.12 U	0.12 U
Benzo(ghi)perylene	0.11 U	0.1 U	0.11 U	0.13 U	0.32 F	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	0.08 U	0.13 M	0.084 U	0.093 U	0.44 M	0.086 U	0.088 U
Butyl benzyl phthalate	0.058 U	0.083 U	0.061 U	0.067 U	0.085 U	0.062 U	0.064 U
Chrysene	0.06 U	0.11 U	0.063 U	0.07 U	0.45 F	0.065 U	0.066 U
Fluoranthene	0.072 U	0.23 M	0.076 U	0.084 U	1.1 M	0.078 U	0.08 U
Indeno(1,2,3-cd)pyrene	0.12 U	0.1 U	0.12 U	0.13 U	0.27 F	0.12 U	0.13 U
Phenanthrene	0.05 U	0.11 F	0.053 U	0.058 U	0.52 F	0.054 U	0.055 U
Pyrene	0.069 U	0.17 F	0.072 U	0.08 U	0.74	0.074 U	0.076 U
Volatiles-(mg/kg)							
cis-1,2-Dichloroethene	0.00089 U	0.00093 U	0.00093 U	0.063	0.00089 U	0.0009 U	0.0011 U
Methylene chloride	0.0019 F	0.0012 U	0.0019 F	0.0022	0.0012 U	0.002	0.0023
Toluene	0.0011 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U
Trichloroethene	0.0011 U	0.0011 U	0.0011 U	0.071	0.0011 U	0.0016 F	0.0033 F
Pesticides/PCBs-(mg/kg)							
(DL 4.0)							
4,4'-DDE	0.0038 U	0.0037 U	0.0038 U	0.0044 U	0.0037 U	0.004 U	0.0042 U
4,4'-DDT	0.0042 U	0.004 U	0.0043 U	0.0048 U	0.0041 U	0.0045 U	0.0046 U
beta-BHC	0.0017 U	0.0016 UM	0.0017 U	0.0019 U	0.0016 UM	0.0018 U	0.0018 U
Endosulfan Sulfate	0.0034 U	0.0033 U	0.0035 U	0.004 U	0.0033 U	0.0037 U	0.0038 U
Explosives	ND	ND	ND	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-29. Summary of DW-1 Soil Sample Detected Results, cont'd.

Location:	DW1-009			DW1-010		
Sample Number:	DW1-009-01	DW1-009-02	DW1-009-03	DW1-010-01	DW1-010-02	DW1-010-03
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.5	6.5 to 8.5	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Parameters[a,b]						
Inorganics-(mg/kg)						
Aluminum	18400 B	9120	2710	18500 B	6220	3990
Antimony	1.2	0.92 U	1 U	1	0.92 U	0.96 U
Arsenic	8.2	4.7	1.5 F	7.1	5.2	6.9
Barium	92.4	46.2	23.6	122	112	19.8
Beryllium	1	0.71	0.35	1.2	0.48	0.48
Cadmium	1.9	0.081 U	0.09 U	0.95	0.081 U	0.084 U
Calcium	91300 B	2530000 B	320000 B	109000 B	288000 B	289000 B
Chromium	49.1 M	14.4	3.8	20.5 M	8.5	8.7
Cobalt	4.6	4.4	1.7	6	1.9	1.2
Copper	15.1	5.2 M	2.2 M	10.3	2.9 M	7 M
Iron	14800 B	9750	3670	15200	5900	25000
Lead	97.2	14.9	4.6	17	3.9	5.5
Magnesium	2280 J	2090	1830	2640 J	1640	1890
Manganese	283	295 B	322 B	347	266 B	255 B
Mercury	0.044 U	0.046 U	0.052 U	0.044 U	0.046 U	0.049 U
Molybdenum	2.7	1.1	0.39 F	1.6	1.4	8.4
Nickel	12.4	6.4	2.2	12.7	9.4	10
Potassium	3850	1100	711	3090	1290	433
Selenium	0.9 M	0.75 U	0.84 U	0.71 R	0.75 U	0.78 U
Sodium	603	975 B	1500	538	855	1110
Vanadium	38	31	6.8	46.3	22.5	33.3
Zinc	72.9	12.8 B	8.3	36.1	16.6	29
Semivolatiles-(mg/kg)						
Anthracene	0.063 F	0.057 U	0.065 U	0.054 U	0.056 U	0.059 U
Benzo(a)anthracene	0.38 F	0.061 U	0.069 U	0.057 U	0.06 U	0.063 U
Benzo(a)pyrene	0.3 F	0.061 U	0.069 U	0.057 U	0.06 U	0.063 U
Benzo(b)fluoranthene	0.29 F	0.11 U	0.13 U	0.11 U	0.11 U	0.12 U
Benzo(ghi)perylene	0.15 F	0.11 U	0.13 U	0.11 U	0.11 U	0.12 U
Bis(2-ethylhexyl) phthalate	0.77	0.28 F	0.095 U	0.078 U	0.083 U	0.086 U
Butyl benzyl phthalate	0.064 F	0.061 U	0.069 U	0.057 U	0.06 U	0.063 U
Chrysene	0.32 F	0.063 U	0.072 U	0.059 U	0.062 U	0.065 U
Fluoranthene	0.85	0.076 U	0.086 U	0.071 U	0.075 U	0.078 U
Indeno(1,2,3-cd)pyrene	0.16 F	0.12 U	0.14 U	0.11 U	0.12 U	0.12 U
Phenanthrene	0.53 F	0.053 U	0.06 U	0.049 U	0.052 U	0.054 U
Pyrene	0.68 F	0.072 U	0.082 U	0.068 U	0.071 U	0.075 U
Volatiles-(mg/kg)						
cis-1,2-Dichloroethene	0.00087 U	0.00094 U	0.0009 U	0.00087 U	0.00096 U	0.00094 U
Methylene chloride	0.0087	0.0018 F	0.0015 F	0.004	0.0019 F	0.0059 B
Toluene	0.0094	0.0012 U	0.0012 U	0.013	0.0012 U	0.0011 U
Trichloroethene	0.0011 U	0.0012 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U
Pesticides/PCBs-(mg/kg)						
(DL 4.0)						
4,4'-DDE	0.01 R	0.004 U	0.0044 U	0.0037 R	0.004 U	0.0042 U
4,4'-DDT	0.0094 R	0.0044 U	0.0049 U	0.0041 R	0.0044 U	0.0046 U
beta-BHC	0.008 F	0.0018 U	0.0019 U	0.0016 U	0.0017 U	0.0018 U
Endosulfan Sulfate	0.0033 U	0.0036 U	0.004 U	0.0034 U	0.0036 U	0.0038 U
Explosives	ND	ND	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-29. Summary of DW-1 Soil Sample Detected Results, cont'd.

Location:	DW1-100			DW1-101	DW1-102	DW1-103	DW1-104	DW1-105
Sample Number:	DW1-100-01	DW1-100-04	DW1-100-02	DW1-101-01	DW1-102-01	DW1-103-01	DW1-104-01	DW1-105-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]		DUP						
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Molybdenum								
Nickel								
Potassium								
Selenium								
Sodium								
Vanadium								
Zinc								
Semivolatiles-(mg/kg)								
Anthracene	0.18 U	0.2 U	0.19 U	0.19 U	0.19 U	0.19 U	0.96 U	0.95 U
Benzo(a)anthracene	0.19 U	0.22 U	0.21 U	0.5 F	0.52 F	0.21 U	1 U	1 U
Benzo(a)pyrene	0.19 U	0.21 U	0.2 U	0.36 F	0.37 F	0.2 U	1 U	0.99 U
Benzo(b)fluoranthene	0.16 U	0.18 U	0.18 U	0.52 F	0.48 F	0.18 U	0.88 U	0.88 U
Benzo(ghi)perylene	0.17 R	0.19 R	0.18 U	0.19 R	0.21 R	0.18 R	0.91 U	0.9 U
Bis(2-ethylhexyl) phthalate	0.2 U	0.22 U	0.21 U	0.25 F	0.21 U	0.21 U	1 U	1 U
Butyl benzyl phthalate	0.18 U	0.2 U	0.19 U	0.19 U	0.19 U	0.19 U	0.95 U	0.94 U
Chrysene	0.16 U	0.18 U	0.18 U	0.56 F	0.63 F	0.18 F	0.87 U	0.87 U
Fluoranthene	0.2 U	0.23 U	0.35 F	1.2	1.2	0.41 F	1.1 U	1.1 U
Indeno(1,2,3-cd)pyrene	0.2 U	0.22 U	0.21 U	0.22 F	0.24 F	0.21 U	1 U	1 U
Phenanthrene	0.19 U	0.21 U	0.2 U	0.71	0.71	0.2 F	1 U	1 U
Pyrene	0.17 U	0.19 U	0.29 F	0.96	0.99	0.31 F	0.93 U	0.92 U
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene								
Methylene chloride								
Toluene								
Trichloroethene								
Pesticides/PCBs-(mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA
(DL 4.0)								
4,4'-DDE								
4,4'-DDT								
beta-BHC								
Endosulfan Sulfate								
Explosives	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-30. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for DW-1.

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detet.	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detet.	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detet.	Per cent >	Maximum Conc. (mg/kg)
Inorganics									
No. of Samples:	28			11			17		
Antimony	18%	11%	1.30	18%	0%	1.20	18%	18%	1.30
Arsenic	100%	29%	24.60	100%	72%	24.60	100%	0%	11.10
Cadmium	79%	43%	4.90	100%	55%	4.90	65%	35%	3.80
Calcium	100%	4%	2,530,000.00	100%	0%	236,000	100%	6%	2,530,000.00
Chromium	100%	36%	185.00	100%	18%	185.00	100%	47%	43.30
Copper	100%	14%	60.10	100%	27%	60.10	100%	6%	18.00
Iron	100%	7%	26;000.00	100%	0%	21,900.00	100%	12%	26,000.00
Lead	100%	18%	97.20	100%	27%	97.20	100%	12%	23.70
Magnesium	100%	11%	2870.00	100%	27%	2830.00	100%	0%	2870.00
Mercury	14%	14%	0.12	27%	27%	0.12	6%	6%	0.10
Molybdenum	100%	14%	14.70	100%	18%	14.70	100%	12%	13.50
Selenium	7%	4%	1.70	9%	0%	0.90	6%	6%	1.70
Zinc	100%	43%	287.00	100%	82%	287.00	100%	18%	82.80
Semivolatiles									
No. of Samples:	28			11			17		
Anthracene	4%	4%	0.063	9%	9%	0.063	0%	0%	N/A
Benzo(a)anthracene	21%	21%	0.440	45%	45%	0.440	6%	6%	0.14
Benzo(a)pyrene	21%	21%	0.300	45%	45%	0.300	6%	6%	0.11
Benzo(b)fluoranthene	21%	21%	0.550	45%	45%	0.550	6%	6%	0.22
Benzo(ghi)perylene	21%	21%	0.320	45%	45%	0.320	0%	0%	N/A

Table 3-30. Summary of Frequency of Detection, Percent of Values Greater than Background $UTL_{95,95}$, and Maximum Concentration for DW-1.

Sample Interval:	Combined			Surface			Subsurface		
	Freq. of Detet.	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detet.	Percent > UTL	Maximum Conc. (mg/kg)	Freq. of Detet.	Percent > UTL	Maximum Conc. (mg/kg)
Semivolatiles cont.									
No. of Samples:		28			11			17	
Butyl benzyl phthalate	4%	4%	0.064	9%	9%	0.064	0%	0%	N/A
Chrysene	21%	21%	0.450	45%	45%	0.450	6%	6%	0.15
Fluoranthene	32%	32%	2.00	72%	72%	2.00	6%	6%	0.47
Indeno(1,2,3-cd)pyrene	18%	18%	0.27	45%	45%	0.27	0%	0%	N/A
Phenanthrene	32%	32%	1.30	72%	72%	1.30	6%	6%	0.24
Pyrene	29%	29%	1.80	64%	64%	1.80	6%	6%	0.29
Volatiles									
No. of Samples:		28			11			17	
cis-1,2-Dichlorethene	4%	4%	0.063	0%	0%	N/A	6%	6%	0.063
Toluene	21%	21%	0.021	55%	68%	0.021	0%	0%	N/A
Trichloroethene	11%	11%	0.071	0%	0%	N/A	18%	18%	0.071
Pesticides/PCBs									
No. of Samples:		28			11			17	
4,4'-DDE	4%	4%	0.0100	9%	9%	0.0100	0%	0%	N/A
4,4'-DDT	4%	4%	0.0094	9%	9%	0.0094	0%	0%	N/A
beta-BHC	7%	7%	0.0320	18%	18%	0.0320	0%	0%	N/A
Endosulfan Sulfate	4%	4%	0.0082	9%	9%	0.0082	0%	0%	N/A

Note: Parameters listed include only those reported at a concentration greater than the background $UTL_{95,95}$ in at least one sample within the area.

Note - Descriptive statistics do not include verification and extent of contamination samples collected in Fourth Quarter 1998 and January 1999.

N/A - Not applicable.

Table 3-31. Summary of DW-2 Soil Sample Detected Results

Location:	DW2-001	DW2-002	DW2-003
Sample Number:	DW2-001-01	DW2-002-01	DW2-003-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]			
Inorganics-(mg/kg)			
Aluminum	13600 B	6980 B	6020 B
Antimony	0.86 U	1.4	1
Arsenic	6.1	5	7.2
Barium	82.5	85.6	62.2
Beryllium	0.87	0.64	0.62
Cadmium	0.8	0.66	0.57
Calcium	188000 B	321000 B	274000 B
Chromium	15.2	8.2	7.6
Cobalt	3.5	5.8	2.3
Copper	6.3	4.9	2.4
Iron	11800 B	8040 B	8560 B
Lead	14.1	8.3	6.8
Magnesium	2410 J	2360 J	2020 J
Manganese	200	528	83.1
Molybdenum	1.2	1.2	2.1
Nickel	9.3	9.6	8.7
Potassium	2690	1440	1090
Sodium	734	1240	1020
Vanadium	34.2	26.9	22.9
Zinc	33	20.6	16.6
Semivolatiles	ND	ND	ND
Volatiles-(mg/kg)			
Methylene chloride	0.0033	0.0032	0.0029
Toluene	0.0027 F	0.0078	0.0012 U
Pesticides/PCBs	ND	ND	ND
Explosives	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b- Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-001	DW3-002	DW3-003	DW3-100		DW3-101	
Sample Number:	DW3-001-01	DW3-002-01	DW3-003-01	DW3-100-01	DW3-100-02	DW3-101-01	DW3-101-02
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 1.2	0.0 to 0.5	0.5 to 0.9
Parameters[a,b]							
Inorganics-(mg/kg)				NA	NA	NA	NA
Aluminum	9300 B	16800 B	6210 B				
Antimony	0.85 U	0.88 U	1				
Arsenic	5.4	5	6.5				
Barium	79.4	154	72.6				
Beryllium	0.74	1.1	0.51				
Cadmium	1.2	0.78	0.58				
Calcium	204000 B	92900 B	292000 B				
Chromium	11.3	17.4	6.6				
Cobalt	4	6	4.5				
Copper	14.2	11.7	3.8				
Iron	9880 B	12200 B	6990 B				
Lead	21.5	15.5	10.7				
Magnesium	2590 J	2720 J	2020 J				
Manganese	302	386	371				
Mercury	0.061 F	0.044 U	0.043 U				
Molybdenum	1.2	0.58	1.5				
Nickel	8	12.4	6.8				
Potassium	1830	2530	1060				
Selenium	0.7 R	1 J	0.69 R				
Sodium	828	584	985				
Vanadium	29.5	30.6	33.6				
Zinc	169	52.5	15.2				
Semivolatiles-(mg/Kg)							
Acenaphthene	0.33 F	0.051 U	0.049 U	0.14 U	0.12 U	0.14 F	0.13 U
Anthracene	0.41 F	0.055 U	0.053 U	0.19 U	0.16 U	0.18 F	0.18 U
Benzo(a)anthracene	2	0.058 U	0.056 U	0.33 F	0.18 U	0.94	0.19 U
Benzo(a)pyrene	1.4	0.058 U	0.056 U	0.2 U	0.17 U	0.64 F	0.19 U
Benzo(b)fluoranthene	2	0.11 U	0.1 U	0.27 F	0.15 U	0.88	0.17 F
Benzo(k)fluoranthene							
Benzo(ghi)perylene	0.66 F	0.11 U	0.1 U	0.18 U	0.16 U	0.34 F	0.17 U
Chrysene	2.1	0.061 U	0.058 U	0.39 F	0.15 U	1.1	0.16 U
Dibenzo(a,h)anthracene	0.062 U	0.065 U	0.063 U	0.2 U	0.17 U	0.18 U	0.18 U
Dibenzofuran	0.16 F	0.058 U	0.056 U	0.15 U	0.13 U	0.13 U	0.14 U
Fluoranthene	5.3	0.073 U	0.07 U	0.77	0.19 U	2.3	0.31 F
Fluorene	0.24 F	0.065 U	0.063 U	0.16 U	0.14 U	0.15 U	0.15 U
Indeno(1,2,3-cd)pyrene	0.83	0.12 U	0.11 U	0.21 U	0.18 U	0.39 F	0.2 U
Naphthalene	0.052 F	0.047 U	0.046 U	0.15 U	0.12 U	0.13 U	0.14 U
Phenanthrene	3.6	0.051 U	0.049 U	0.45 F	0.17 U	1.7	0.19 U
Pyrene	4	0.069 U	0.067 U	0.62 F	0.16 U	1.9	0.24 F
Volatiles-(mg/kg)				NA	NA	NA	NA
Methylene chloride	0.0062	0.0031	0.0018 F				
Toluene	0.01	0.0022 F	0.0035 F				
Pesticides/PCBs-(mg/kg)(DL 4.0)				NA	NA	NA	NA
beta-BHC	0.031 F	0.0017 U	0.0016 U				
Explosives	ND	ND	ND	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at least one sample (see Appendix E).

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-101	DW3-102	DW3-103	DW3-104	DW3-105	DW3-106	
Sample Number:	DW3-101-05	DW3-102-01	DW3-103-01	DW3-104-01	DW3-105-01	DW3-106-01	DW3-106-02
Depth (ft bgs):	0.5 to 0.9	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5
Parameters[a,b]	DUP						
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Molybdenum							
Nickel							
Potassium							
Selenium							
Sodium							
Vanadium							
Zinc							
Semivolatiles-(mg/Kg)			DILUTED			DL 10	DL 10
Acenaphthene	0.13 U	0.69 U	24	0.7 U	0.73 U	0.61 F	0.14 U
Anthracene	0.17 U	0.93 UM	34 M	0.95 UM	0.99 UM	0.028 F	0.018 F
Benzo(a)anthracene	0.19 U	1 UM	71 M	1.3 M	3.1 M	0.1	0.065
Benzo(a)pyrene	0.18 U	0.98 UM	55 M	1.1	1 UM	0.12	0.071
Benzo(b)fluoranthene	0.16 U	0.86 UM	8.8 U	0.88 UM	3.5 M	0.12	0.07
Benzo(k)fluoranthene						0.047	0.028
Benzo(ghi)perylene	0.16 U	0.89 UM	26	0.9 UM	0.94 UM	0.083	0.058
Chrysene	0.16 U	0.85 UM	69 M	1.3 M	3.4 M	0.12	0.074 F
Dibenzo(a,h)anthracene	0.18 U	0.97 U	9.9 U	0.98 U	1 U	0.024 UM	0.022 UM
Dibenzofuran	0.13 U	0.72 U	15	0.73 U	0.76 U		
Fluoranthene	0.22 F	1.1 UM	210 M	3.9 M	9.1 M	0.35	0.21
Fluorene	0.15 U	0.79 U	22	0.8 U	0.84 U	0.018 UM	0.017 UM
Indeno(1,2,3-cd)pyrene	0.19 U	1 UM	31	1 UM	1.1 UM	0.086	0.052
Naphthalene	0.13 U	0.71 U	7.4	0.72 U	0.75 U	0.4 F	0.086 U
Phenanthrene	0.18 U	0.99 UM	180 M	2.3 M	5.5 M	0.16 F	0.1 F
Pyrene	0.17 F	0.91 UM	110 M	2.1 M	4.9 M	0.29	0.18
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Methylene chloride							
Toluene							
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA	NA
beta-BHC							
Explosives	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-107	DW3-108	DW3-109	DW3-110		DW3-111	DW3-112
Sample Number:	DW3-107-01	DW3-108-01	DW3-109-01	DW3-110-01	DW3-110-04	DW3-111-01	DW3-112-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]					DUP		
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Molybdenum							
Nickel							
Potassium							
Selenium							
Sodium							
Vanadium							
Zinc							
Semivolatiles-(mg/Kg)	DL 50	DL 50	DL 2.0	DL 2.0	DL 10	DL 250	DL 50
Acenaphthene	1.6	1.9	0.032 U	0.23 F	0.46 F	8.7	4.2
Anthracene	0.13 F	0.13 F	0.004	0.0150 F	0.04 F	0.82	0.36 F
Benzo(a)anthracene	0.38	0.4	0.0088 F	0.055	0.11	2.2	1.2
Benzo(a)pyrene	0.4	0.43	0.0099 F	0.057	0.12	2.2	1.3
Benzo(b)fluoranthene	0.38	0.41	0.012	0.058	0.12	2	1.2
Benzo(k)fluoranthene	0.16	0.16	0.0054 F	0.023	0.045	0.84	0.46
Benzo(ghi)perylene	0.28	0.3	0.018 F	0.042 F	0.083	1.5	0.75
Chrysene	0.43	0.44	0.012 F	0.06 F	0.13	2.4	1.2
Dibenzo(a,h)anthracene	0.24 M	0.12 UM	0.0048 UM	0.0048 UM	0.066 M	0.56 UM	0.13 UM
Dibenzofuran							
Fluoranthene	1.4	1.4	0.12 F	0.17	0.39	7.4	3.2
Fluorene	0.097 M	0.088 UM	0.0037 UM	0.0037 UM	0.018 UM	0.42 UM	0.096 UM
Indeno(1,2,3-cd)pyrene	0.27	0.31	0.0082 F	0.18	0.08	1.4	0.86
Naphthalene	1.7	1.9	0.019 U	0.17 F	0.45 F	9.5	3.1
Phenanthrene	0.78	0.8	0.02 F	0.077 F	0.22 F	4.7	1.8
Pyrene	1.1	1.1	0.043 F	0.14 F	0.33	6	2.9
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Methylene chloride							
Toluene							
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA	NA
beta-BHC							
Explosives	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-113	DW3-114	DW3-115			DW3-116
Sample Number:	DW3-113-01	DW3-114-01	DW3-115-01	DW3-115-04	DW3-115-02	DW3-116-01
Depth. (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.0 to 0.5
Parameters[a,b]				DUP		
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Vanadium						
Zinc						
Semivolatiles-(mg/Kg)	DL 50	DL 250	DL 250	DL 50	DL 250	DL 250
Acenaphthene	2.8	24	8.1	5.3	11	20
Anthracene	0.19 F	3	0.61	0.49	1.1	2.1
Benzo(a)anthracene	0.68	6.1	2	1.5	2.8	5.4
Benzo(a)pyrene	0.69	5.6	2.1	1.6	2.8	5
Benzo(b)fluoranthene	0.7	5.1	2	1.5	2.6	4.5
Benzo(k)fluoranthene	0.27	2.1	0.79	0.61	1	1.9
Benzo(ghi)perylene	0.42	3.2	1.3	1	1.8	2.8
Chrysene	0.78	6.5	2.2	1.7	3	5.7
Dibenzo(a,h)anthracene	0.12 UM	0.66 UM	0.59 UM	0.12 UM	0.58 UM	0.58 UM
Dibenzofuran						
Fluoranthene	2.2	22	6.4	0.94	8.6	17
Fluorene	0.089 UM	1.9 M	0.45 UM	0.24 M	0.44 UM	1.2 M
Indeno(1,2,3-cd)pyrene	0.48	3.4	1.5	1.1	1.8	3.1
Naphthalene	3.2	30	8.4	5.5	10	22
Phenanthrene	1.3	18	3.5	0.52	5.5	12
Pyrene	1.8	17	5.2	3.9	7.4	14
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA
Methylene chloride						
Toluene						
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA
beta-BHC						
Explosives	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-117		DW3-118		DW3-119		DW3-120
Sample Number:	DW3-117-01	DW3-117-02	DW3-118-01	DW3-118-02	DW3-119-01	DW3-119-02	DW3-120-01
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5
Parameters[a,b]							
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Molybdenum							
Nickel							
Potassium							
Selenium							
Sodium							
Vanadium							
Zinc							
Semivolatiles-(mg/Kg)	DL 50	DL 5.0	DL 50	DL 5.0	DL 1.0	DL 1.0	DL 1.0
Acenaphthene	6.1	0.071 U	4.7	0.078 U	0.016 U	0.014 U	0.12 F
Anthracene	0.52	0.1 M	0.46	0.057 M	0.026 M	0.0002 UM	0.033 M
Benzo(a)anthracene	1.6	0.11 M	1.2	0.057 M	0.03 M	0.0006 UM	0.038 M
Benzo(a)pyrene	1.8	0.11 M	1.3	0.058 M	0.028 M	0.0008 UM	0.035 M
Benzo(b)fluoranthene	1.7	0.12	1.2	0.059	0.029	0.0007 U	0.035
Benzo(k)fluoranthene	0.66	0.056	0.48	0.024	0.014	0.0025 U	0.02
Benzo(ghi)perylene	1.1	0.074	0.77	0.043 F	0.024 F	0.0018 U	0.03 F
Chrysene	1.8	0.13 M	1.4	0.068 M	0.032 M	0.0016 UM	0.042 M
Dibenzo(a,h)anthracene	0.12 UM	0.011 U	0.13 UM	0.012 U	0.026	0.0022 U	0.0037 U
Dibenzofuran							
Fluoranthene	5.1	0.34 M	3.9	0.18 M	0.084 M	0.0032 UM	0.11 M
Fluorene	0.28 M	0.008 U	0.24 M	0.0091 U	0.0018 U	0.0017 U	0.0028 U
Indeno(1,2,3-cd)pyrene	1.2	0.085 M	0.9	0.048 M	0.021 M	0.0005 UM	0.0081 M
Naphthalene	6	0.042 U	4.9	0.046 U	0.0092 U	0.0085 U	0.014 U
Phenanthrene	2.8	0.19 M	2.3	0.095 M	0.042 M	0.0006 UM	0.056 M
Pyrene	4.2	0.27 M	3.2	0.029 M	0.069 M	0.0033 UM	0.087 M
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Methylene chloride							
Toluene							
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA	NA
beta-BHC							
Explosives	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-120	DW3-121		DW3-122		DW3-123	
Sample Number:	DW3-120-02	DW3-121-01	DW3-121-02	DW3-122-01	DW3-122-02	DW3-123-01	DW3-123-0
Depth (ft bgs):	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]							
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Molybdenum							
Nickel							
Potassium							
Selenium							
Sodium							
Vanadium							
Zinc							
Semivolatiles-(mg/Kg)	DL 1.0	DL 5.0	DL 1.0	DL 1.0	DL 1.0	DL 10	DL 1.0
Acenaphthene	0.015 U	0.076 U	0.015 U	0.015 U	0.016 U	0.51 F	0.016 U
Anthracene	0.0002 UM	0.096 M	0.0061 M	0.045 M	0.0003 UM	0.26 M	0.02 M
Benzo(a)anthracene	0.0007 UM	0.1 M	0.0059 M	0.046 M	0.0007 UM	0.26 M	0.022 M
Benzo(a)pyrene	0.0008 U	0.091 M	0.0051 M	0.043 M	0.0009 UM	0.24 M	0.021 M
Benzo(b)fluoranthene	0.0008 U	0.081	0.0051 F	0.043	0.0008 U	0.22	0.021
Benzo(k)fluoranthene	0.0026 U	0.039	0.0026 U	0.021	0.0028 U	0.11	0.01 F
Benzo(ghi)perylene	0.0019 U	0.062	0.0034 F	0.036 F	0.002 U	0.17	0.015 F
Chrysene	0.0017 UM	0.11 M	0.0057 M	0.052 M	0.0018 UM	0.28 M	0.025 M
Dibenzo(a,h)anthracene	0.0024 U	0.012 U	0.0023 U	0.029	0.0025 U	0.026 U	0.0025 U
Dibenzofuran							
Fluoranthene	0.0034 UM	0.084 M	0.018 M	0.14 M	0.0036 UM	0.76 M	0.069 M
Fluorene	0.0018 U	0.022 F	0.0018 U	0.0075 F	0.0019 U	0.02 U	0.0019 U
Indeno(1,2,3-cd)pyrene	0.0005 UM	0.063 M	0.0023 M	0.032 M	0.0005 UM	0.18 M	0.015 M
Naphthalene	0.0091 U	0.045 U	0.0089 U	0.009 U	0.0095 U	0.1 U	0.0095 U
Phenanthrene	0.003 M	0.2	0.0068 M	0.079 M	0.0006 UM	0.47 M	0.04 M
Pyrene	0.0035 UM	0.23 M	0.016 M	0.11 M	0.0037 UM	0.61 M	0.055 M
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA	NA
Methylene chloride							
Toluene							
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA	NA
beta-BHC							
Explosives	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-124		DW3-125		DW3-126	
Sample Number:	DW3-124-01	DW3-124-02	DW3-125-01	DW3-125-02	DW3-126-01	DW3-126-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]						
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Vanadium						
Zinc						
Semivolatiles-(mg/Kg)	DL 5.0	DL 1.0	DL 1.0	DL 1.0	DL 20	DL 1.0
Acenaphthene	0.078 U	0.015 U	0.016 U	0.015 U	0.27 U	0.015 U
Anthracene	0.21 F	0.0049 M	0.02 M	0.0002 UM	0.17 M	0.0002 UM
Benzo(a)anthracene	0.21 M	0.0043 M	0.024 M	0.0007 UM	0.16 M	0.0006 UM
Benzo(a)pyrene	0.18 M	0.0047 M	0.024 M	0.0008 UM	0.17 M	0.0008 UM
Benzo(b)fluoranthene	0.17	0.006 F	0.024	0.0008 U	0.13	0.0023 F
Benzo(k)fluoranthene	0.092	0.0026 F	0.013	0.0026 U	0.069	0.0025 U
Benzo(ghi)perylene	0.12	0.0019 U	0.03 F	0.0019 U	0.069	0.0018 U
Chrysene	0.22 M	0.0047 M	0.026 M	0.0017 UM	0.18 M	0.0017 UM
Dibenzo(a,h)anthracene	0.012 U	0.0024 U	0.0025 U	0.0024 U	0.041 U	0.0023 U
Dibenzofuran						
Fluoranthene	0.63 M	0.014 M	0.074 M	0.0034 UM	0.52 M	0.0033 UM
Fluorene	0.038 F	0.0018 U	0.0019 U	0.0018 U	0.031 U	0.0017 U
Indeno(1,2,3-cd)pyrene	0.13 M	0.0039 M	0.017 M	0.0005 UM	0.12 M	0.0005 UM
Naphthalene	0.046 U	0.009 U	0.0096 U	0.0091 U	0.16 U	0.0088 U
Phenanthrene	0.42 M	0.0088 M	0.038 M	0.0006 UM	0.38 M	0.0006 UM
Pyrene	0.49 M	0.014 M	0.059 M	0.0035 UM	0.062 UM	0.0034 UM
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA
Methylene chloride						
Toluene						
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA
beta-BHC						
Explosives	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

e - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-127		DW3-128			DW3-129
Sample Number:	DW3-127-01	DW3-127-02	DW3-128-01	DW3-128-04	DW3-128-02	DW3-129-01
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.5	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5
Parameters[a,b]				DUP		
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Vanadium						
Zinc						
Semivolatiles-(mg/Kg)	DL 20	DL 10	DL 10	DL 10	DL 5.0	DL 1.0
Acenaphthene	0.31 U	0.16 U	0.16 UM	0.15 U	0.073 UM	0.016 U
Anthracene	0.005 UM	0.092 M	0.084 F	0.13 F	0.053 F	0.0057 F
Benzo(a)anthracene	0.64 M	0.11 M	0.0066 U	0.15	0.061	0.0057 F
Benzo(a)pyrene	0.017 UM	0.11 M	0.13	0.0085 U	0.054	0.0057 F
Benzo(b)fluoranthene	0.061	0.099	0.13	0.12	0.053	0.0084 F
Benzo(k)fluoranthene	0.053 U	0.047	0.057	0.05	0.022	0.0038 F
Benzo(ghi)perylene	0.24	0.067	0.086 M	0.08	0.039 M	0.0093 M
Chrysene	0.035 UM	0.12 M	0.13	0.17	0.066 F	0.0066 F
Dibenzo(a,h)anthracene	0.048 U	0.025 U	0.024 UM	0.024 UM	0.011 UM	0.016 M
Dibenzofuran						
Fluoranthene	0.069 UM	0.3 M	0.035 U	0.047 F	0.19	0.019 F
Fluorene	0.036 U	0.019 U	0.018 U	0.018 U	0.0085 U	0.0019 U
Indeno(1,2,3-cd)pyrene	0.0099 UM	0.067 M	0.11	0.11	0.044	0.0048 F
Naphthalene	0.18 U	0.094 U	0.092 UM	0.091 UM	0.043 UM	0.0095 UM
Phenanthrene	0.078 M	0.15 M	0.15 F	0.32 F	0.12 F	0.007 F
Pyrene	0.072 UM	0.25 M	0.27	0.37	0.15 F	0.017 F
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA
Methylene chloride						
Toluene						
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA
beta-BHC						
Explosives	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-129		DW3-130		DW3-131	
Sample Number:	DW3-129-02	DW3-130-01	DW3-130-04	DW3-130-02	DW3-131-01	DW3-131-02
Depth (ft bgs):	0.5 to 2.0	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]			DUP			
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Vanadium						
Zinc						
Semivolatiles-(mg/Kg)	DL 1.0	DL 20	DL 20	DL 1.0	DL 1.0	DL 1.0
Acenaphthene	0.016 UM	0.31 UM	0.3 UM	0.016 UM	0.017 UM	0.015 UM
Anthracene	0.0003 U	0.76	0.33 F	0.013 F	0.0003 U	0.0003 U
Benzo(a)anthracene	0.0007 U	0.84	0.4	0.022	0.0072 F	0.0007 U
Benzo(a)pyrene	0.0009 U	0.76	0.43	0.0022 F	0.0063 F	0.0008 U
Benzo(b)fluoranthene	0.0008 U	0.77	0.41	0.022	0.006 F	0.0008 U
Benzo(k)fluoranthene	0.0027 U	0.35	0.19	0.0096 F	0.0031 F	0.0026 U
Benzo(ghi)perylene	0.0019 UM	0.45 M	0.28 M	0.016 M	0.01 M	0.0019 UM
Chrysene	0.0018 U	0.91	0.45	0.022 F	0.0063 F	0.0017 U
Dibenzo(a,h)anthracene	0.0024 UM	0.048 UM	0.047 UM	0.0024 UM	0.0026 UM	0.0024 UM
Dibenzofuran						
Fluoranthene	0.0035 U	2.6	1.1	0.053 F	0.013 F	0.0034 U
Fluorene	0.0018 U	0.15	0.035 U	0.0018 U	0.002 U	0.0018 U
Indeno(1,2,3-cd)pyrene	0.0005 U	0.56	0.31	0.017 F	0.0056 F	0.0005 U
Naphthalene	0.0093 UM	0.18 UM	0.18 UM	0.0092 UM	0.01 UM	0.0091 UM
Phenanthrene	0.0006 U	1.9	0.58	0.027 F	0.0043 F	0.0006 U
Pyrene	0.0036 U	2	0.91	0.052 F	0.022 F	0.0036 U
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA
Methylene chloride						
Toluene						
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA
beta-BHC						
Explosives	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-32. Summary of DW-3 Soil Sample Detected Results

Location:	DW3-132		DW3-133		DW3-134	
Sample Number:	DW3-132-01	DW3-132-02	DW3-133-01	DW3-133-02	DW3-134-01	DW3-134-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 2.0
Parameters[a,b]						
Inorganics-(mg/kg)	NA	NA	NA	NA	NA	NA
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Vanadium						
Zinc						
Semivolatiles-(mg/Kg)	DL 10	DL 1.0	DL 10	DL 1.0	DL 1.0	DL 1.0
Acenaphthene	0.17 UM	0.016 UM	0.17 UM	0.015 UM	0.015 UM	0.016 UM
Anthracene	0.041 F	0.0085 F	0.064 F	0.0002 U	0.0002 U	0.0003 U
Benzo(a)anthracene	0.05	0.012	0.082	0.0006 U	0.0038 F	0.0007 U
Benzo(a)pyrene	0.064	0.012 F	0.09	0.0008 U	0.0035 F	0.0009 U
Benzo(b)fluoranthene	0.041	0.013	0.084	0.0007 U	0.0052 F	0.0008 U
Benzo(k)fluoranthene	0.03 U	0.0052 F	0.037	0.0026 U	0.0031 F	0.0027 U
Benzo(ghi)perylene	0.021 UM	0.0097 M	0.074 M	0.0018 UM	0.0018 UM	0.0019 UM
Chrysene	0.058 F	0.014 F	0.094 F	0.0017 U	0.0029 F	0.0018 U
Dibenzo(a,h)anthracene	0.027 UM	0.0025 UM	0.026 UM	0.0023 UM	0.0023 UM	0.0024 UM
Dibenzofuran						
Fluoranthene	0.16	0.032 F	0.24	0.0033 U	0.0033 U	0.0035 U
Fluorene	0.02 U	0.0019 U	0.019 U	0.0018 U	0.0017 U	0.0018 U
Indeno(1,2,3-cd)pyrene	0.049	0.01 F	0.079	0.0005 U	0.0005 U	0.0005 U
Naphthalene	0.1 UM	0.0095 UM	0.098 UM	0.0089 UM	0.0088 UM	0.0092 UM
Phenanthrene	0.066 F	0.015 F	0.11 F	0.0019 F	0.0033 F	0.0006 U
Pyrene	0.13 F	0.031 F	0.21	0.0035 U	0.0034 U	0.0036 U
Volatiles-(mg/kg)	NA	NA	NA	NA	NA	NA
Methylene chloride						
Toluene						
Pesticides/PCBs-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA	NA
beta-BHC						
Explosives	NA	NA	NA	NA	NA	NA

NA - Not analyzed

ND - Not Detected

DL - Dilution Factor

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at le

Note - Boxed values exceed background UTLs.

Table 3-33. Summary of DW-4 Soil Sample Detected Results

Location:	DW4-001		DW4-002	DW4-100	
Sample Number:	DW4-001-01	DW4-001-20	DW4-002-01	DW4-100-01	DW4-100-02
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.5 to 1.5
Parameters[a,b]					
Inorganics-(mg/kg)				NA	NA
Aluminum	7850 B	9870	14600 B		
Antimony	1.3	1 U	0.91 U		
Arsenic	4.3	3.3	6.5		
Barium	97.4	56.1	123		
Beryllium	0.55	0.48	0.94		
Cadmium	1.4	0.09 U	0.82		
Calcium	239000 B	208000	133000 B		
Chromium	15.1	14.6	15.5		
Cobalt	4.1	2.6	5.2		
Copper	8.6	6.2	8.5		
Iron	7120 B	7890	11400 B		
Lead	71.6	44.8	26.8		
Magnesium	2150 J	2380	2830 J		
Manganese	661	222	589		
Molybdenum	1.2	0.93	0.69		
Nickel	10.7	6.5	11.2		
Potassium	1460	1170	2380		
Selenium	0.75 R	0.84 U	1.6 J		
Sodium	708	1170	649		
Vanadium	19.7	20.2	29.9		
Zinc	80.2	37.2	52.1		
Semivolatiles-(mg/kg)					
Acenaphthene	0.19 F	0.16 F	0.052 U	0.64 U	0.12 U
Anthracene	0.23 F	0.22 F	0.057 U	0.86 U	0.17 U
Benzo(a)anthracene	1.4	1.2	0.06 U	0.93 U	0.18 U
Benzo(a)pyrene	1.3	1.3	0.06 U	0.9 U	0.18 U
Benzo(b)fluoranthene	1.8	1.9	0.11 U	0.8 U	0.16 U
Benzo(ghi)perylene	0.34 F	0.62 F	0.11 U	0.82 U	0.16 U
Chrysene	1.4	1.5	0.062 U	0.79 U	0.15 U
Dibenzo(a,h)anthracene	0.074 F	0.19 U	0.067 U	0.9 U	0.18 U
Fluoranthene	3.8	3.3	0.075 U	0.99 U	0.19 U
Fluorene	0.086 F	0.16 U	0.067 U	0.73 U	0.14 U
Indeno(1,2,3-cd)pyrene	0.52 F	0.91	0.12 U	0.95 U	0.19 U
Phenanthrene	1.8	1.6	0.052 U	0.91 U	0.18 U
Pyrene	2.9	2.4	0.071 U	0.84 U	0.16 U
Volatiles-(mg/kg)		NA		NA	NA
Methylene chloride	0.0047		0.014 R		
Toluene	0.0043 F		0.0091 R		
Pesticides/PCB's-(mg/kg)(DL 4.0)		NA		NA	NA
4,4'-DDE	0.0096 R		0.0038 R		
4,4'-DDT	0.0086 R		0.0042 R		
Explosives	ND	NA	ND	NA	NA

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-33. Summary of DW-4 Soil Sample Detected Results

Location:	DW4-101		DW4-102	
Sample Number:	DW4-101-01	DW4-101-02	DW4-102-01	DW4-102-02
Depth (ft bgs):	0.0 to 0.5	0.5 to 1.25	0.0 to 0.5	0.5 to 1.5
Parameters[a,b]				
Inorganics-(mg/kg)	NA	NA	NA	NA
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Magnesium				
Manganese				
Molybdenum				
Nickel				
Potassium				
Selenium				
Sodium				
Vanadium				
Zinc				
Semivolatiles-(mg/kg)				
Acenaphthene	0.13 U	0.12 U	0.67 U	0.13 U
Anthracene	0.17 U	0.17 U	0.91 U	0.17 U
Benzo(a)anthracene	0.18 U	0.18 U	1.7	0.18 U
Benzo(a)pyrene	0.18 U	0.18 U	1.1	0.18 U
Benzo(b)fluoranthene	0.16 U	0.16 U	1.6	0.16 U
Benzo(ghi)perylene	0.16 U	0.16 U	0.87 U	0.16 U
Chrysene	0.16 U	0.16 U	2.1	0.16 U
Dibenzo(a,h)anthracene	0.18 U	0.18 U	0.94 U	0.18 U
Fluoranthene	0.2 U	0.19 U	4.6	0.2 U
Fluorene	0.14 U	0.14 U	0.77 U	0.14 U
Indeno(1,2,3-cd)pyrene	0.19 U	0.19 U	1 U	0.19 U
Phenanthrene	0.18 U	0.18 U	2.5	0.18 U
Pyrene	0.17 U	0.16 U	3.8	0.17 U
Volatiles-(mg/kg)	NA	NA	NA	NA
Methylene chloride				
Toluene				
Pesticides/PCB's-(mg/kg)(DL 4.0)	NA	NA	NA	NA
4,4'-DDE				
4,4'-DDT				
Explosives	NA	NA	NA	NA

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-33. Summary of DW-4 Soil Sample Detected Results

Location:	DW4-103		DW4-104		
Sample Number:	DW4-103-01	DW4-103-02	DW4-104-01	DW4-104-02	DW4-104-05
Depth (ft bgs):	0.0 to 0.5	0.5 to 2.0	0.0 to 0.5	0.5 to 1.25	0.5 to 1.25
Parameters[a,b]					DUP
Inorganics-(mg/kg)	NA	NA	NA	NA	NA
Aluminum					
Antimony					
Arsenic					
Barium					
Beryllium					
Cadmium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Potassium					
Selenium					
Sodium					
Vanadium					
Zinc					
Semivolatiles-(mg/kg)					
Acenaphthene	0.14 U	0.13 U	0.14 U	0.14 U	0.13 U
Anthracene	0.19 U	0.17 U	0.19 U	0.18 U	0.18 U
Benzo(a)anthracene	0.21 U	0.18 U	0.2 U	0.2 U	0.19 U
Benzo(a)pyrene	0.2 U	0.18 U	0.2 U	0.19 U	0.19 U
Benzo(b)fluoranthene	0.18 U	0.16 U	0.17 U	0.17 U	0.17 U
Benzo(ghi)perylene	0.18 U	0.16 U	0.18 U	0.18 U	0.17 U
Chrysene	0.18 U	0.16 U	0.17 U	0.17 U	0.16 U
Dibenzo(a,h)anthracene	0.2 U	0.18 U	0.2 U	0.19 U	0.19 U
Fluoranthene	0.22 U	0.2 U	0.22 U	0.21 U	0.2 U
Fluorene	0.16 U	0.14 U	0.16 U	0.16 U	0.15 U
Indeno(1,2,3-cd)pyrene	0.21 U	0.19 U	0.21 U	0.2 U	0.2 U
Phenanthrene	0.2 U	0.18 U	0.2 U	0.19 U	0.19 U
Pyrene	0.19 U	0.16 U	0.18 U	0.18 U	0.17 U
Volatiles-(mg/kg)	NA	NA	NA	NA	NA
Methylene chloride					
Toluene					
Pesticides/PCB's-(mg/kg)(DL 4.0)	NA	NA	NA	NA	NA
4,4'-DDE					
4,4'-DDT					
Explosives	NA	NA	NA	NA	NA

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-34. Summary of DW-5 Soil Sample Detected Results

Location:	DW5-001	DW5-002	DW5-003	DW5-004
Sample Number:	DW5-001-01	DW5-002-01	DW5-003-01	DW5-004-01
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]				
Inorganics-(mg/kg)				
Aluminum	17600 B	6670	4060	3050
Antimony	0.9 U	1.3	1	0.84 F
Arsenic	6.8	4	6.9	8.1
Barium	102	97.6	46.5	52.2
Beryllium	0.95	0.64	0.33	0.33
Cadmium	0.78	0.27	0.18	0.22
Calcium	144000 B	180000	280000	291000
Chromium	19.2	9.7	5.3	4.9
Cobalt	5.1	4.1	2.4	3.2
Copper	7.9	8.8	5.9	5
Iron	13100 B	7190	6860	9440
Lead	11.2	10	5.4	6.6
Magnesium	2520 J	1970 J	2190 J	2350 J
Manganese	395	341	347	442
Molybdenum	0.92	2	1.8	2.2
Nickel	11.5	10.3	5.1	5.6
Potassium	3080	1100 J	756 J	679 J
Selenium	0.75 F	0.67 R	0.65 R	0.65 R
Sodium	737	1310	1310	1590
Vanadium	35	32	18.9	24.6
Zinc	55.8	50.1	13	13.4
Semivolatiles-(mg/kg)				
Bis(2-ethylhexyl) phthalate	0.082 U	0.076 U	0.12 F	0.073 U
Volatiles-(mg/kg)				
Methylene chloride	0.0068 R	0.0028	0.0023	0.0023
Toluene	0.0023 R	0.0026 F	0.0011 U	0.0012 U
Pesticides/PCBs	ND	ND	ND	ND
Explosives	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-35. Summary of DW-6 Soil Sample Detected Results

Location:	DW6-001	DW6-002
Sample Number:	DW6-001-01	DW6-002-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]		
Inorganics-(mg/kg)		
Aluminum	11300	10700
Antimony	0.96 F	1.1
Arsenic	5.2	4.9
Barium	86	74.6
Beryllium	0.62	0.63
Cadmium	0.29	0.3
Calcium	194000	143000
Chromium	9.4	10.4
Cobalt	4.2	3.2
Copper	13.7	10.2
Iron	10000	10900
Lead	14.6	13.8
Magnesium	2460 J	2300 J
Manganese	435	298
Molybdenum	0.96	1
Nickel	9.9	9.7
Potassium	1600 J	1590 J
Sodium	1030	1250
Vanadium	23	22.5
Zinc	61.8	42.7
Semivolatiles	ND	ND
Volatiles-(mg/kg)		
Methylene chloride	0.0044	0.0021
Toluene	0.033	0.0014 U
Pesticides/PCBs	ND	ND
Explosives	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-36. Summary of DW-7 Soil Sample Detected Results

Location:	DW7-001	
Sample Number:	DW7-001-01	DW7-001-02
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]		DUP
Inorganics-(mg/kg)		
Aluminum	4400 B	3950 B
Antimony	0.89 F	0.93 F
Arsenic	3.5	3.9
Barium	20.7	17.5
Beryllium	0.38	0.38
Cadmium	0.46	0.47
Calcium	304000 B	304000 B
Chromium	8.3	7.7
Cobalt	1.5	1.1
Copper	3.2	3.3
Iron	5700 B	5950 B
Lead	4.8	4.7
Magnesium	2280 J	2200 J
Manganese	260	249
Molybdenum	2.4	2.8
Nickel	5.1	5
Potassium	1400	1300
Sodium	1100	1080
Vanadium	21.1	21.2
Zinc	20	15.6
Semivolatiles	ND	ND
Volatiles-(mg/kg)		
Methylene chloride	0.0038	0.0023
Toluene	0.018	0.003 F
Pesticides/PCBs	ND	ND
Explosives	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-37. Summary of DW-8 and DW-9 Soil Sample Detected Results

Location:	DW8-001	DW8-002	DW9-001	DW9-002
Sample Number:	DW8-001-01	DW8-002-01	DW9-001-01	DW9-002-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a,b]				
Inorganics-(mg/kg)				
Aluminum	12200 B	12400 B	9100 B	1980
Antimony	0.89 F	1.1 U	0.99 F	2.5
Arsenic	6.2	7.2	7.8	10.5
Barium	39.4	55	51.3	50.3
Beryllium	0.79	0.77	0.61	1.2
Cadmium	0.64	0.64	0.82	0.71
Calcium	204000 B	219000 B	249000 B	185000
Chromium	14.6	14.4	10.9	371
Cobalt	2.8	4.8	3.7	12.2
Copper	5.3	4.2	5.1	64.6
Iron	10700 B	12400 B	9260 B	49100
Lead	13.4	6	8.8	106
Magnesium	2920 J	2680 J	2430 J	1330 J
Manganese	171	250	242	744
Molybdenum	1.5	2.2	1.3	15.3
Nickel	8.3	9.1	7.2	207
Potassium	3660	2120	2470	199 J
Sodium	751	1130	883	852
Vanadium	25.9	31.5	31.1	54.4
Zinc	28.9	26.4	27.1	82.5
Semivolatiles-(mg/kg)	NA	NA	NA	ND
Volatiles-(mg/kg)	NA	NA	NA	
Methylene chloride				0.0023
Toluene				0.0042 F
Pesticides/PCBs	NA	NA	NA	ND
Explosives	ND	ND	ND	ND

NA - Not analyzed.
ND - Not detected.
DL - Dilution factor.
a - See Table 2-10 for data qualifier definitions.
b - Parameters limited to those detected in at least one sample (see Appendix E).
Note - Boxed values exceed background UTLs.

Table 3-38. Summary of Seep Sediment Sample Detected Results

Location:	SP-001		SP-002	SP-003	SP-004
Sample Number:	SP-001-01	SP-001-02	SP-002-01	SP-003-01	SP-004-01
Depth (ft bgs):	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5	0.0 to 0.5
Parameters[a]		DUP			
Inorganics (mg/kg)					
Aluminum	24,100	23,400	3,760	7,790	14,400
Antimony	1.4 U	1.3 U	0.96 U	1.1	1.2 U
Arsenic	6	5.9	4.2	3.7	6.6
Barium	99	89.6	18.4	42.4	44.1
Beryllium	1.1	1.0	0.37	0.45	0.9
Calcium	86,000	75,000	304,000	210,000 B	169,000
Chromium	24	23.1	6.4	9.3	20.8
Cobalt	6.1	5.8	1.1	2	8.6
Copper	10.7	9.8	2.8	3	7.6
Iron	16,900	15,800	6,520	7,450	15,300
Lead	16.3	15.5	3.2	4.2	12.2
Magnesium	3,730	3,520	2,380	1,980	2,970
Manganese	566	535	215	114	159
Molybdenum	0.93	0.95	2.4	3.6	5.6
Nickel	14	13.0	4.2	5.7	10.8
Potassium	3,100	2,940	950	1,180	2,820
Sodium	1,340	1,180	1,410	1,200	1,090
Vanadium	42.8	41	14.2	20.5	33
Zinc	90.1	93.7	19.5	30.4	36.2
Semivolatiles	ND	ND	ND	ND	ND
Volatiles	ND	ND	ND	ND	ND
Pesticides/PCBs	ND	ND	ND	ND	ND
Explosives	ND	ND	ND	ND	ND

Note - Boxed values exceed background surface soil/sediment $UTL_{95,95}$ (derived in [TEC 1998]).

ND - not detected

F - Compound was positively detected below the PQL

U - Compound was analyzed for, but detected below the method detection limit

Table 3-39. Summary of Drainageway Surface Water Sample Detected Results

Location:	DW1-002	DW5-004	DW9-003
Sample Number:	DW1-002-10	DW5-004-10	DW9-003-10
Parameters[a]			
Inorganics (mg/L)			
Aluminum	0.11	0.072	0.068
Barium	0.055	0.044	0.048
Calcium	133	90.9	73.7
Copper	0.0037 F	0.0035 U	0.0035 U
Iron	0.06	0.045 U	0.045 UM
Magnesium	9.8	2.3	4.1
Manganese	0.0015 U	0.0016 F	0.0015 U
Molybdenum	0.003 U	0.02	0.003 U
Potassium	1.3	0.71	1.9
Sodium	33.8	8	8.8
Zinc	0.023	0.0057 F	0.0025 U
Semivolatiles	ND	ND	ND
Volatile Organics	ND	ND	ND
Pesticides/PCBs	ND	ND	ND
Explosives	ND	ND	ND

Note - Boxed values exceed background surface water $UTL_{95,95}$.

ND - not detected

F - Compound was positively detected below the PQL

U - Compound was analyzed for, but detected below the method detection limit

[a]Parameters limited to those detected in at least one sample.

Table 3-40. Summary of Seep Surface Water Sample Detected Results

Location:	SP-001			SP-002			SP-003		SP-004	
Sample Number:	SP-001-10	SP-001-03[b]	SP-001-04[b]	SP-002-10	SP-002-12	SP-002-03[b]	SP-003-10	SP-003-03[b]	SP-004-10	SP-004-03[b]
Parameters[a]					DUP					
Inorganics (mg/L)		NA	NA			NA		NA		NA
Aluminum	0.12			0.16	0.12		0.078		0.12	
Barium	0.063			0.073	0.048		0.04		0.068	
Calcium	113			66.5	60.2		54.8		132	
Copper	0.0048 F			0.0035 U	$\boxed{0.013}$		0.0035 U		0.0035 U	
Iron	0.045 F			0.084	0.052		0.16		0.12	
Magnesium	5.3			2.8	2.7		2.6		5.4	
Manganese	0.007			0.0071	0.0043 F		0.0043 F		0.014	
Molybdenum	0.003 U			0.003 U	0.003 U		0.019		0.003 U	
Nickel	0.005 U			0.005 U	$\boxed{0.0064}$		0.005 U		0.005 U	
Potassium	1.8			1.2	1.1		2.2		2.7	
Sodium	19.4			12.5	11.8		7.2		6.2	
Zinc	0.026			0.0083 F	0.063		0.004 F		0.14	
Semivolatiles	ND	NA	NA	ND	ND	NA	ND	NA	ND	NA
Volatile Organics (ug/L)										
Chloroform	0.1 U	NA	NA	0.1 U	0.1 U	NA	$\boxed{0.3}$	NA	0.1 U	NA
Pesticides/PCBs	ND	NA	NA	ND	ND	NA	ND	NA	ND	NA
Explosives	R	ND	ND	R	R	ND	R	ND	R	ND

Note - Boxed values exceed background surface water $UTL_{95,95}$.

ND - not detected

F - Compound was positively detected below the PQL

R - Data Rejected

U - Compound was analyzed for, but detected below the method detection limit

[a]Parameters limited to those detected in at least one sample.

[b] These samples were reanalyzed during the May 1998 sampling event, because the original results (Feb 1998) for the explosives analyses were rejected during data validation.

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Table 3-41. Summary of Groundwater Quality Field Parameter Measurements

Location Description	Location Number	Purge Volume (gallons)	Temperature (°C)	pH	Electrical Conductivity (mmho/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)
Primary Water Supply Well	XU-32-12-902	27	22.4	7.5	630	5	9.8
Backup Water Supply Well	XU-32-901	22	22.1	7.5	626	<1	10.0
Upgradient Background Well	WJEPX925	10.8	22.4	7.4	513	4	8.1

Table 3-42. Summary of Paluxy Aquifer Groundwater Sampling Detected Results

Location:	XU-32-12-901	XU-32-12-902	
Sample Number:	XU-32-12-901-01	XU-32-12-902-01	XU-32-12-902-02
Parameters[a,b]			Duplicate
Inorganics-(mg/L)			
Aluminum	0.07 B	0.07 B	0.078 B
Barium	0.059	0.061	0.061
Calcium	68.8 B	70.1 B	67.8 B
Copper	0.0035 U	0.014	0.012
Iron	0.41	1.2	1.1
Lead	0.0035 U	0.0037 F	0.0035 U
Magnesium	23.3	23.3	23
Manganese	0.022	0.025	0.024
Molybdenum	0.0032 F	0.003 U	0.003 U
Potassium	4.5	4.5	4.6
Sodium	30.7	31.2	31.2
Zinc	0.032	0.03	0.029
Semivolatiles	ND	ND	ND
Volatiles	ND	ND	ND
Pesticides/PCBs	ND	ND	ND
Explosives	ND	ND	ND

NA - Not analyzed.

ND - Not detected.

a - See Table 2-10 for data qualifier definitions.

b - Parameters limited to those detected in at least one sample (see Appendix E).

Note: Boxed values exceed background UTL $_{95,95}$.

Table 3-43. Summary of Asbestos Survey Results

Building Number	Homogeneous Area Identification Number	Number of Samples	Material Type	Quantity of ACM[1]	Lab Results	Friable/ Nonfriable[2]	Cond.[3]	Comments
8503	503-MSC-03	3	Floor Tile	575 SF	Negative	N	GC	Mastic is visible through the cracks between the floor tiles
8503	503-MSC-04	3	Ceiling Tile	1350 SF	Negative	F	D	Water damage, some tiles falling out
8503	503-MSC-05	3	Ceiling Tile	1350 SF	Negative	F	D	
8503	503-MSC-06	2	Roofing Felt	6900 SF	Negative	N	GC	One duplicate sample taken as part of this Homogeneous Area
8503	503-MSC-07	1	Roofing Mesh	75 SF	Negative	N	GC	
8503	503-MSC-08	2	Roof Shingle	75 SF	Negative	N	GC	One duplicate sample taken as part of this Homogeneous Area
8503	503-MSC-09	2	Roof Sealant	75 SF	Positive	N	GC	
8503	503-SFC-01	3	Plaster	60 SF	Negative	N	D	Plaster is approximately 1/2" thick
8503	503-TSI-01	3	Aircell TSI	150 LF	Positive	F	D	
8503	503-TSI-02	3	Fitting TSI	10 EA	Positive	F	D	
8504	504-MSC-01	1	Roofing Felt	78 SF	Negative	N	GC	
8504	504-TSI-01	1	Fitting TSI	1 EA	Negative	F	SD	
8505	505-MSC-01	1	Roofing Felt	1400 SF	Negative	N	GC	
8505	505-MSC-02	1	Roof Sealant	85 SF	Positive	N	GC	
8505	505-TSI-01	3	Preformed TSI	7 SF	Negative	F	SD	
8505	505-TSI-02	3	Fitting TSI	2 EA	Negative	F	SD	
8505	505-TSI-03	3	Aircell TSI	30 LF	Positive	F	SD	

[1] Quantity: SF - square feet, LF - linear feet, EA - each.
[2] N -Non Friable , F - Friable
[3] Condition: GC - Good condition, D - Damaged, SD - Significantly Damaged

Note - Boxed sample for positive asbestos results.

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Table 3-43. Summary of Asbestos Survey Results

Building Number	Homogeneous Area Identification Number	Number of Samples	Material Type	Quantity of ACM[1]	Lab Results	Friable/ Nonfriable[2]	Cond.[3]	Comments
8500	500-MSC-01	3	Floor Tile	330 SF	Positive	N	GC	
8500	500-MSC-02	3	Ceiling Tile	180 SF	Negative	F	D	
8500	500-MSC-03	3	Ceiling Tile	45 SF	Negative	F	D	
8500	500-MSC-04	3	Ceiling Tile	75 SF	Negative	F	GC	
8500	500-MSC-05	1	Floor Tile	83 SF	Positive	N		Condition is unknown because the material is underneath floor tile.
8500	500-MSC-06	3	Gypsum Board	160 SF	Negative	F	D	
8500	500-MSC-07	1	Ceiling Tile	5 SF	Negative	F	GC	
8500	500-MSC-08	1	Roofing Felt	932 SF	Negative	N	GC	
8500	500-MSC-09	1	Roof Sealant	5 SF	Negative	F	GC	
8500	500-SFC-01	3	Plaster	250 SF	Negative	N	D	
8500	500-TSI-01	3	Aircell TSI	10 LF	Positive	F	D	
8502	502-MSC-01	1	Pipe Gasket	1 EA	Negative	N	SD	
8502	502-MSC-02	1	Roofing Felt	75 SF	Positive	N	GC	
8502	502-TSI-01	4	Fitting TSI	6 EA	Negative	F	D	One duplicate sample taken as part of this Homogeneous Area.
8502	502-TSI-02	1	Aircell TSI	5 LF	Positive	F	D	
8503	503-MSC-01	3	Floor Tile	165 SF	Negative	N	GC	
8503	503-MSC-02	3	Floor Tile	500 SF	Negative	N	GC	

[1] Quantity: SF - square feet, LF - linear feet, EA - each.
[2] N -Non Friable , F - Friable
[3] Condition: GC - Good condition, D - Damaged, SD - Significantly Damaged
Note - Boxed sample for positive asbestos results.

Table 3-43. Summary of Asbestos Survey Results

Building Number	Homogeneous Area Identification Number	Number of Samples	Material Type	Quantity of ACM[1]	Lab Results	Friable/ Nonfriable[2]	Cond.[3]	Comments
8506	506-MSC-01	0	Transite	4500 SF	Positive	N	GC	No sample taken, assumed asbestos
8507	507-MSC-01	2	Duct cloth	10 SF	Positive	N	GC	One duplicate sample taken as part of this homogeneous area.
8507	507-MSC-02	3	Floor Tile	450 SF	Positive	N	GC	
8507	507-MSC-03	1	Roofing Felt	2500 SF	Negative	N	GC	
8507	507-MSC-04	1	Roof Sealant	10 SF	Positive	N	GC	
8508	508-MSC-01	1	Roofing Felt	350 SF	Negative	N	GC	
8509	509-MSC-01	1	Roofing Felt	540 SF	Positive	N	GC	
8509	509-MSC-02	1	Roof Sealant	10 SF	Negative	N	GC	
8511	511-MSC-01	1	Roofing Felt	126 SF	Positive	N	GC	
8514	514-MSC-01	1	Roofing Tar	2600 SF	Negative	N	GC	
8514	514-TSI-01	3	Aircell TSI	40 LF	Positive	F	D	
8514	514-TSI-02	4	Preformed TSI	20 LF	Positive	F	D	One duplicate sample taken as part of this homogeneous area.
8514	514-TSI-03	3	Fitting TSI	8 EA	Negative	F	D	
8533	533-MSC-01	1	Insulation	5 LF	Negative	F	D	

[1] Quantity: SF - square feet, LF - linear feet, EA - each.
[2] N -Non Friable , F - Friable
[3] Condition: GC - Good condition, D - Damaged, SD - Significantly Damaged
Note - Boxed sample for positive asbestos results.

Table 3-44. LBP Sample Summary

Facility Number	Sample Number	Paint Color	Building Component	Paint Condition	Area (SF)	Lab Results (ppm)
8500	STP-500-01	White	Door	Fair	42	66500
8500	STP-500-02	Tan	Wall	Poor	1200	65400
8500	STP-500-03	Brown	Window frame	Intact	20	3280
8500	STP-500-04	Brown	Windowsill	Fair	20	3850
8500	STP-500-05	White	Window sash	Fair	20	1090
8500	STP-500-06	White	Wall	Intact	900	1210
8500	STP-500-07	Brwn/Tan	Glass window	Poor	38	3110
8500	STP-500-08	Brown	Door	Intact	126	451
8500	STP-500-09	Brown	Wall	Intact	210	1450
8501	STP-501-01	Tan	Watertower	Poor	5000	219000
8502	STP-502-01	Brown	Door Jamb	Fair	24	24500
8502	STP-502-02	White	Door	Poor	64	28600
8502	STP-502-03	Tan	Wall	Fair	448	255
8503	STP-503-01	Tan	Wall	Fair	4650	1510
8503	STP-503-02	Lt. Blue	Wall	Intact	478	538
8503	STP-503-03	White	Wall	Intact	1092	547
8503	STP-503-04	White	Wall	Intact	0	381
8503	STP-503-05	Brown	Metal Door	Intact	96	1240
8503	STP-503-06	Brown	Inside Door	Intact	96	11000
8503	STP-503-07	White	Interior Wall	Intact	2160	220
8503	STP-503-08	White	Ceiling	Poor	1200	1000
8503	STP-503-09	Beige	Wall	Fair	2080	520
8503	STP-503-10	Beige	Steel Beam	Intact	240	81500
8504	STP-504-01	Tan	Walls	Poor	280	1010
8504	STP-504-02	White	Metal Door	Fair	42	42100
8505	STP-505-01	White	Door	Poor	170	1040
8505	STP-505-02	Tan	Wall	Fair	1860	15800
8505	STP-505-03	White	Wall	Intact	2250	3110
8505	STP-505-04	White	On AHU	Poor	160	1700
8505	STP-505-05	White	On AHU	Poor	160	1700
8506	STP-506-01	Whtie	Metal overhead Door	Poor	300	48700
8506	STP-506-02	Tan	Wall	Poor	4200	616
8506	STP-506-03	Drk. Brown	Back of front door	Fair	64	1520
8506	STP-506-04	Yellow	Safety paint on ramp.	Poor	200	163000
8506	STP-506-05	White	Metal overhead door	Poor	300	37000
8506	STP-506-06	Brn/Tan	Front of loading dock	Poor	300	86700
8507	STP-507-01	White	Metal overhead door	Fair	130	896
8507	STP-507-02	Tan	Wall	Poor	4000	601
8507	STP-507-03	Yellow	Wall	Intact	1312	2790
8507	STP-507-04	Drk. Green	Door	Fair	64	3420
8507	STP-507-05	Black	Floor molding	Fair	750	34800
8507	STP-507-06	White	HVAC duct	Intact	1700	3850
8507	STP-507-07	Lt. Blue	Wall	Intact	700	1440
8507	STP-507-08	Red	Steel beams	Intact	20	29300
8508	STP-508-01	Tan	Wall	Poor	1120	86.5
8508	STP-508-02	White	Metal door	Poor	42	23000
8508	STP-508-03	Gray	Metal door	Poor	60	18900
8508	STP-508-04	Tan	Handrail	Poor	10	43400
8509	STP-509-01	Olive Drab	Door	Poor	168	31500
8509	STP-509-02	White	Door	Poor	168	2960

Table 3-44. LBP Sample Summary, cont'd.

Facility Number	Sample Number	Paint Color	Building Component	Paint Condition	Area (SF)	Lab Results (ppm)
8509	STP-509-03	Tan	Wall	Poor	1050	1180
8509	STP-509-04	Off-White	Upper Facia	Fair	31	706
8511	STP-511-01	Off-White	Door	Fair	43	13600
8511	STP-511-02	Olive Green	Metal door	Fair	43	2830
8511	STP-511-03	Tan	Wall	Poor	290	53.4
8511	STP-511-04	Olive Green	Metal door	Fair	43	5220
8512	STP-512-01	Red	Column	Intact	200	1360
8512	STP-512-02	White	Wall	Intact	320	6280
8514	STP-514-01	Tan	Wall	Poor	1660	255
8514	STP-514-02	Tan	Stair rail	Poor	800	38700
8514	STP-514-03	White	Overhead door frame	Fair	350	4950
8514	STP-514-04	White	Overhead door	Fair	100	18300
8514	STP-514-05	Lt. Blue	Wall (upper)	Poor	200	1980
8514	STP-514-06	Creme	Wall (upper)	Poor	180	1680
8514	STP-514-07	Black	Door frame	Intact	25	2790
8514	STP-514-08	Black	Floor molding	Fair	50	73300
8514	STP-514-09	Black	Floor molding	Fair	50	71600
8514	STP-514-10	White	Wall	Poor	180	6530
8514	STP-514-11	Drk. Blue	Stripe in middle of wall	Fair	23	13200
8514	STP-514-12	Brown	Mechanical room door	Fair	42	7510
8514	STP-514-13	Black	Door	Intact	25	1960
8514	STP-514-14	Yellow	Ramp	Poor	820	103000
8514	STP-514-15	White	Soffit	Intact	85	293
8531	STP-531-01	Drk. Pink	Metal swinging door	Poor	125	41500
8531	STP-531-02	Black	Metal swinging door	Fair	21	11700
8531	STP-531-03	White	Metal door frame	Fair	10	65400
8531	STP-531-04	Drk. Pink	Metal door frame	Fair	10	119000
8531	STP-531-05	White	Walls	Fair	1000	805
8531	STP-531-06	Drk. Pink	Lower walls	Fair	700	211
8531	STP-531-07	Gray	Back of door	Poor	21	22600
8531	STP-531-08	Gray	Back of door	Poor	21	21500
8533	STP-533-01	Drk. Pink	Metal swinging door	Poor	125	66500
8533	STP-533-02	Drk. Pink	Wall	Fair	700	2070
8533	STP-533-03	White	Wall	Fair	1000	164
8535	STP-535-01	Drk. Pink	Metal overhead door	Poor	125	29600
8537	STP-537-01	Drk. Pink	Metal overhead door	Poor	125	2730
8539	STP-539-01	Drk. Pink	Metal overhead door	Poor	125	3090
8541	STP-541-01	Drk. Pink	Metal overhead door	Poor	125	2500
8552	STP-552-01	Drk. Pink	Metal door	Poor	125	12000
8554	STP-554-01	Drk. Pink	Metal door	Poor	125	3050
8554	STP-554-02	Silver	Door frame	Poor	20	271000
8554	STP-554-03	Silver	Door frame	Poor	20	261000
8556	STP-556-01	Drk. Pink	Metal overhead door	Fair	125	3890
8558	STP-558-01	Drk. Pink	Metal door	Poor	125	4560
8560	STP-560-01	Drk. Pink	Metal door	Poor	125	2670

Table 3-45. Facility Surface Contamination Sampling Results

Building Number:	8503					
Sample Number:	STI/STE-503-01	STI/STE-503-02	STI/STE-503-03	STI/STE-503-04	STI/STE-503-05	STI/STE-503-06
Parameters						
Inorganics-(mg/ft²)[a]						
Aluminum	3.4	0.4	0.675	0.095	2.725	1.025
Antimony	0.0025	0.00675	0.01025	0.00925	0.00775	0.01425
Arsenic	0.00675	0.00055	0.00245	0.000575	0.01	0.002375
Barium	0.1325	0.045	0.022	0.00575	0.15	0.02325
Beryllium	0.000245	0.0001 U	0.0000275	0.0001 U	0.0000675	0.0001 U
Cadmium	0.01125	0.003	0.00775	0.006	0.0205	0.00375
Calcium	98	2.875	5.35	0.625	37	2.2
Chromium	0.1325	0.12	0.0525	0.019	0.1675	0.1925
Cobalt	0.00525	0.0017	0.00065	0.0001225	0.00275	0.001575
Copper	0.075	0.00575	0.0195	0.0021	0.0475	0.0145
Iron	15.25	0.7	1.1	0.145	6	3.05
Lead	0.19	0.035	0.0145	0.0035	0.1075	0.02375
Magnesium	1.625	0.13	0.425	0.0425	0.75	0.13
Manganese	0.205	0.01075	0.01975	0.0023	0.08	0.023
Mercury	0.001425	0.001675	0.00105	0.00025	0.002425	0.0012
Molybdenum	0.0215	0.0045	0.004	0.001125	0.00975	0.0075
Nickel	0.01425	0.00105	0.00475	0.00045	0.00725	0.0045
Potassium	12.65	0.2125	0.55	0.07	5.25	0.25
Selenium	0.00045 U	0.00045 U	0.0002	0.00045 U	0.00045 U	0.00045 U
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Sodium	9.975	0.45	1.15	0.75	2.425	0.675
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.011	0.000625	0.001175	0.0000925	0.0055	0.000875
Zinc	3.225	0.2275	0.1675	0.045	1.4	0.325
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	1.625	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

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Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8503		8506			8507
Sample Number:	STI/STE-503-07	STI/STE-503-08	STI/STE-506-01	STI/STE-506-02	STI/STE-506-03	STI/STE-507-01
Parameters					Dupe of 506-01	
Inorganics-(mg/ft²)[a]						
Aluminum	2.7	0.35	1.35	0.25	1.7	1.625
Antimony	0.007	0.00825	0.00825	0.01275	0.012	0.0035
Arsenic	0.0075	0.000575	0.0023	0.000525	0.00235	0.004
Barium	0.205	0.25	0.03	0.0045	0.0235	0.035
Beryllium	0.0001225	0.0001 U	0.0000775	0.0001 U	0.00008	0.0000775
Cadmium	0.03	0.0115	0.008	0.005	0.007	0.004
Calcium	31.25	5.35	13.1	3.55	13.65	14.7
Chromium	0.085	0.013	0.775	0.01125	1.65	0.0195
Cobalt	0.00375	0.00035	0.0025	0.000275	0.00425	0.00275
Copper	0.525	0.01825	0.0155	0.00105	0.015	0.03
Iron	22.625	0.65	2.3	0.2025	2.35	2.3
Lead	0.3	0.03	3.85	0.055	7.475	0.12
Magnesium	1.325	0.1475	0.6	0.065	0.675	0.625
Manganese	0.12	0.007	0.0525	0.00725	0.05	0.055
Mercury	0.001575	0.00085	0.0000825	0.00004 U	0.0000825	0.001275
Molybdenum	0.0045	0.00135	0.0018	0.001225	0.001975	0.001075
Nickel	0.0115	0.000775	0.0035	0.00024	0.00375	0.00275
Potassium	1.6	0.2325	6.975	0.105	7.025	2.325
Selenium	0.0003	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.0001975
Silver	0.006	0.00045	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Sodium	1.4	0.425	2.525	0.325	1.95	1.05
Thallium	0.0003	0.00053 U	0.00035	0.00053 U	0.000725	0.00053 U
Vanadium	0.006	0.0007	0.00525	0.0006	0.00675	0.004
Zinc	1.25	0.185	0.25	0.0375	0.625	0.35
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8507			8508		8509
Sample Number:	STI/STE-507-02	STI/STE-507-03	STI/STE-507-04	STI/STE-508-01	STI/STE-508-02	STI/STE-509-01
Parameters						
Inorganics-(mg/ft^2)[a]						
Aluminum	0.11	1.225	0.3	3.25	0.375	2.6
Antimony	0.00775	0.0055	0.0085	0.00055	0.01275	0.005
Arsenic	0.0003	0.0045	0.00042 U	0.005	0.0003	0.00245
Barium	0.0025	0.0325	0.0019	0.065	0.004	0.028
Beryllium	0.0001 U	0.0001525	0.0001 U	0.0001975	0.000025 U	0.000145
Cadmium	0.0006	0.0055	0.000425	0.004	0.0001975	0.0034
Calcium	1.925	26	0.9	47.25	6.575	25.05
Chromium	0.0045	0.019	0.001625	0.01975	0.002225	0.019
Cobalt	0.004	0.0024	0.000575	0.00325	0.0000925	0.0025
Copper	0.003	0.035	0.0018	0.0825	0.0015	0.0275
Iron	0.1125	1.55	0.055	10.6	0.25	4.4
Lead	0.00925	0.14	0.0035	0.875	0.00375	0.055
Magnesium	0.06	0.8	0.04	1.25	0.155	1.05
Manganese	0.00725	0.055	0.001825	0.18	0.01025	0.09
Mercury	0.001575	0.0019	0.0002175	0.000775	0.0000125	0.000235
Molybdenum	0.0005	0.0023	0.000225	0.00145	0.0002425	0.00085
Nickel	0.00021	0.01	0.00013	0.01325	0.000275	0.005
Potassium	0.105	1.6	0.045	4.25	1.375	10.8
Selenium	0.00045 U	0.000675	0.00045 U	0.00023	0.00045 U	0.00045 U
Silver	0.0002 U	0.000475	0.0002 U	0.000115	0.0002 U	0.0002 U
Sodium	0.4	1.3	0.4	1.75	1.625	2.4
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.000145	0.00375	0.000195	0.00925	0.001	0.007
Zinc	0.0225	0.235	0.025	1.1	0.01275	0.18
Semivolatiles-(mg/ft^2)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft^2)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft^2.

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Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8509					
Sample Number:	STI/STE-509-02	STI/STE-509-03	STI/STE-509-04	STI/STE-509-05	STI/STE-509-06	STI/STE-509-07
Parameters						
Inorganics-(mg/ft²)[a]						
Aluminum	0.85	2.55	1.15	2.3	0.65	2.2
Antimony	0.006	0.0044	0.0065	0.00485	0.007	0.0044
Arsenic	0.0006	0.0023	0.0014	0.00175	0.00042 U	0.0015
Barium	0.013	0.0325	0.012	0.0305	0.0055	0.0235
Beryllium	0.00005	0.00016	0.0001 U	0.00014	0.0001 U	0.000135
Cadmium	0.00045	0.00355	0.0009	0.00245	0.000165	0.0014
Calcium	12.45	25.65	15.3	23.2	9.3	24.55
Chromium	0.0044	0.0085	0.0055	0.0085	0.0022	0.0075
Cobalt	0.0014	0.00155	0.001	0.0013	0.00095	0.00125
Copper	0.00335	0.0285	0.0115	0.026	0.0013	0.024
Iron	0.75	4.3	1.25	3.15	0.5	3.2
Lead	0.018	0.029	0.0125	0.0205	0.005	0.0165
Magnesium	0.235	1.1	0.275	0.95	0.15	0.95
Manganese	0.026	0.095	0.0365	0.08	0.0195	0.085
Mercury	0.00014	0.00004 U	0.00004 U	0.000095	0.00004 U	0.00004 U
Molybdenum	0.00036	0.0012	0.0004	0.00075	0.000155	0.0006
Nickel	0.0007	0.005	0.00125	0.00405	0.000335	0.0045
Potassium	0.385	11.3	0.285	9.3	0.185	7.7
Selenium	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.00045 U
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Sodium	0.65	2.45	0.6	2.35	0.6	1.7
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.0015	0.007	0.00205	0.006	0.0012	0.006
Zinc	0.0385	0.15	0.038	0.13	0.02	0.095
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.
ND - Not detected.
U - Undetected by the laboratory. Detectable limits are shown.
$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8509					
Sample Number:	STI/STE-509-08	STI/STE-509-09	STI/STE-509-10	STI/STE-509-11	STI/STE-509-12	STI/STE-509-13
Parameters		Dupe of 509-08				
Inorganics-(mg/ft²)[a]						
Aluminum	1.4	0.7	3.35	1.05	3.75	0.9
Antimony	0.00495	0.006	0.00355	0.005	0.0065	0.0055
Arsenic	0.0006	0.00042 U	0.0036	0.00055	0.0028	0.00042 U
Barium	0.0215	0.006	0.055	0.25	0.044	0.008
Beryllium	0.00007	0.0001 U	0.00019	0.000065	0.000185	0.0001 U
Cadmium	0.00019	0.00015	0.0044	0.00035	0.0038	0.000315
Calcium	18.7	10.1	58.5	14.75	55	13.4
Chromium	0.0036	0.0021	0.0195	0.007	0.0155	0.0029
Cobalt	0.00065	0.000155	0.0025	0.0021	0.0024	0.001
Copper	0.00275	0.00205	0.0405	0.0038	0.047	0.00285
Iron	1.1	0.55	7.35	1.05	7.75	0.85
Lead	0.008	0.00455	0.08	0.0285	0.05	0.005
Magnesium	0.335	0.16	1.65	0.285	1.7	0.25
Manganese	0.0405	0.023	0.135	0.035	0.165	0.0305
Mercury	0.00004 U	0.00004 U	0.000215	0.00004 U	0.000205	0.00004 U
Molybdenum	0.000355	0.0002 U	0.005	0.0017	0.00125	0.001
Nickel	0.00095	0.00027	0.0085	0.0013	0.0085	0.0008
Potassium	0.395	0.195	26.25	0.42	12	0.43
Selenium	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.000225	0.00045 U
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001	0.0002 U
Sodium	0.7	0.6	3.6	0.7	2.5	0.6
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.000265	0.00053 U
Vanadium	0.0025	0.0015	0.0085	0.002	0.009	0.0017
Zinc	0.0365	0.0165	0.21	0.0395	0.24	0.024
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a]- Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

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Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8511	8512			8514	
Sample Number:	STI/STE-511-02	STI/STE-512-01	STI/STE-512-02	STS-512-03	STI/STE-514-01	STI/STE-514-02
Parameters						
Inorganics-(mg/ft²)[a]				NA		
Aluminum	0.47	0.4	0.11		3.45	0.255
Antimony	0.0048	0.0005 U	0.0075		0.0016	0.000465
Arsenic	0.00042 U	0.00042 U	0.00042 U		0.006	0.000375
Barium	0.006	0.027	0.013		0.07	0.175
Beryllium	0.0001 U	0.0001 U	0.0001 U		0.0002	0.0001 U
Cadmium	0.000165	0.0005	0.000285		0.015	0.006
Calcium	6.35	3.4	0.8		80	4.25
Chromium	0.00165	0.00455	0.0215		0.09	0.0075
Cobalt	0.00012	0.0001 U	0.0001 U		0.008	0.00025
Copper	0.00345	0.00245	0.002		0.085	0.009
Iron	0.6	0.5	0.17		12.55	0.32
Lead	0.0165	0.0025	0.0445		0.235	0.014
Magnesium	0.115	0.175	0.0495		2.05	0.185
Manganese	0.015	0.055	0.00265		0.205	0.0095
Mercury	0.00004 U	0.00004 U	0.00004 U		0.00025	0.000185
Molybdenum	0.00017	0.00039	0.00015		0.019	0.006
Nickel	0.0006	0.0006	0.00016 U		0.012	0.00055
Potassium	0.195	0.095	0.12		12.25	0.14
Selenium	0.00045 U	0.00045 U	0.00045 U		0.00045 U	0.00045 U
Silver	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U
Sodium	0.6	1.05	0.9		8.05	1.4
Thallium	0.00053 U	0.00053 U	0.00053 U		0.00053 U	0.00053 U
Vanadium	0.00115	0.00095	0.00027		0.01	0.000365
Zinc	0.0365	0.08	0.055		1.7	0.09
Semivolatiles-(mg/ft²)	NA	ND	ND	ND	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	NA	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

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Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8509				8511
Sample Number:	STI/STE-509-14	STI/STE-509-15	STI/STE-509-16	STI/STE-509-17	STI/STE-511-01
Parameters					
Inorganics-(mg/ft²)[a]					
Aluminum	1.8	0.49	2.4	0.22	3.5
Antimony	0.00495	0.0085	0.0055	0.0105	0.00335
Arsenic	0.0017	0.00042 U	0.00175	0.00042 U	0.009
Barium	0.0325	0.315	0.0205	0.0033	0.08
Beryllium	0.00012	0.0001 U	0.00009	0.0001 U	0.00025
Cadmium	0.005	0.000495	0.00195	0.000265	0.0025
Calcium	29	7.35	23.3	2.9	57.5
Chromium	0.0095	0.00205	0.008	0.0022	0.016
Cobalt	0.00155	0.00055	0.0011	0.0001 U	0.004
Copper	0.0305	0.00235	0.021	0.0014	0.075
Iron	3.95	0.41	3.4	0.2	18.7
Lead	0.06	0.0075	0.021	0.0075	0.155
Magnesium	1	0.16	0.9	0.065	1.8
Manganese	0.11	0.055	0.08	0.0065	0.21
Mercury	0.00026	0.00013	0.00004 U	0.00004 U	0.000415
Molybdenum	0.0013	0.00036	0.00095	0.00055	0.0014
Nickel	0.005	0.00016 U	0.00395	0.00016 U	0.0125
Potassium	9.7	0.17	8.2	0.09	10.1
Selenium	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.00045 U
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Sodium	3.1	0.6	1.75	0.55	2.05
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.005	0.001	0.006	0.000455	0.01
Zinc	0.2	0.02	0.12	0.021	0.7
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)					
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.
ND - Not detected.
U - Undetected by the laboratory. Detectable limits are shown.
$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8514				
Sample Number:	STI/STE-514-03	STI/STE-514-04	STI/STE-514-05	STI/STE-514-06	STI/STE-514-07
Parameters					
Inorganics-(mg/ft²)[a]					
Aluminum	7.05	0.355	2.7	0.6	3.8
Antimony	0.006	0.0027	0.0018	0.0005 U	0.0016
Arsenic	0.013	0.0006	0.00385	0.000455	0.0185
Barium	0.135	0.0095	0.09	0.08	0.17
Beryllium	0.00041	0.0001 U	0.000295	0.0001 U	0.00021
Cadmium	0.0345	0.00155	0.0215	0.00047	0.02
Calcium	106	6	87	11.05	61.5
Chromium	0.6	0.175	0.165	0.008	0.1
Cobalt	0.0095	0.0013	0.005	0.00033	0.012
Copper	0.31	0.0105	0.075	0.005	0.395
Iron	20.35	0.455	9.65	0.9	143
Lead	0.75	0.36	0.5	0.0205	0.37
Magnesium	3.45	0.25	1.8	0.335	2.35
Manganese	0.32	0.015	0.215	0.023	0.6
Mercury	0.0005	0.00004 U	0.00095	0.00004 U	0.0008
Molybdenum	0.0041	0.0055	0.0075	0.0008	0.007
Nickel	0.024	0.00065	0.013	0.00125	0.115
Potassium	26	0.335	10.3	0.33	16.3
Selenium	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.0005
Silver	0.00033	0.0002 U	0.001	0.0002 U	0.00075
Sodium	16.9	1.7	5.95	1.35	8.8
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00075
Vanadium	0.0195	0.0009	0.007	0.0009	0.02
Zinc	4.05	0.2	1.7	0.075	2.85
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)					
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.
ND - Not detected.
U - Undetected by the laboratory. Detectable limits are shown.
$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8514				8531	
Sample Number:	STI/STE-514-08	STI/STE-514-09	STI/STE-514-10	STI/STE-514-11 Dupe of 514-09	STI/STE-531-01	STI/STE-531-02
Parameters						
Inorganics-(mg/ft²)[a]						
Aluminum	0.285	1.7	0.11	1.65	1.75	0.075
Antimony	0.0005 U	0.00065	0.0005 U	0.0016	0.00041	0.0005 U
Arsenic	0.00042 U	0.0035	0.00042 U	0.0022	0.00275	0.00042 U
Barium	0.0115	0.24	0.011	0.23	8	0.34
Beryllium	0.0001 U	0.000085	0.0001 U	0.00007	0.000065	0.0001 U
Cadmium	0.0006	0.0095	0.000175	0.005	0.011	0.0405
Calcium	2.75	20.55	0.85	17.75	25.45	1.5
Chromium	0.00395	0.014	0.0125	0.016	0.0185	0.00115
Cobalt	0.0001 U	0.0018	0.0008	0.0018	0.013	0.00023
Copper	0.0155	0.085	0.0018	0.046	0.0365	0.0014
Iron	0.55	4.7	0.175	3.2	2.8	0.55
Lead	0.011	0.085	0.0405	0.1	0.2	0.0034
Magnesium	0.14	0.85	0.08	0.7	1.15	0.09
Manganese	0.008	0.075	0.00375	0.06	0.065	0.00305
Mercury	0.00004 U	0.0008	0.000025	0.00085	0.0013	0.0019
Molybdenum	0.000495	0.002	0.0012	0.0015	0.00165	0.000235
Nickel	0.00115	0.00495	0.00016 U	0.00375	0.00385	0.00016 U
Potassium	0.165	5.55	0.0425	5.45	2.8	0.1
Selenium	0.00045 U	0.00045 U	0.00033	0.00045 U	0.00045 U	0.00045 U
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Sodium	1.1	3.3	1.05	3.25	2.4	1.25
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.0011	0.006	0.00025	0.005	0.0039	0.000235
Zinc	0.0435	0.29	0.0205	0.265	0.27	0.025
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

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Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8541	8554		8560	
Sample Number:	STI/STE-541-03	STI/STE-554-01	STI/STE-554-02	STI/STE-560-01	STI/STE-560-02
Parameters	Dupe of 541-01				
Inorganics-(mg/ft²)[a]					
Aluminum	2.425	0.975	2.125	0.75	0.475
Antimony	0.000675	0.0055	0.0005 U	0.000325	0.0005 U
Arsenic	0.0025	0.00525	0.00185	0.000875	0.000525
Barium	0.025	0.024	0.01575	0.01875	0.0045
Beryllium	0.0001575	0.000045	0.0000725	0.000035	0.0001 U
Cadmium	0.003	0.0025	0.000825	0.00145	0.000375
Calcium	23.275	28.25	31.25	6.75	5.65
Chromium	0.0525	0.01675	0.01	0.05	0.00575
Cobalt	0.001675	0.001175	0.00075	0.0007	0.00019
Copper	0.025	0.01225	0.0035	0.008	0.001625
Iron	2.725	1.75	1.5	1.275	0.475
Lead	0.2025	0.03	0.02	0.1975	0.005
Magnesium	0.85	0.5	0.5	0.35	0.1875
Manganese	0.1025	0.04	0.06	0.03	0.01475
Mercury	0.000075	0.00004 U	0.0001825	0.00004 U	0.00004 U
Molybdenum	0.00115	0.000525	0.000215	0.000375	0.0000775
Nickel	0.0035	0.0021	0.001475	0.001625	0.000575
Potassium	3.1	4.625	0.85	1.725	0.25
Selenium	0.00045	0.00022	0.00025	0.0002225	0.0003
Silver	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Sodium	2	2.4	1.925	2.375	1.625
Thallium	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.00525	0.00325	0.0035	0.002075	0.0007
Zinc	0.245	0.2225	0.0325	0.22	0.035
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)					
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.

ND - Not detected.

U - Undetected by the laboratory. Detectable limits are shown.

$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

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Table 3-45. Facility Surface Contamination Sampling Results, cont'd.

Building Number:	8531		8535		8541	
Sample Number:	STI/STE-531-03	STI/STE-531-04	STI/STE-535-01	STI/STE-535-02	STI/STE-541-01	STI/STE-541-02
Parameters						
Inorganics-(mg/ft²)[a]						
Aluminum	0.65	0.0375	4.075	0.425	1.25	0.6
Antimony	0.0005 U	0.0005 U	0.000475	0.00035	0.0007	0.000275
Arsenic	0.000355	0.00042 U	0.01125	0.000275	0.001775	0.000675
Barium	14.8	0.06	0.0425	0.00775	0.01675	0.00725
Beryllium	0.0001 U	0.0001 U	0.000275	0.0001 U	0.0000675	0.0000275
Cadmium	0.0115	0.002	0.0045	0.00065	0.00155	0.00055
Calcium	19.9	0.75	40.5	6.475	10.4	8.025
Chromium	0.012	0.001	0.0375	0.002325	0.055	0.003
Cobalt	0.0155	0.0001 U	0.002075	0.0001125	0.00155	0.000275
Copper	0.012	0.00115	0.05	0.001775	0.02025	0.0035
Iron	0.9	0.0465	3.425	0.35	1.8	0.525
Lead	0.155	0.0017	0.115	0.0975	0.2225	0.0075
Magnesium	0.8	0.085	1.175	0.15	0.525	0.25
Manganese	0.0315	0.0016	0.1375	0.0145	0.0475	0.02125
Mercury	0.00335	0.0011	0.0000875	0.00014	0.00004 U	0.00004 U
Molybdenum	0.001	0.000165	0.001325	0.0003	0.000525	0.00225
Nickel	0.0025	0.00016 U	0.00475	0.0003	0.0021	0.0012
Potassium	1.3	0.049	4.225	0.1875	2.025	0.3
Selenium	0.00045 U	0.00045 U	0.0001825	0.00045 U	0.00035	0.00025
Silver	0.0002 U	0.0002 U	0.0004 U	0.0002 U	0.0002 U	0.0002 U
Sodium	1.65	1.1	1.75	0.825	1.75	1.425
Thallium	0.00053 U	0.00053 U	0.00106 U	0.00053 U	0.00053 U	0.00053 U
Vanadium	0.0012	0.0001 U	0.008	0.000725	0.003	0.000925
Zinc	0.18	0.019	0.325	0.0155	0.17	0.06
Semivolatiles-(mg/ft²)	NA	NA	NA	NA	NA	NA
Explosives[a]-(mg/ft²)						
1,3-Dinitrobenzene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U

NA - Not analyzed.
ND - Not detected.
U - Undetected by the laboratory. Detectable limits are shown.
$UTL_{95,95}$ - 95% Upper Tolerance Limit.

[a] - Sample results were originally reported in mg/composite. Those values were divided by the number of composites and reported in mg/ft².

A1-001		
Sample Number:	A1-001-01	
Depth (ft. bgs):	0.0 to 0.5	
Inorganics	-	
Semivolatiles	-	

A1-002		
Sample Number:	A1-002-01	
Depth (ft. bgs):	0.0 to 0.5	
Inorganics	-	
Semivolatiles	-	

A1-003		
Sample Number:	A1-003-01	A1-003-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Antimony	-	1.9
Semivolatiles	-	-
Volatiles	NA	-

A1-004			
Sample Number:	A1-004-01	A1-004-02	A1-004-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	-	1.2
Zinc	-	-	43.8
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-005			
Sample Number:	A1-005-01	A1-005-02	A1-005-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Antimony	-	-	2
Cadmium	-	-	0.52
Lead	32.3	-	-
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-006		
Sample Number:	A1-006-01	A1-006-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Zinc	-	47.5
Semivolatiles	-	-
Volatiles	NA	-

A1-007		
Sample Number:	A1-007-01	A1-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Zinc	-	46.7
Semivolatiles	-	-
Volatiles	NA	-

A1-008		
Sample Number:	A1-008-01	A1-008-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-009			
Sample Number:	A1-009-01	A1-009-02	A1-009-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	-	0.71
Copper	-	-	32.4
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-010						
Sample Number:	A1-010-01	A1-010-04	A1-010-02	A1-010-05	A1-010-03	A1-010-06
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	2.5 to 4.5	2.5 to 4.5
Inorganics						
Cadmium	-	-	-	-	1.1	1.4
Iron	-	-	-	-	-	22400
Molybdenum	-	-	-	8.3	-	-
Semivolatiles	-	-	-	-	NA	NA
Volatiles	NA	NA	-	-	-	-
Pesticides/PCB's	-	-	-	-	-	NA
Explosives	-	-	-	-	-	-

A1-011		
Sample Number:	A1-011-01	A1-011-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-012			
Sample Number:	A1-012-01	A1-012-02	A1-012-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Inorganics			
Lead	42.8	-	-
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-013		
Sample Number:	A1-013-01	A1-013-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Antimony	-	0.98 (F)
Copper	-	16.7
Semivolatiles	-	-
Volatiles	NA	-

A1-014		
Sample Number:	A1-014-01	A1-014-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics		
Copper	-	14.4
Semivolatiles	-	-
Volatiles	NA	-

A1-015			
Sample Number:	A1-015-01	A1-015-04	A1-015-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-	-
Semivolatiles	-	-	-
Volatiles	NA	NA	-

A1-016			
Sample Number:	A1-016-01	A1-016-02	A1-016-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0
Inorganics	-	-	-
Semivolatiles	-	-	-
Volatiles	NA	-	-

A1-017			
Sample Number:	A1-017-01	A1-017-02	A1-017-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics			
Selenium	-	-	1.2
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-018			
Sample Number:	A1-018-01	A1-018-02	A1-018-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0	2.5 to 4.5
Inorganics			
Antimony	-	1.5	-
Cadmium	-	-	0.9
Chromium	-	25.1	-
Selenium	-	-	2
Semivolatiles	-	-	-
Volatiles	NA	-	-

A1-019		
Sample Number:	A1-019-01	A1-019-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics	-	-
Semivolatiles	0.48	-
Volatiles	NA	-

A1-020		
Sample Number:	A1-020-01	A1-020-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCB's	-	NA
Explosives	-	NA

A1-021			
Sample Number:	A1-021-01	A1-021-02	A1-021-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics			
Antimony	-	-	0.97 (F)
Semivolatiles	-	-	-
Volatiles	NA	-	0.0017
Pesticides/PCB's	NA	-	-
Explosives	NA	-	-

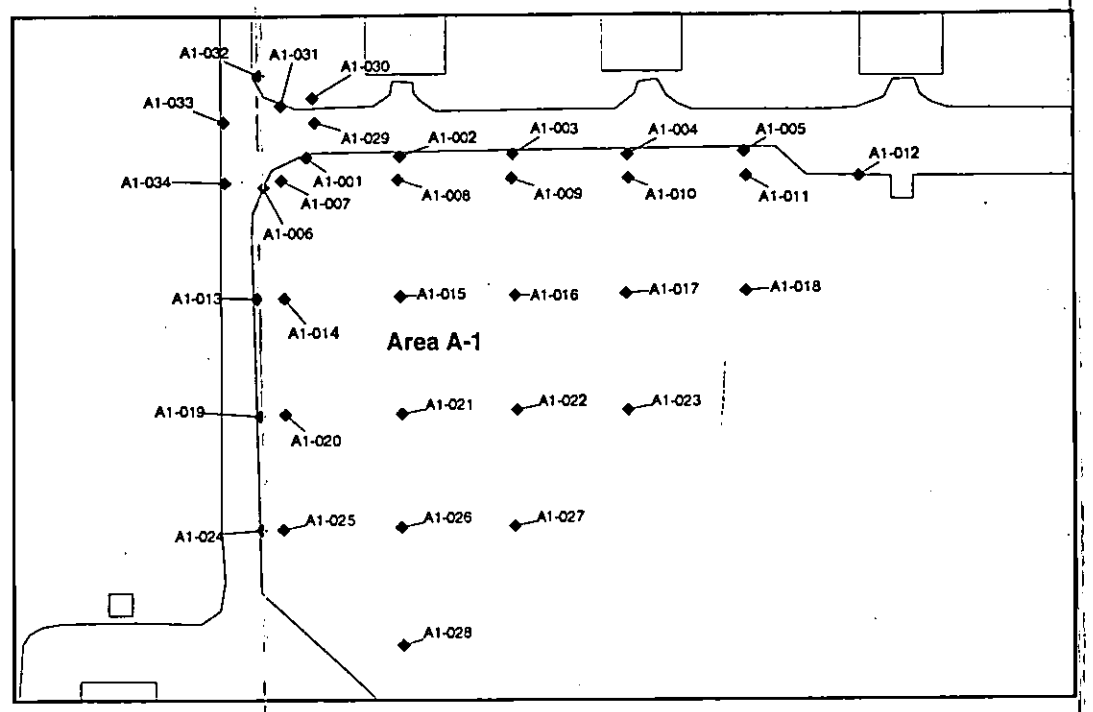
A1-022			
Sample Number:	A1-022-01	A1-022-02	A1-022-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Antimony	-	0.97 (F)	-
Cadmium	-	-	0.48
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-023			
Sample Number:	A1-023-01	A1-023-02	A1-023-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics			
Cadmium	-	-	1.1
Selenium	-	-	1.2
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-024		
Sample Number:	A1-024-01	A1-024-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Semivolatiles	0.47	-
Volatiles	NA	-

A1-025				
Sample Number:	A1-025-01	A1-025-04	A1-025-02	A1-025-05
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics				
Zinc	-	-	39.1	-
Semivolatiles	-	-	-	-
Volatiles	NA	NA	0.0034	-

A1-026		
Sample Number:	A1-026-01	A1-026-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Chromium	-	15
Selenium	-	1.4
Semivolatiles	-	-
Volatiles	NA	-



A1-027		
Sample Number:	A1-027-01	A1-027-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-028			
Sample Number:	A1-028-01	A1-028-02	A1-028-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	-	0.71
Nickel	514	-	-
Selenium	-	-	1.2
Semivolatiles	0.35	-	-
Volatiles	NA	-	-

A1-029		
Sample Number:	A1-029-01	A1-029-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-030		
Sample Number:	A1-030-01	A1-030-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Chromium	-	14.8
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCB's	-	NA
Explosives	-	-

A1-031		
Sample Number:	A1-031-01	A1-031-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-032		
Sample Number:	A1-032-01	A1-032-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-033		
Sample Number:	A1-033-01	A1-033-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Antimony	-	1
Lead	33	-
Semivolatiles	-	-
Volatiles	NA	-

A1-034		
Sample Number:	A1-034-01	A1-034-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

The Environmental Company, Inc.

Date: February 1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

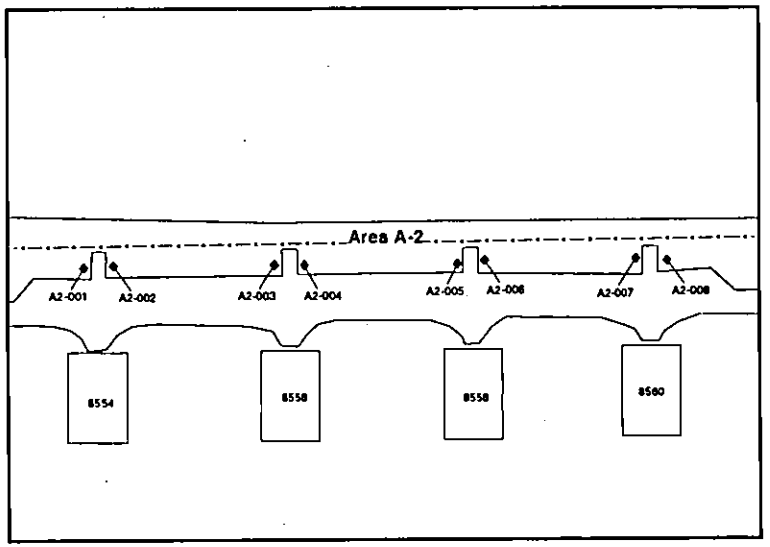
Figure 3-1
Soil Contaminant Distribution at the Outdoor Materiel Storage and Maintenance Area A-1

A2-001		
Sample Number:	A2-001-01	A2-001-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.2
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A2-002		
Sample Number:	A2-002-01	A2-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.0
Inorganics		
Antimony	-	1.4
Molybdenum	-	8.7
Semivolatiles	-	-
Volatiles	NA	-

A2-003			
Sample Number:	A2-003-01	A2-003-04	A2-003-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 1.5
Inorganics			
Arsenic	-	8.3	-
Semivolatiles	-	-	-
Volatiles	NA	NA	-

A2-005		
Sample Number:	A2-005-01	A2-005-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Zinc	71.8	-
Semivolatiles	-	-
Volatiles	NA	-



A2-004			
Sample Number:	A2-004-01	A2-004-02	A2-004-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5	0.5 to 1.5
Inorganics	-	-	NA
Semivolatiles	-	-	NA
Volatiles	NA	-	0.001

A2-007		
Sample Number:	A2-007-01	A2-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Zinc	70	-
Semivolatiles	-	-
Volatiles	NA	-

A2-008		
Sample Number:	A2-008-01	A2-008-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Lead	27.3	-
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCBs	-	-
Explosives	-	-

A2-006			
Sample Number:	A2-006-01	A2-006-02	A2-006-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics			
Antimony	-	1	-
Copper	-	16	-
Semivolatiles	-	-	-
Volatiles	NA	-	-

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-4

Soil Contaminant Distribution at the Outdoor Materiel Storage and Maintenance Area A-2

Date: February 1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

498 311

A1-001	
Sample Number:	A1-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-

A1-002	
Sample Number:	A1-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-

A1-003		
Sample Number:	A1-003-01	A1-003-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Antimony	-	1.9
Semivolatiles	-	-
Volatiles	NA	-

A1-004			
Sample Number:	A1-004-01	A1-004-02	A1-004-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	-	1.2
Zinc	-	-	43.8
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-005			
Sample Number:	A1-005-01	A1-005-02	A1-005-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Antimony	-	-	2
Cadmium	-	-	0.52
Lead	32.3	-	-
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-006		
Sample Number:	A1-006-01	A1-006-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Zinc	-	47.5
Semivolatiles	-	-
Volatiles	NA	-

A1-007		
Sample Number:	A1-007-01	A1-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Zinc	-	46.7
Semivolatiles	-	-
Volatiles	NA	-

A1-008		
Sample Number:	A1-008-01	A1-008-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-009			
Sample Number:	A1-009-01	A1-009-02	A1-009-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	-	0.71
Copper	-	-	32.4
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-010						
Sample Number:	A1-010-01	A1-010-04	A1-010-02	A1-010-05	A1-010-03	A1-010-06
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	2.5 to 4.5	2.5 to 4.5
Inorganics						
Cadmium	-	-	-	-	1.1	1.4
Iron	-	-	-	-	-	22400
Molybdenum	-	-	-	8.3	-	-
Semivolatiles	-	-	-	-	NA	NA
Volatiles	NA	NA	-	-	-	-
Pesticides/PCB's	-	-	-	-	-	NA
Explosives	-	-	-	-	-	-

A1-011		
Sample Number:	A1-011-01	A1-011-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-012			
Sample Number:	A1-012-01	A1-012-02	A1-012-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Inorganics			
Lead	42.8	-	-
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-013		
Sample Number:	A1-013-01	A1-013-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Antimony	-	0.98 (F)
Copper	-	16.7
Semivolatiles	-	-
Volatiles	NA	-

A1-014		
Sample Number:	A1-014-01	A1-014-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics		
Copper	-	14.4
Semivolatiles	-	-
Volatiles	NA	-

A1-015			
Sample Number:	A1-015-01	A1-015-04	A1-015-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-	-
Semivolatiles	-	-	-
Volatiles	NA	NA	-

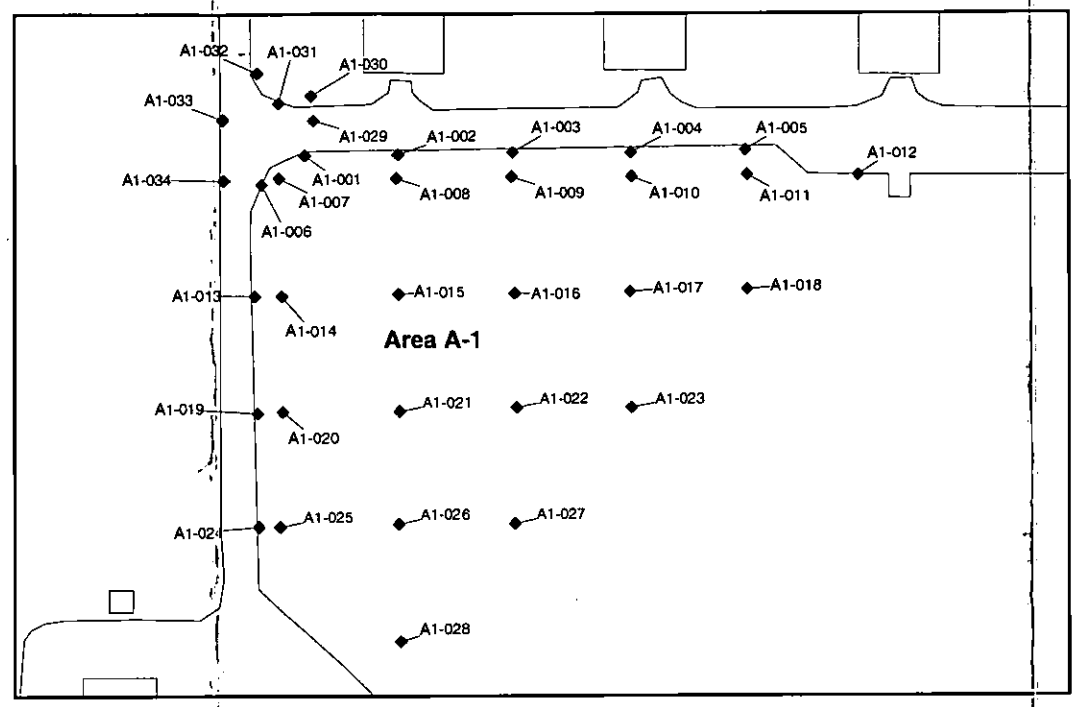
A1-016			
Sample Number:	A1-016-01	A1-016-02	A1-016-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0
Inorganics	-	-	-
Semivolatiles	-	-	-
Volatiles	NA	-	-

A1-017			
Sample Number:	A1-017-01	A1-017-02	A1-017-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics			
Selenium	-	-	1.2
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-018			
Sample Number:	A1-018-01	A1-018-02	A1-018-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0	2.5 to 4.5
Inorganics			
Antimony	-	1.5	-
Cadmium	-	-	0.9
Chromium	-	25.1	-
Selenium	-	-	2
Semivolatiles	-	-	-
Volatiles	NA	-	-

A1-019		
Sample Number:	A1-019-01	A1-019-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics	-	-
Semivolatiles	0.48	-
Volatiles	NA	-

A1-020		
Sample Number:	A1-020-01	A1-020-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCB's	-	NA
Explosives	-	NA



A1-021			
Sample Number:	A1-021-01	A1-021-02	A1-021-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics			
Antimony	-	-	0.97 (F)
Semivolatiles	-	-	-
Volatiles	NA	-	0.0017
Pesticides/PCB's	NA	-	-
Explosives	NA	-	-

A1-022			
Sample Number:	A1-022-01	A1-022-02	A1-022-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Antimony	-	0.97 (F)	-
Cadmium	-	-	0.48
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-023			
Sample Number:	A1-023-01	A1-023-02	A1-023-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics			
Cadmium	-	-	1.1
Selenium	-	-	1.2
Semivolatiles	-	-	NA
Volatiles	NA	-	-

A1-024		
Sample Number:	A1-024-01	A1-024-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Semivolatiles	0.47	-
Volatiles	NA	-

A1-025				
Sample Number:	A1-025-01	A1-025-04	A1-025-02	A1-025-05
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics				
Zinc	-	-	39.1	-
Semivolatiles	-	-	-	-
Volatiles	NA	NA	0.0034	-

A1-026		
Sample Number:	A1-026-01	A1-026-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		-
Chromium	-	15
Selenium	-	1.4
Semivolatiles	-	-
Volatiles	NA	-

A1-027		
Sample Number:	A1-027-01	A1-027-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-028			
Sample Number:	A1-028-01	A1-028-02	A1-028-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	-	0.71
Nickel	514	-	-
Selenium	-	-	1.2
Semivolatiles	0.35	-	-
Volatiles	NA	-	-

A1-029		
Sample Number:	A1-029-01	A1-029-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-030		
Sample Number:	A1-030-01	A1-030-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Chromium	-	14.8
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCB's	-	NA
Explosives	-	-

A1-031		
Sample Number:	A1-031-01	A1-031-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-032		
Sample Number:	A1-032-01	A1-032-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A1-033		
Sample Number:	A1-033-01	A1-033-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Antimony	-	1
Lead	33	-
Semivolatiles	-	-
Volatiles	NA	-

A1-034		
Sample Number:	A1-034-01	A1-034-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-1
Soil Contaminant Distribution at the Outdoor Materiel Storage and Maintenance Area A-1

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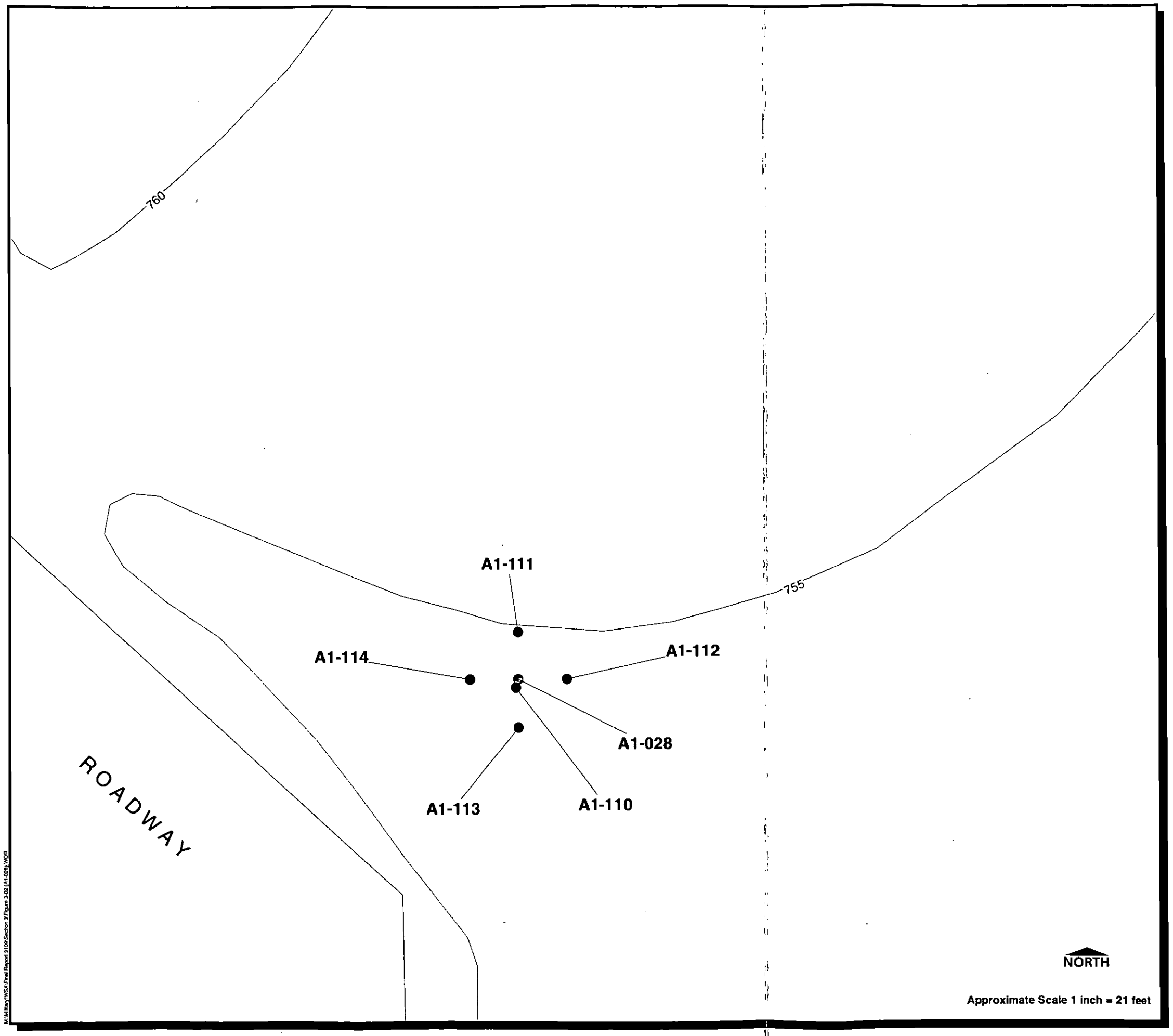
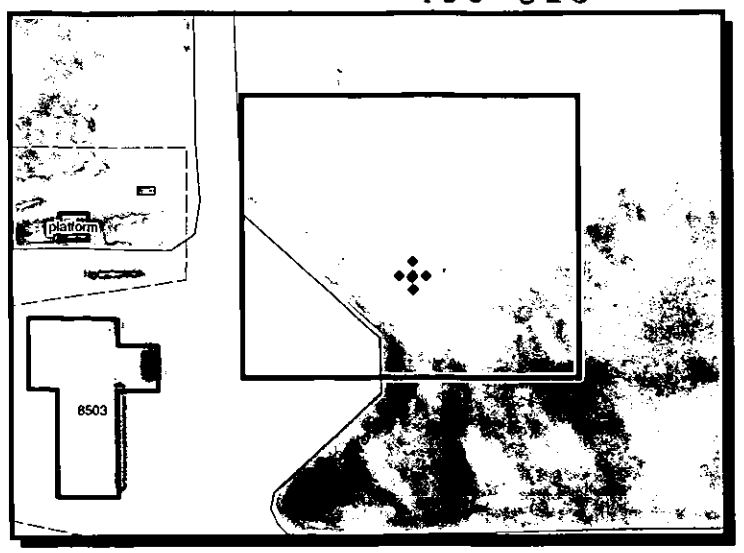




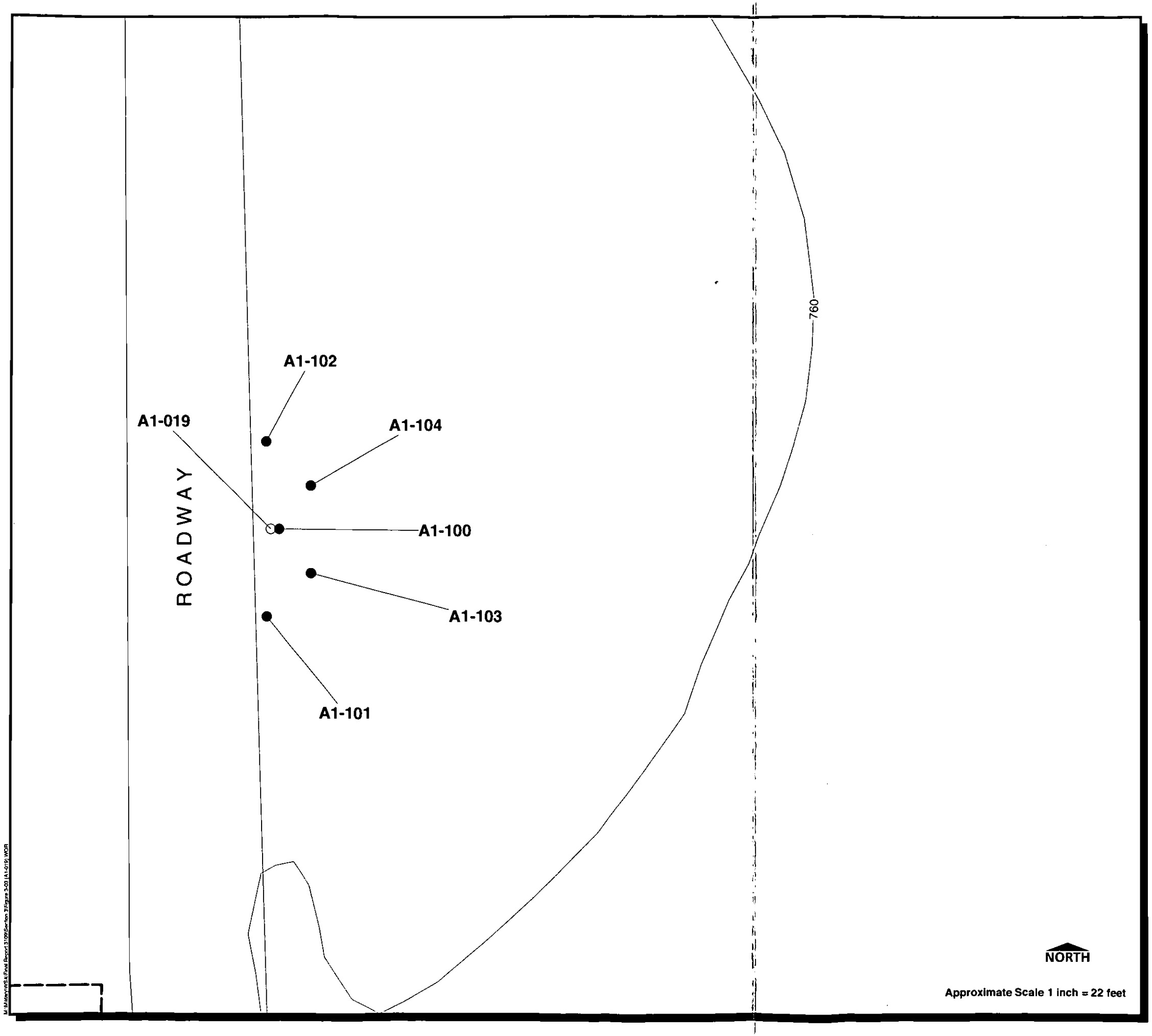
Nickel Conc ntration Relative to Background UTL$_{95,95}$

- Less than background
- Detected at concentration less than 100 times background

Figure 3-2
Surface Soil Nickel Levels in the Vicinity of Location A1-028

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109



PAH Conc ntration Relative to Background

- ● Less than background
- ○ Detected at concentration less than 10 times background

Figure 3-3 Surface Soil PAH Levels in the Vicinity of Location A1-019

The Environmental Company, Inc.

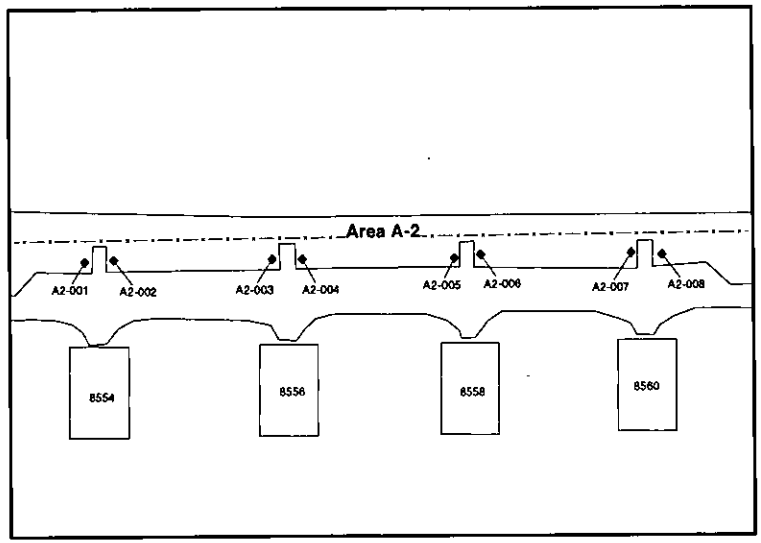
Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

A2-001		
Sample Number:	A2-001-01	A2-001-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.2
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-

A2-002		
Sample Number:	A2-002-01	A2-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.0
Inorganics		
Antimony	-	1.4
Molybdenum	-	8.7
Semivolatiles	-	-
Volatiles	NA	-

A2-003			
Sample Number:	A2-003-01	A2-003-04	A2-003-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 1.5
Inorganics			
Arsenic	-	8.3	-
Semivolatiles	-	-	-
Volatiles	NA	NA	-

A2-005		
Sample Number:	A2-005-01	A2-005-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Zinc	71.8	-
Semivolatiles	-	-
Volatiles	NA	-



A2-004			
Sample Number:	A2-004-01	A2-004-02	A2-004-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5	0.5 to 1.5
Inorganics	-	-	NA
Semivolatiles	-	-	NA
Volatiles	NA	-	0.001

A2-007		
Sample Number:	A2-007-01	A2-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Zinc	70	-
Semivolatiles	-	-
Volatiles	NA	-

A2-008		
Sample Number:	A2-008-01	A2-008-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Lead	27.3	-
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCBs	-	-
Explosives	-	-

A2-006			
Sample Number:	A2-006-01	A2-006-02	A2-006-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics			
Antimony	-	1	-
Copper	-	16	-
Semivolatiles	-	-	-
Volatiles	NA	-	-

- = Analyzed but not detected above background $UTL_{95,95}$.

- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.

- All concentrations reported in mg/kg.

- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-4

Soil Contaminant Distribution at the Outdoor Materiel Storage and Maintenance Area A-2

Creation Date: 02/01/1999
Rev. Date: 07/23/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

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A3-001			
Sample Number:	A3-001-01	A3-001-02	A3-001-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.8
Inorganics			
Cadmium	2.3	-	0.75
Copper	24.8	-	-
Lead	96	-	-
Semivolatiles	49.95	0.079	-
Volatiles	NA	-	-

A3-002		
Sample Number:	A3-002-01	A3-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.8
Inorganics		
Arsenic	8.5	-
Cadmium	2.1	0.63
Copper	19.6	-
Lead	34	-
Zinc	99.1	-
Semivolatiles	60.33	0.903
Volatiles	NA	-

A3-003		
Sample Number:	A3-003-01	A3-003-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Arsenic	22.9	-
Cadmium	1.6	-
Copper	46.3	-
Zinc	129	-
Semivolatiles	8.5	0.342
Volatiles	NA	-

A3-004		
Sample Number:	A3-004-01	A3-004-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Arsenic	9.8	-
Cadmium	1.5	-
Lead	31.6	-
Semivolatiles	4.13	-
Volatiles	NA	-
Pesticides/PCB's	0.0147	-
Explosives	-	-

A3-005		
Sample Number:	A3-005-01	A3-005-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Copper	27	-
Lead	49.6	-
Semivolatiles	10.29	-
Volatiles	NA	-

A3-006		
Sample Number:	A3-006-01	A3-006-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Antimony	-	1.1
Arsenic	14.4	-
Cadmium	4.6	-
Copper	21.7	-
Lead	41.7	-
Mercury	10.9	-
Zinc	80.2	-
Semivolatiles	15.06	-
Volatiles	NA	-

A3-007		
Sample Number:	A3-007-01	A3-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	3.8	-
Lead	153	-
Zinc	85.4	-
Semivolatiles	7.64	-
Volatiles	NA	-

A3-008			
Sample Number:	A3-008-01	A3-008-02	A3-008-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics	-	-	-
Semivolatiles	4.42	-	NA
Volatiles	NA	-	-

A3-009						
Sample Number:	A3-009-01	A3-009-04	A3-009-02	A3-009-05	A3-009-03	A3-009-06
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	6.5 to 8.5	6.5 to 8.5
Inorganics						
Cadmium	-	-	-	-	0.75	0.59
Copper	-	-	-	-	-	36.8
Semivolatiles	11.08	1.42	-	-	NA	NA
Volatiles	NA	NA	-	-	0.085	0.0324
Pesticides/PCB's	0.016	0.015	-	-	NA	NA
Explosives	-	-	-	-	-	-

A3-010			
Sample Number:	A3-010-01	A3-010-02	A3-010-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	6.5 to 8.5
Inorganics			
Chromium	-	16	-
Lead	37.8	-	-
Semivolatiles	18.76	-	NA
Volatiles	NA	-	0.0092

A3-011			
Sample Number:	A3-011-01	A3-011-02	A3-011-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	8.5 to 10.5
Inorganics			
Antimony	-	0.98 (F)	-
Cadmium	-	-	1.2
Chromium	-	16.3	-
Iron	65200	-	-
Lead	35.1	18.4	-
Semivolatiles	2.3	-	NA
Volatiles	NA	0.004	0.0057

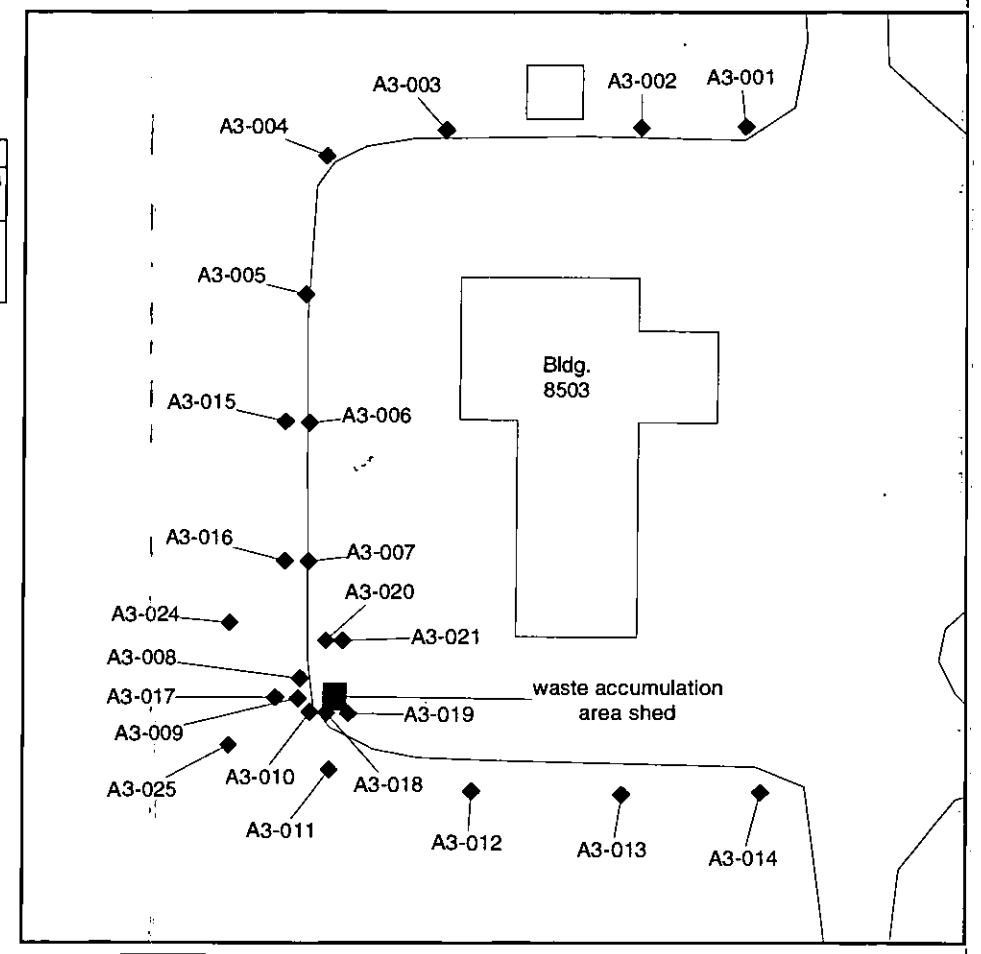
A3-012			
Sample Number:	A3-012-01	A3-012-02	A3-012-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	8.5 to 10.5
Inorganics			
Antimony	-	1.2	-
Cadmium	3.7	0.51	0.95
Chromium	-	15.5	-
Lead	67.3	-	-
Zinc	75.6	38.7	-
Semivolatiles	17.54	-	NA
Volatiles	NA	-	0.0045

A3-013			
Sample Number:	A3-013-01	A3-013-02	A3-013-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	7.0 to 9.0
Inorganics			
Antimony	-	0.95 (F)	-
Cadmium	2.6	-	-
Lead	57.1	-	-
Zinc	127	-	-
Semivolatiles	31.49	5.99	-
Volatiles	NA	-	-

A3-014			
Sample Number:	A3-014-01	A3-014-02	A3-014-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	7.0 to 9.0
Inorganics			
Cadmium	3.4	0.58	-
Copper	-	-	17.2
Lead	129	-	-
Molybdenum	-	7.4	-
Zinc	81.9	43.9	39.1
Semivolatiles	33.5	-	NA
Volatiles	NA	-	-

A3-015		
Sample Number:	A3-015-01	A3-015-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Antimony	-	1.4
Arsenic	8.5	-
Cadmium	6.3	-
Lead	50.5	-
Mercury	0.1	-
Molybdenum	9.9	-
Zinc	87.4	-
Semivolatiles	13.84	-
Volatiles	NA	-
Pesticides/PCB's	0.018	-
Explosives	-	-

A3-016			
Sample Number:	A3-016-01	A3-016-02	A3-016-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Antimony	-	-	0.93 (F)
Semivolatiles	1.75	-	NA
Volatiles	NA	-	-



A3-017			
Sample Number:	A3-017-01	A3-017-02	A3-017-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics			
Antimony	-	1.2	-
Chromium	-	15.4	-
Semivolatiles	41.49	-	NA
Volatiles	NA	-	-

A3-018		
Sample Number:	A3-018-02	A3-018-03
Depth (ft. bgs):	1.2 to 3.2	5.2 to 7.2
Inorganics		
Antimony	1.1	0.94 (F)
Chromium	20	-
Semivolatiles	-	-
Volatiles	-	0.0013
Pesticides/PCB's	-	-
Explosives	-	-

A3-019		
Sample Number:	A3-019-02	A3-019-03
Depth (ft. bgs):	1.0 to 3.0	5.0 to 7.0
Inorganics		
Antimony	1300	5
Semivolatiles	-	-
Volatiles	-	-
Pesticides/PCB's	-	-
Explosives	-	-

A3-020		
Sample Number:	A3-020-02	A3-020-03
Depth (ft. bgs):	3.1 to 5.1	5.1 to 7.1
Inorganics		
Antimony	13.7	1.8
Cadmium	1.9	-
Semivolatiles	-	-
Volatiles	-	-
Pesticides/PCB's	-	-
Explosives	-	-

A3-021			
Sample Number:	A3-021-02	A3-021-03	A3-021-06
Depth (ft. bgs):	1.2 to 3.2	5.2 to 7.2	5.2 to 7.2
Inorganics			
Antimony	1.1	0.95 (F)	1.3
Cadmium	0.76	0.71	-
Copper	112	-	-
Zinc	74.5	50.2	-
Semivolatiles	-	-	-
Volatiles	-	0.0012	-
Pesticides/PCB's	-	-	-
Explosives	-	-	-

A3-024		
Sample Number:	A3-024-01	A3-024-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCB's	NA	-
Explosives	NA	-

A3-025			
Sample Number:	A3-025-01	A3-025-02	A3-025-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics	-	-	-
Semivolatiles	-	-	NA
Volatiles	NA	-	-
Pesticides/PCB's	NA	-	NA
Explosives	NA	-	-

The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-5
Soil Contaminant Distribution at the Waste Accumulation Area (SWMU 59) and Bldg. 8503 Area A-3

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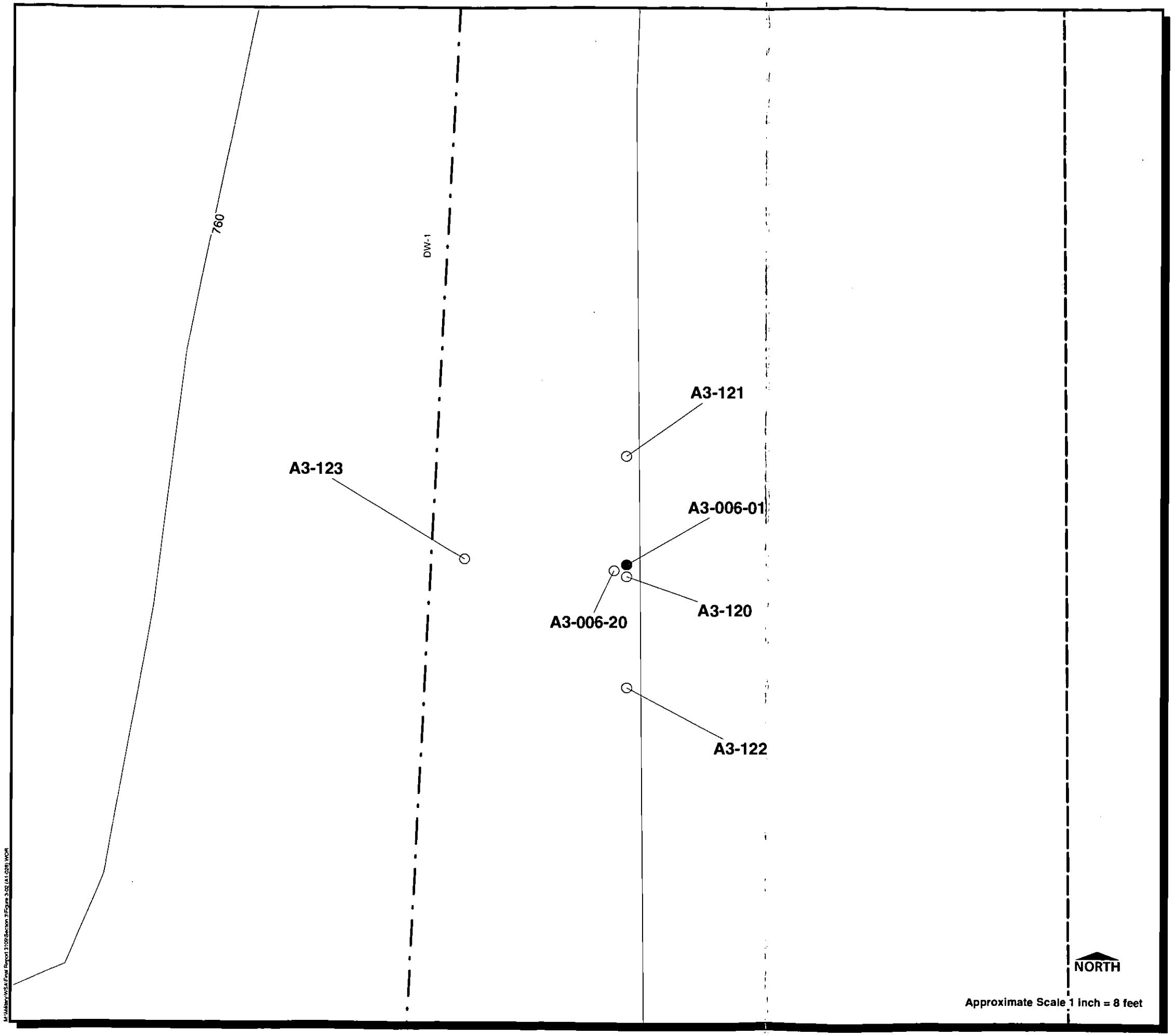
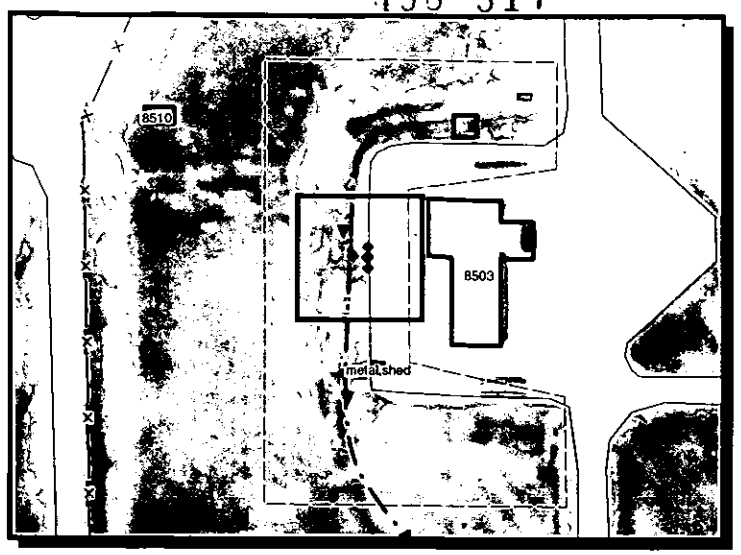




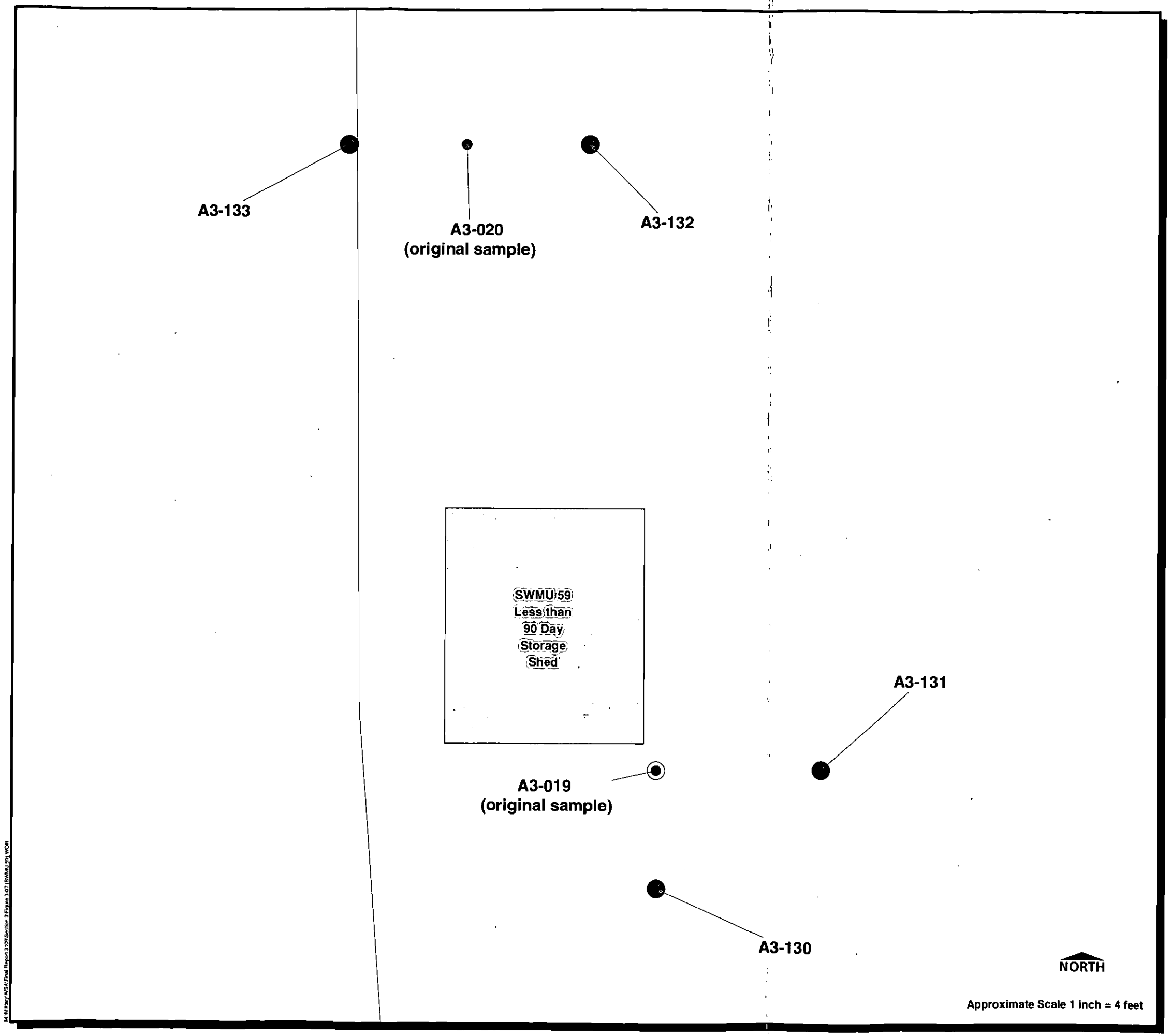
Mercury Conc ntration Relative to Background UTL$_{95,95}$

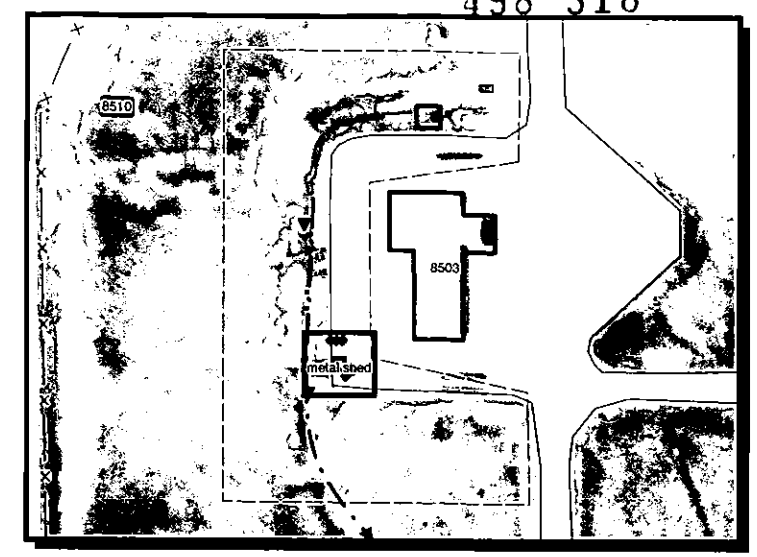
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration greater than 100 times background

Figure 3-6
Surface Soil Mercury Levels in the Vicinity of Location A3-006

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109





Antimony Concentration Relative to Background $UTL_{95,95}$

- ● Less than background
- ● Not detected; detection limit above background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background
- ● Detected at concentration greater than 100 times background

Inner color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-7
Subsurface Soil Antimony Levels Beneath Concrete Pad in the Vicinity of SWMU 59

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

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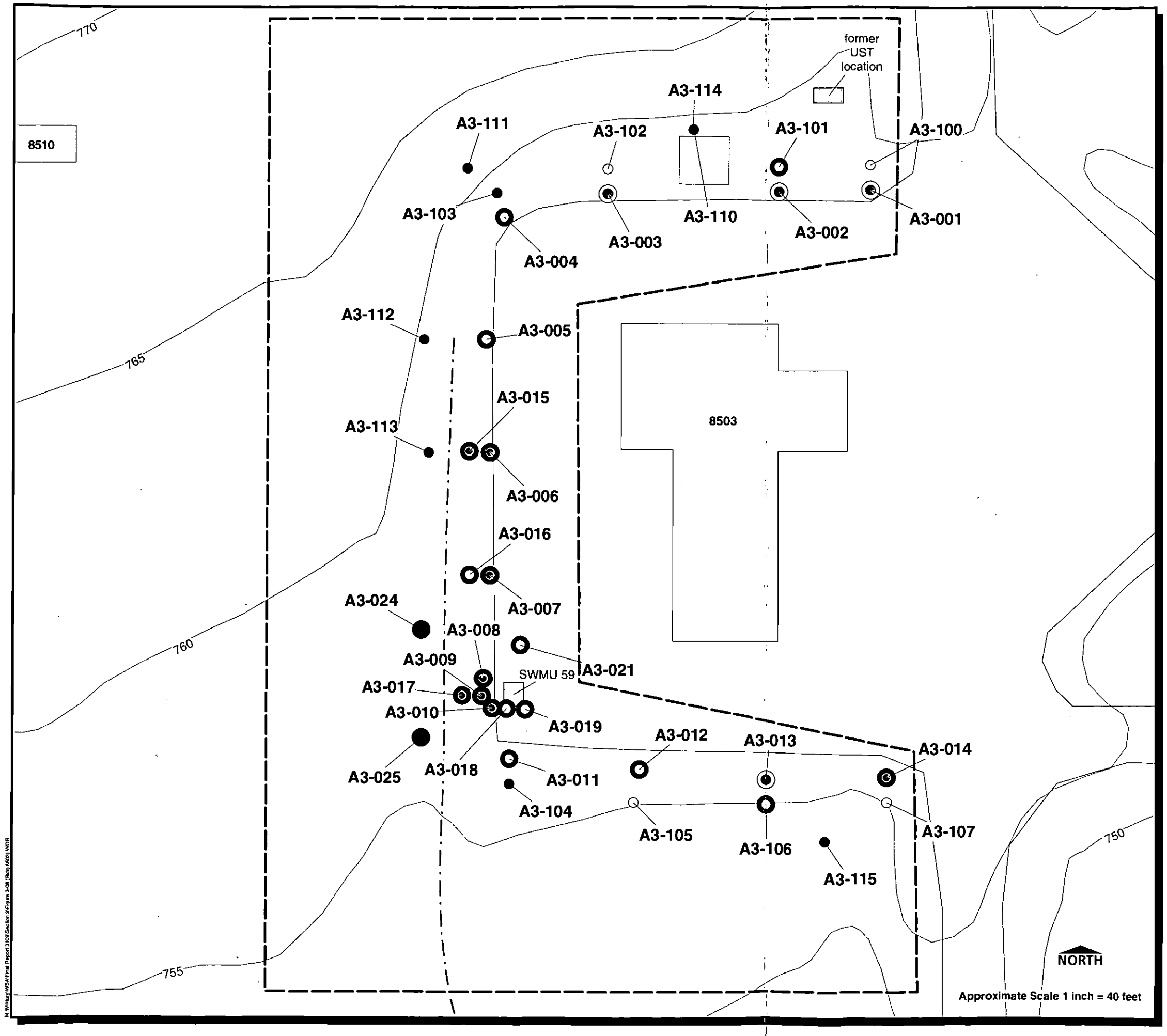


PAH Concentration Relative to Background

- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Inner color indicates Surface
Outer color indicates Upper Subsurface (0.5-2.5 ft. bgs)

Figure 3-8
Surface and Upp r Subsurface Soil PAH Levels in th Vicinity of Bldg. 8503 and SWMU 59

The Environmental Company, Inc.

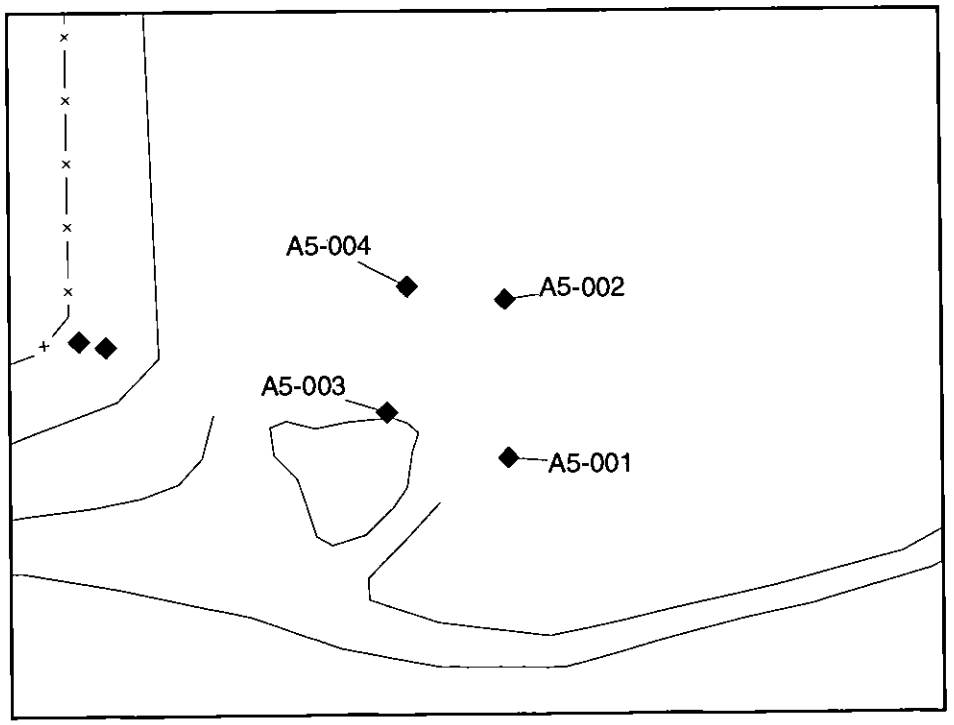
Creation Date:	12/14/1998
Rev. Date:	05/26/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

A5-001			
Sample Number:	A5-001-01	A5-001-02	A5-001-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	1	-
Molybdenum	-	7.3	-
Selenium	-	1.2	-
Zinc	-	-	55.7
Semivolatiles	-	-	NA
Volatiles	NA	-	NA
Pesticides/PCBs	-	-	NA
Explosives	-	-	-

A5-003				
Sample Number:	A5-003-01	A5-003-02	A5-003-05	A5-003-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	2.5 to 4.5
Inorganics				
Antimony	-	-	2.5	-
Cadmium	-	0.6	0.66	-
Copper	-	-	34.6	-
Semivolatiles	-	-	-	NA
Volatiles	NA	-	-	NA
Pesticides/PCBs	-	-	-	NA
Explosives	-	-	-	-

A5-004		
Sample Number:	A5-004-01	A5-004-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.7
Inorganics		
Antimony	-	1.2
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCBs	-	-
Explosives	-	-

A5-002		
Sample Number:	A5-002-01	A5-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	NA	-
Pesticides/PCBs	-	-
Explosives	-	-



- = Analyzed but not detected above background $UTL_{95,95}$.

- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.

- All concentrations reported in mg/kg.

- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-9 -- Soil Contaminant Distribution at the Disturbed Surface Area A-5

Creation Date: 02/01/1999
Rev. Date: 07/23/1999
Project Manager: B. Duffner
Prepared By: D. Bedard
Project No: P-3109

498 320

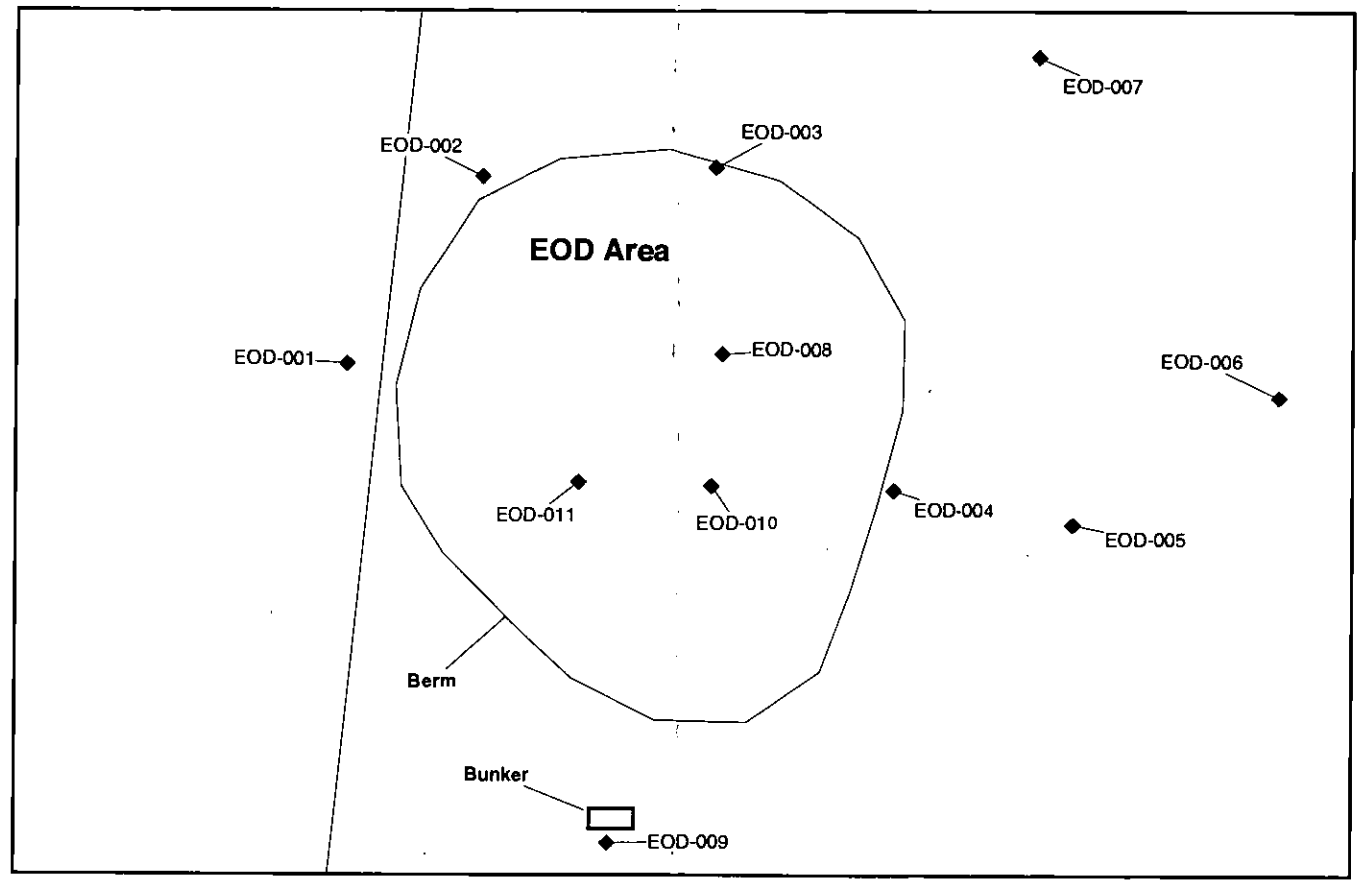
EOD-001		
Sample Number:	EOD-001-01	EOD-001-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics	-	-
Explosives	-	-

EOD-005			
Sample Number:	EOD-005-01	EOD-005-02	EOD-005-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.0
Inorganics	-	-	-
Explosives	-	-	-

EOD-007		
Sample Number:	EOD-007-01	EOD-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics	-	-
Explosives	-	-

EOD-009			
Sample Number:	EOD-009-01	EOD-009-04	EOD-009-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0
Inorganics			
Antimony	-	-	2.2
Selenium	-	-	5
Thallium	-	-	4.1
Explosives	-	-	-

EOD-002		
Sample Number:	EOD-002-01	EOD-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Copper	-	20.6
Silver	0.73	-
Explosives	-	-



EOD-010					
Sample Number:	EOD-010-01	EOD-010-02	EOD-010-05	EOD-010-03	EOD-010-06
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5	4.5 to 6.5	4.5 to 6.5
Inorganics					
Antimony	-	1	0.98 (F)	-	-
Zinc	-	-	-	38.6	-
Explosives	-	-	-	-	-

EOD-003			
Sample Number:	EOD-003-01	EOD-003-02	EOD-003-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	6.5 to 8.0
Inorganics			
Silver	0.67	1.9	-
Zinc	-	-	54.4
Explosives	-	-	-

EOD-004			
Sample Number:	EOD-004-01	EOD-004-02	EOD-004-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 5.0
Inorganics			
Arsenic	10.6	-	-
Vanadium	69.6	-	-
Zinc	-	-	44.7
Explosives	-	-	-

EOD-006		
Sample Number:	EOD-006-01	EOD-006-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	-	0.65
Copper	-	14.8
Silver	1.5	-
Explosives	-	28.23

EOD-008			
Sample Number:	EOD-008-01	EOD-008-02	A1-008-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics	-	-	-
Explosives	-	-	-

EOD-011			
Sample Number:	EOD-011-01	EOD-011-02	EOD-011-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	5.5 to 7.5
Inorganics			
Antimony	-	1	-
Cadmium	-	-	0.48
Zinc	-	-	65.1
Explosives	-	-	-

The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-10
Soil Contaminant Distribution
at the EOD Range

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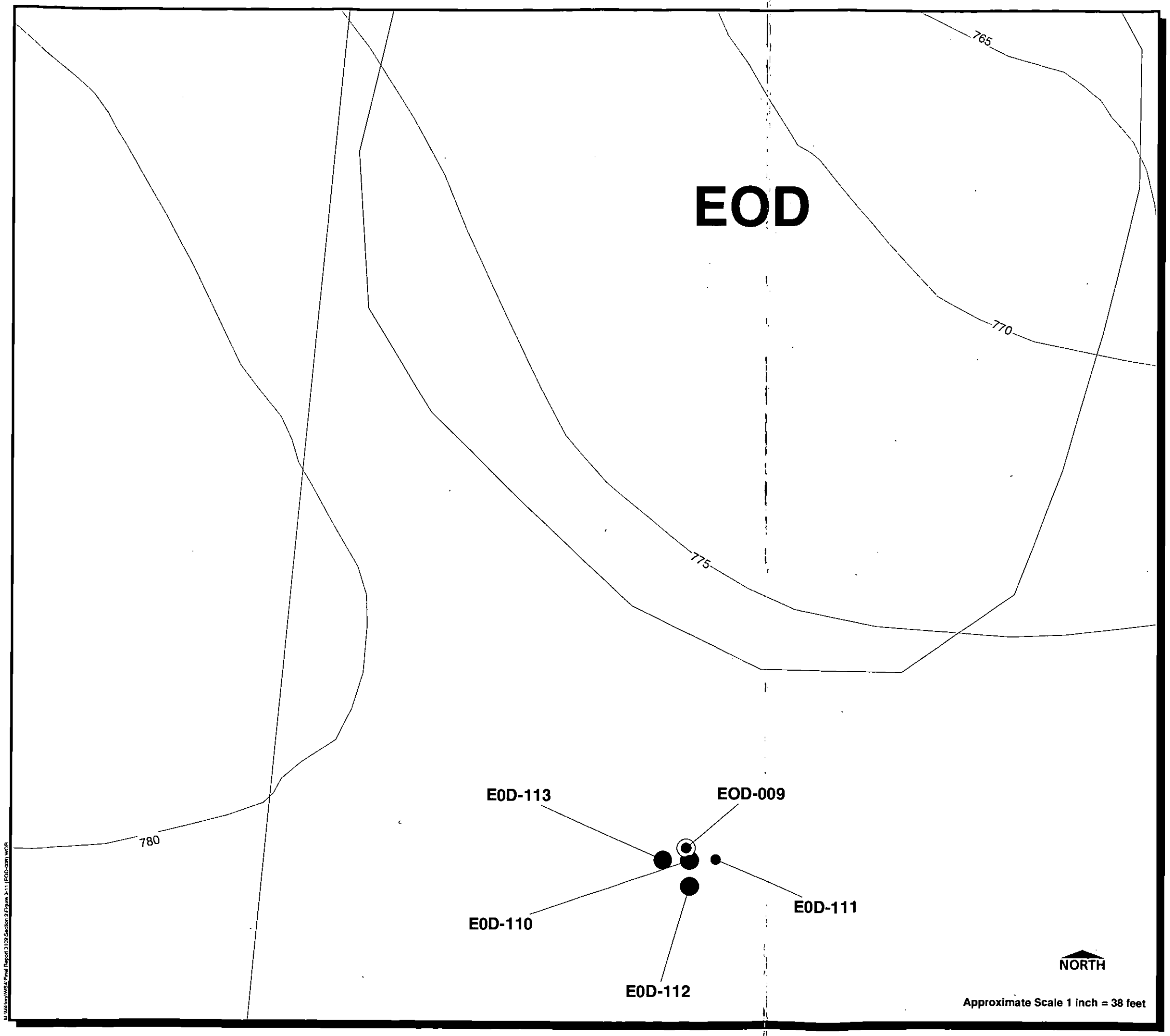
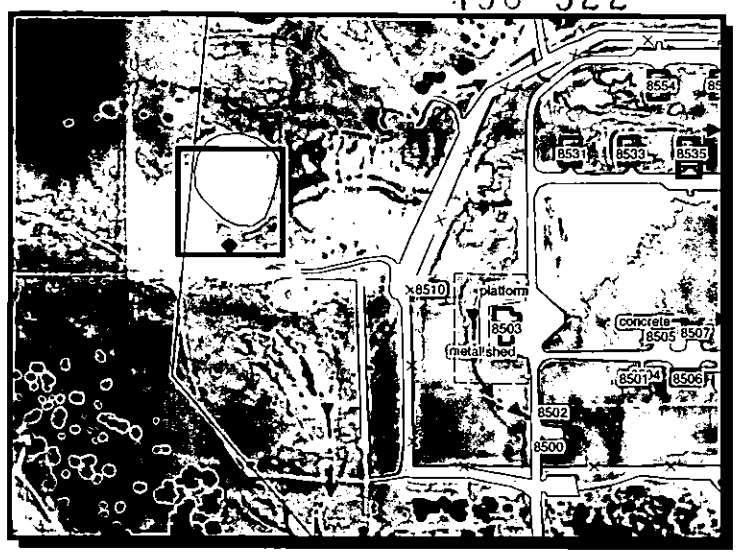




Thallium Conc ntration Relative to Background UTL$_{95,95}$

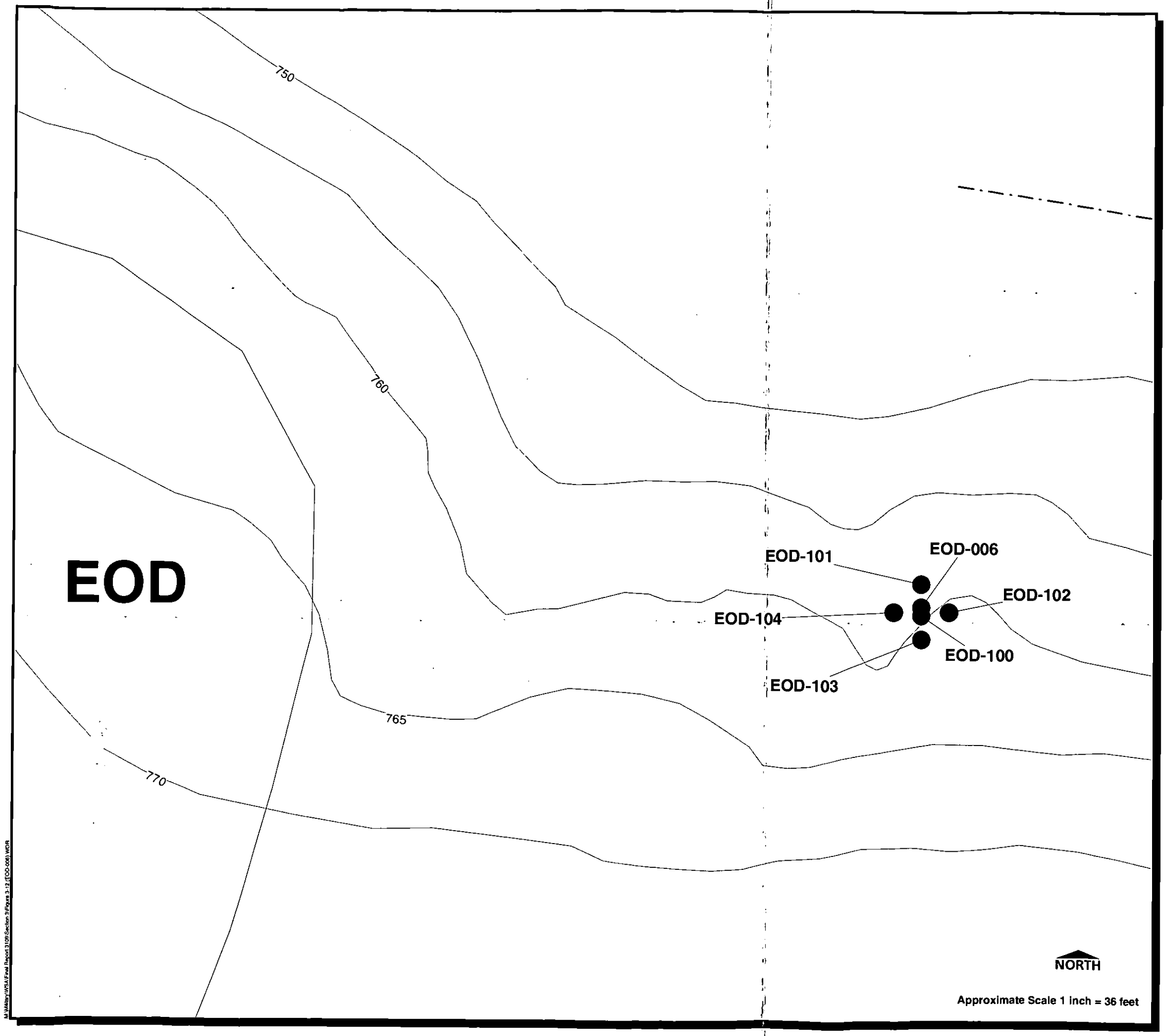
- ● **Less than background**
- ○ **Detected at conc ntration less than 10 times background**

Inner color indicates Surface
Outer color indicates Upper Subsurface (0.5-2.5 ft. bgs)

Figure 3-11
Surface and Subsurface Soil Thallium Lev ls in th Vicinity of EOD-009

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109



Dinitrotoluene Concentration Relative to Background

- Less than background
- Detected at concentration greater than 100 times background

Inner color indicates Surface
Outer color indicates Upper Subsurface (0.5-2.5 ft. bgs)

Figure 3-12
Surface and Subsurface Soil Dinitrotoluene Lev Is in the Vicinity of Location EOD-006

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

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BD-001		
Sample Number:	BD-001-01	BD-001-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Lead	47.4	-
Mercury	0.057 (F)	-
Explosives	-	-

BD-002		
Sample Number:	BD-002-01	BD-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	8	-
Lead	30.8	-
Mercury	0.2	-
Zinc	-	48.2
Explosives	-	-

BD-003			
Sample Number:	BD-003-01	BD-003-02	BD-003-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.0
Inorganics			
Chromium	-	15.4	-
Iron	-	-	24500
Lead	99.8	-	-
Mercury	-	-	-
Nickel	-	-	23.5
Zinc	199	-	40.9
Explosives	-	-	NA

BD-004			
Sample Number:	BD-004-01	BD-004-02	BD-004-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	4.5 to 6.5
Inorganics			
Arsenic	-	-	12
Cadmium	9.7	-	-
Zinc	355	-	50.2
Explosives	-	-	NA

BD-005			
Sample Number:	BD-005-01	BD-005-02	BD-005-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	-	0.88	-
Chromium	-	39	-
Copper	-	-	166
Lead	49.5	200	-
Zinc	97.7	145	-
Explosives	-	-	NA

BD-006			
Sample Number:	BD-006-01	BD-006-02	BD-006-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0
Inorganics			
Lead	-	19.8	-
Mercury	0.072 (F)	-	-
Zinc	112	-	-
Explosives	-	-	NA

BD-007			
Sample Number:	BD-007-01	BD-007-02	BD-007-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Inorganics			
Cadmium	1.3	-	-
Chromium	-	-	18.8
Lead	65.9	-	-
Zinc	347	-	-
Explosives	-	-	NA

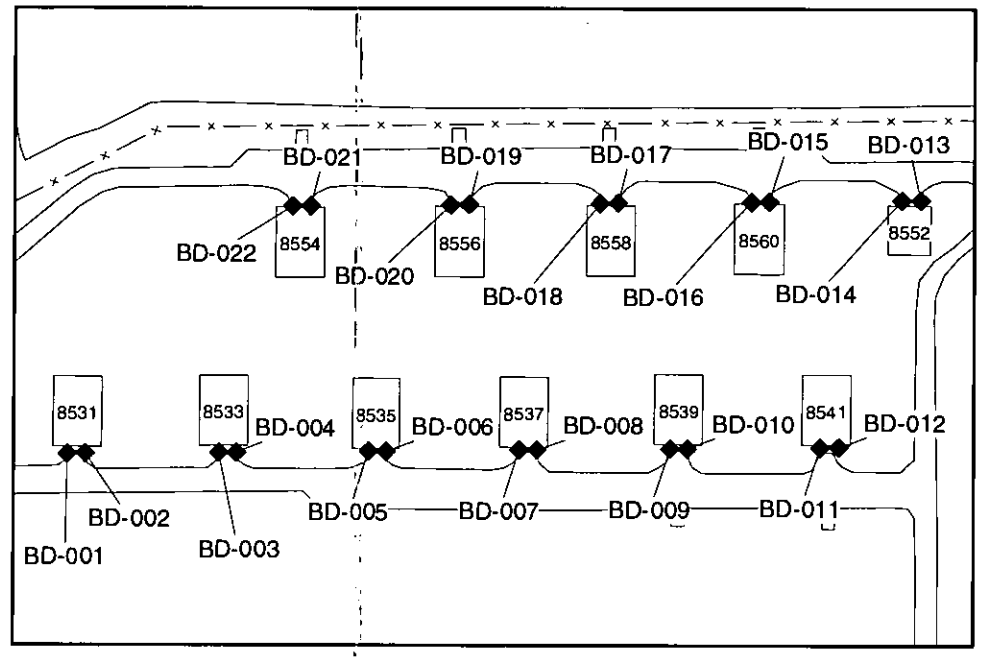
BD-008			
Sample Number:	BD-008-01	BD-008-02	BD-008-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.5
Inorganics			
Cadmium	1.8	2.2	-
Chromium	-	25.3	-
Copper	91.4	55	-
Lead	29	49.8	-
Zinc	224	61.5	-
Explosives	-	-	NA

BD-009		
Sample Number:	BD-009-01	BD-009-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics		
Lead	44	-
Mercury	0.056 (F)	-
Zinc	134	-
Explosives	-	-

BD-010				
Sample Number:	BD-010-01	BD-010-04	BD-010-02	BD-010-05
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics				
Arsenic	-	8.8	-	-
Cadmium	2.6	4.5	-	-
Cobalt	-	11.5	-	-
Copper	-	20.7	-	-
Iron	36700	53400	-	-
Lead	29.2	79.3	-	-
Manganese	-	603	-	-
Nickel	-	25	-	-
Zinc	166	142	-	-
Explosives	-	-	-	-

BD-011		
Sample Number:	BD-011-01	BD-011-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics		
Cadmium	-	0.79
Chromium	-	16.1
Copper	40.6	-
Lead	60.5	28.3
Zinc	250	55
Explosives	-	-

BD-012		
Sample Number:	BD-012-01	BD-012-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	-	2.4
Chromium	-	25.3
Cobalt	11.4	-
Copper	39.1	27
Iron	48700	-
Lead	45.3	71.2
Nickel	27.5	-
Selenium	-	1.2
Zinc	160	71.1
Explosives	-	-



BD-013		
Sample Number:	BD-013-01	BD-013-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.2
Inorganics		
Cadmium	2.5	1.1
Chromium	-	15.2
Copper	30.4	-
Lead	69.4	45.3
Zinc	142	-
Explosives	-	-

BD-014		
Sample Number:	BD-014-01	BD-014-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Inorganics		
Cadmium	4.5	1.4
Copper	26.7	-
Lead	62.3	21.2
Zinc	101	-
Explosives	-	-

BD-015		
Sample Number:	BD-015-01	BD-015-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	-	0.61
Lead	80	-
Zinc	201	-
Explosives	-	-

BD-016		
Sample Number:	BD-016-01	BD-016-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	3.5	0.6
Copper	31.5	-
Lead	43.9	-
Zinc	160	-
Explosives	-	-

BD-017			
Sample Number:	BD-017-01	BD-017-02	BD-017-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Inorganics			
Cadmium	1.4	0.62	-
Copper	29.7	-	-
Lead	68.3	23.6	-
Zinc	192	-	-
Explosives	-	-	NA

BD-018			
Sample Number:	BD-018-01	BD-018-02	BD-018-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Inorganics			
Antimony	-	1.5	2
Cadmium	1.5	0.52	-
Copper	30.1	-	-
Lead	67.9	-	-
Mercury	0.14	-	-
Zinc	179	-	-
Explosives	-	-	NA

BD-019		
Sample Number:	BD-019-01	BD-019-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	3.7	0.79
Chromium	-	15.8
Cobalt	10.1	-
Copper	32.5	-
Iron	37500	-
Lead	43	-
Nickel	22.2	-
Zinc	187	-
Explosives	-	-

BD-020				
Sample Number:	BD-020-01	BD-020-04	BD-020-02	BD-020-05
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0	0.5 to 2.0
Inorganics				
Cadmium	-	NA	0.88	0.69
Lead	63.5	NA	58.6	-
Zinc	143	NA	-	-
Explosives	-	-	-	-

BD-021		
Sample Number:	BD-021-01	BD-021-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics		
Cadmium	1.3	0.7
Copper	43.8	-
Lead	79.5	-
Zinc	285	-
Explosives	-	-

BD-022		
Sample Number:	BD-022-01	BD-022-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Inorganics		
Cadmium	-	0.75
Copper	19.5	68.2
Lead	32.2	-
Zinc	149	242
Explosives	-	-

The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-13
Soil Contaminant Distribution at the Bunker Floor Drain Outlets

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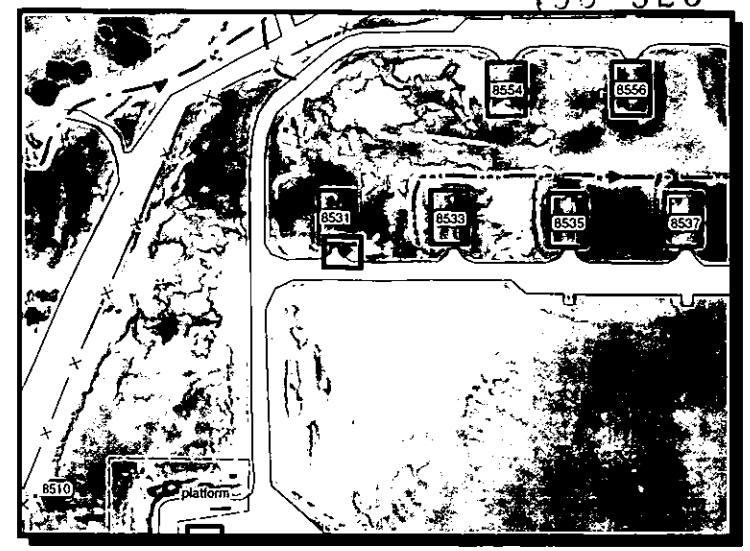

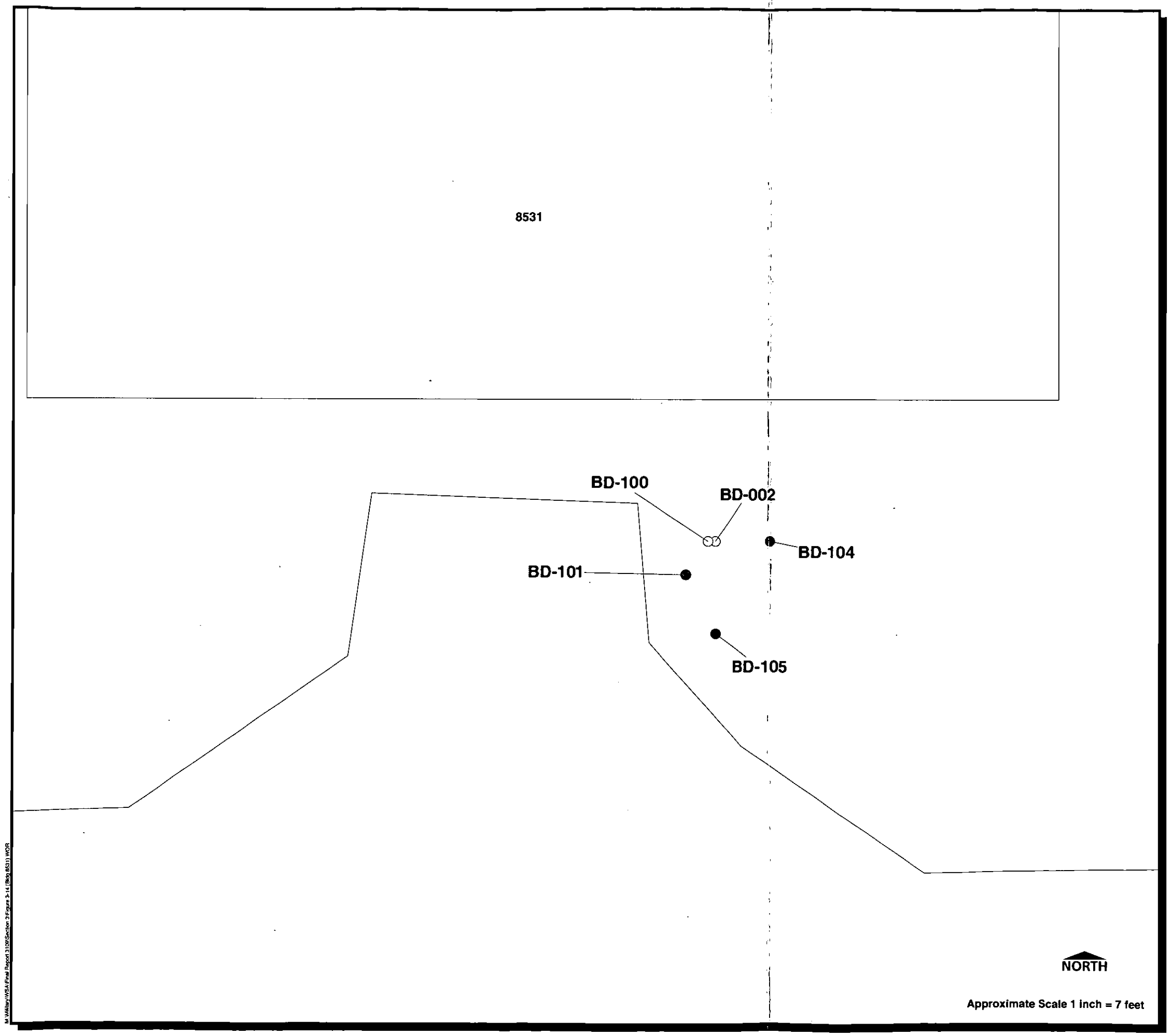

Mercury Conc ntrati n Relative to Background UTL$_{95,95}$

- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Figure 3-14
Surface Soil Mercury Levels Adjacent to Bunker Bldg. 8531

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

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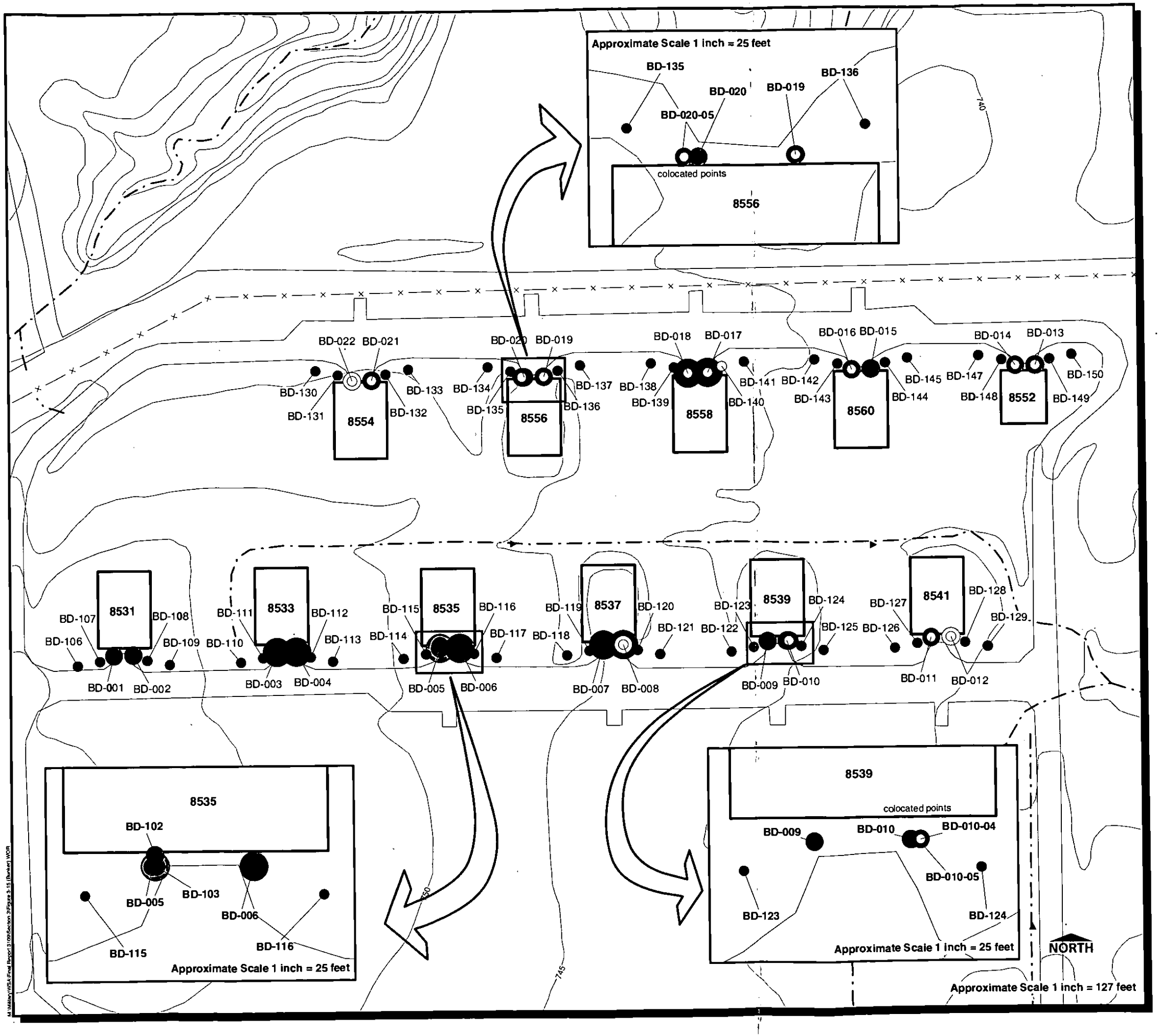
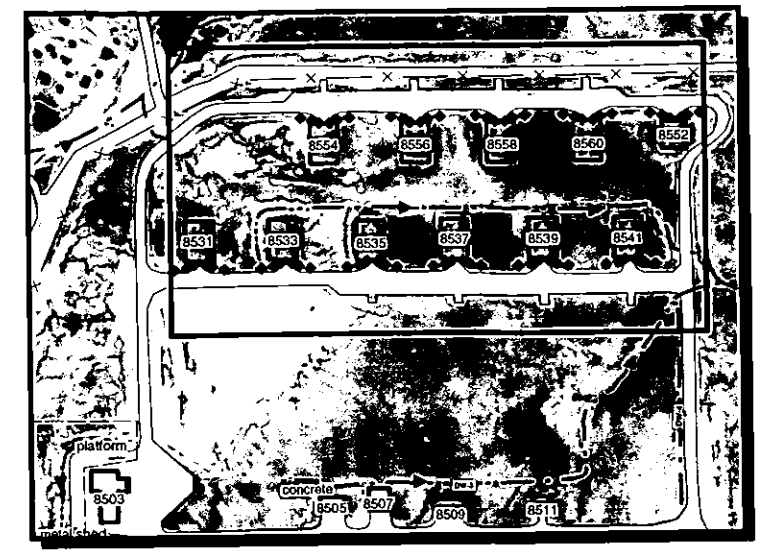




Copper Conc ntration Relative to Background UTL$_{95,95}$

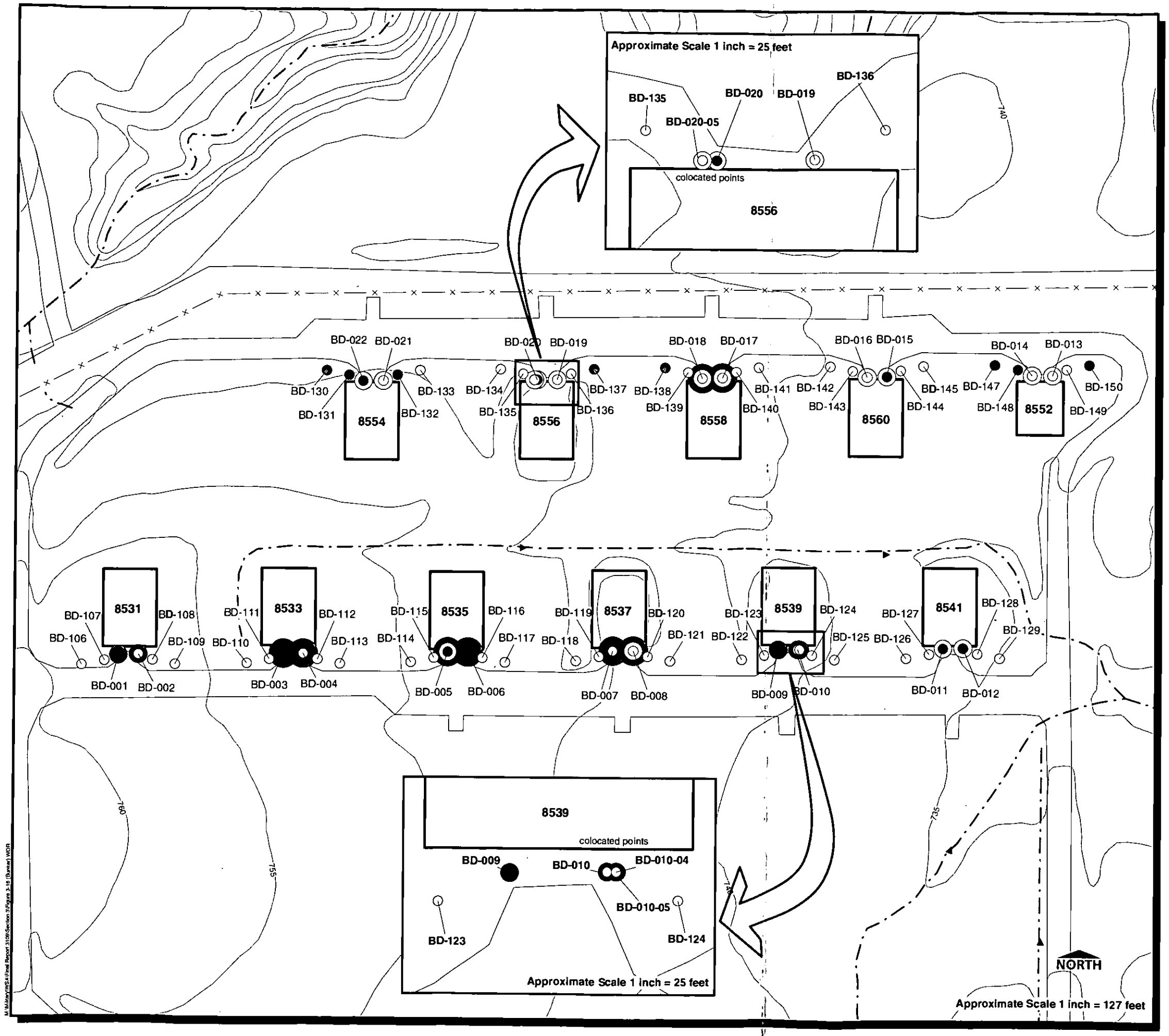
- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Inner color indicates Surface
Middle color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-15
Surface and Subsurface Soil Copper Lev ls Adjac nt to Bunker Buildings

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/11/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109



Cadmium Conc ntration Relative to Background UTL$_{95,95}$

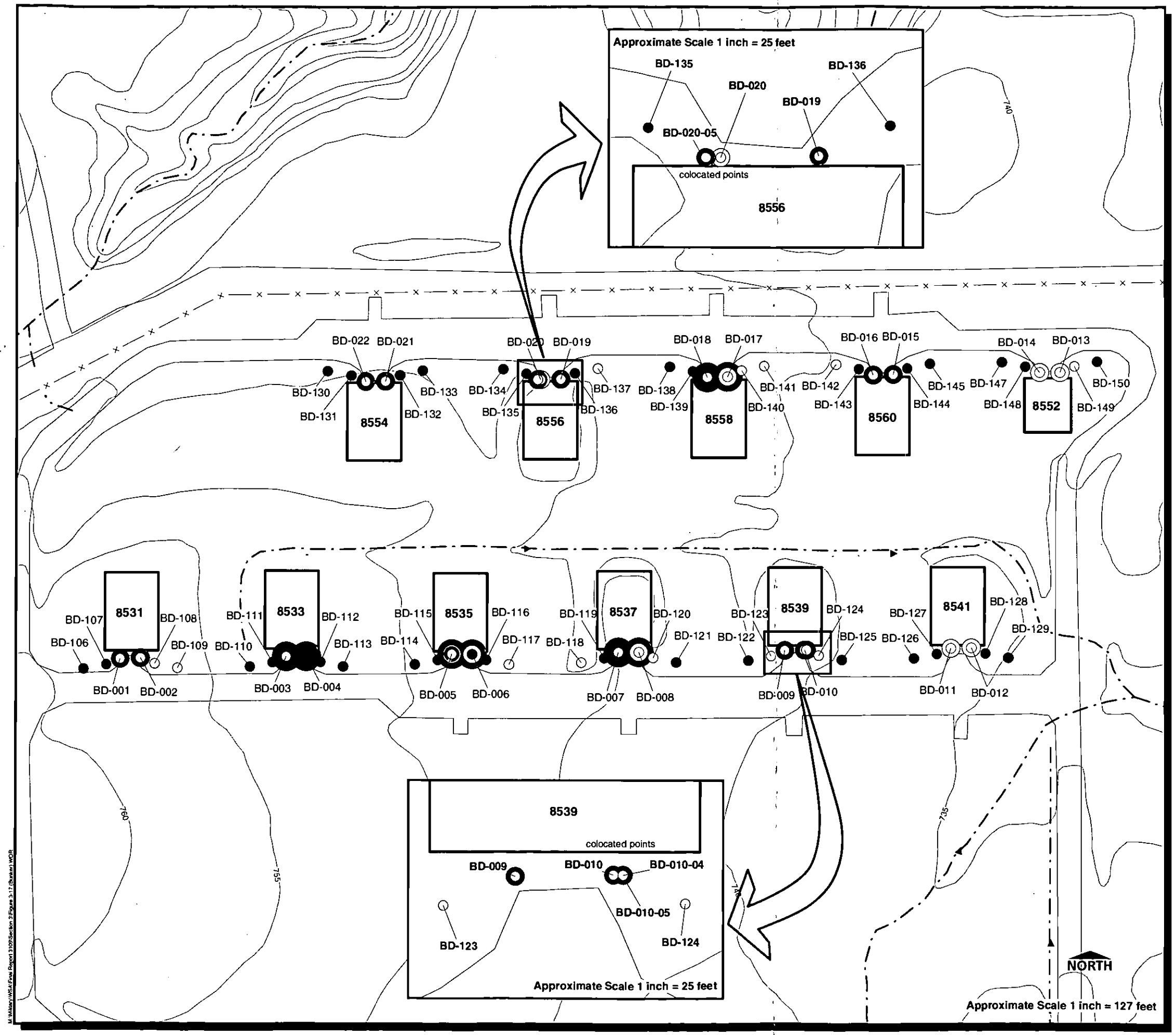
- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

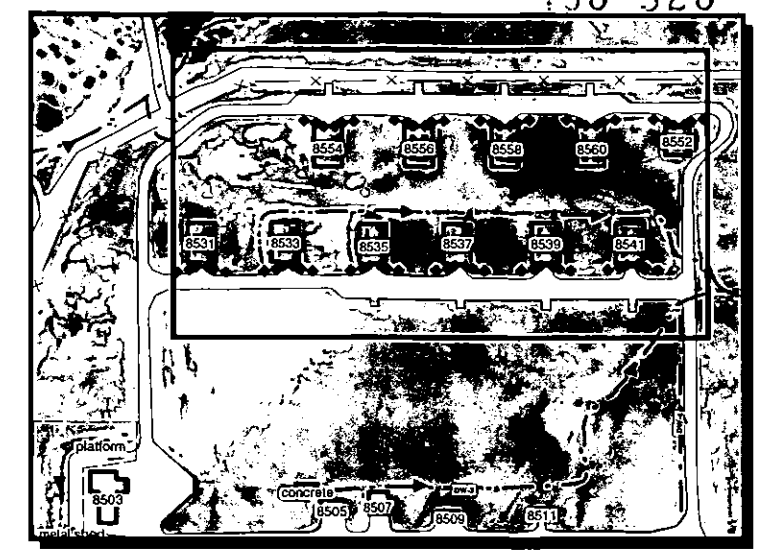
Inner color indicates Surface
Middle color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-16
Surface and Subsurfac Soil Cadmium Levels Adjac nt to Bunker Buildings

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/17/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109





Lead Concentrati n
Relative to Backgr und UTL$_{95,95}$

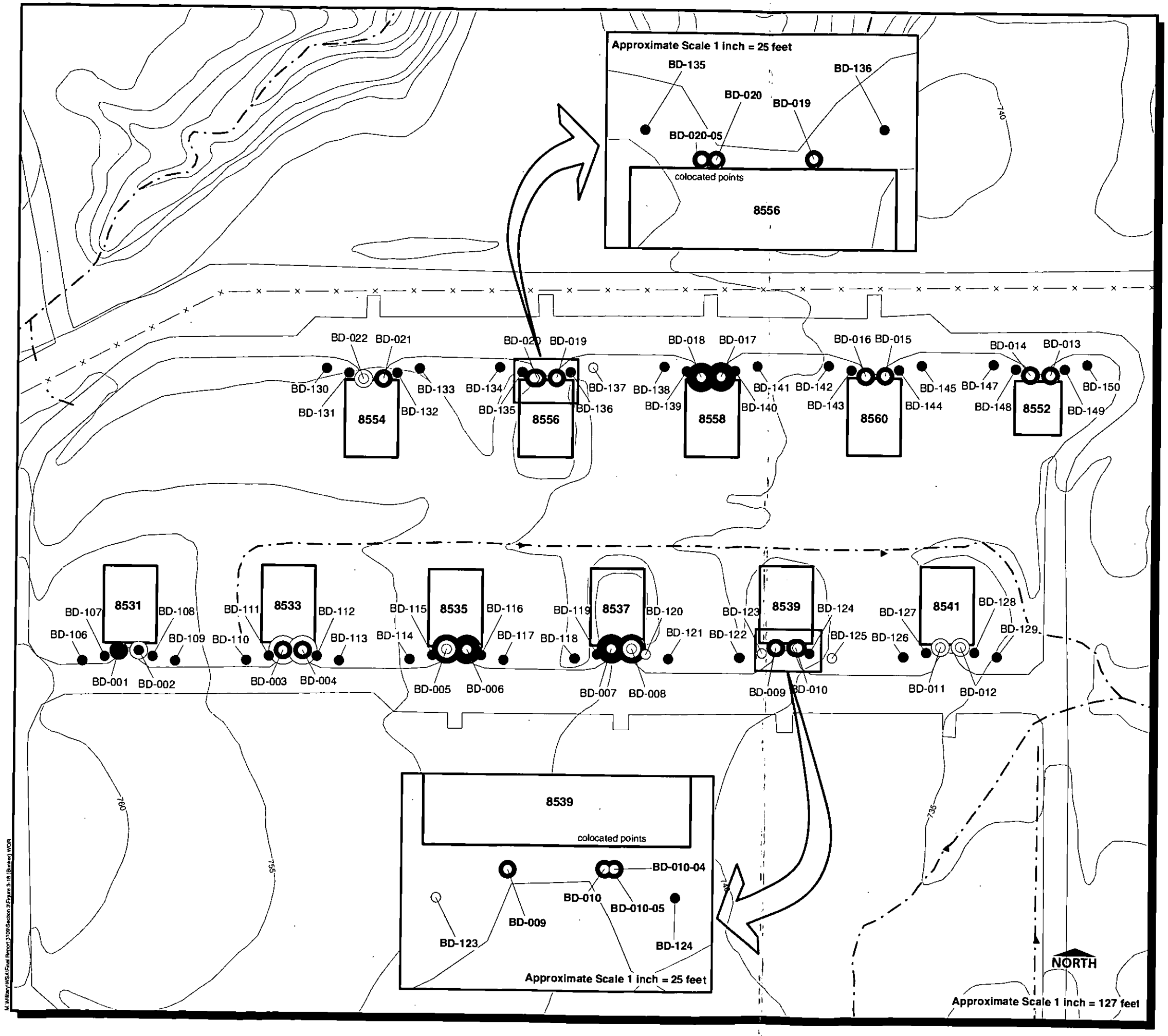
- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Inner color indicates Surface
Middle color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-17
Surface and Subsurfac Soil Lead Levels Adjac nt to Bunker Buildings

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/11/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109



Zinc Concentration Relative to Background $UTL_{95,95}$

- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Inner color indicates Surface
Middle color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-18
Surface and Subsurfac Soil Zinc Lev ls Adjac nt to Bunker Buildings

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/26/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

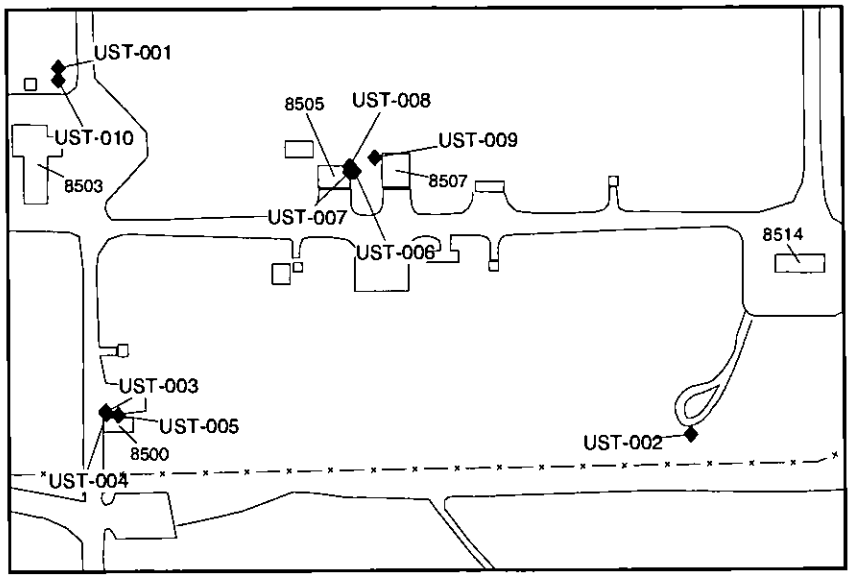
UST-001	
Sample Number:	UST-001-01
Depth (ft. bgs):	0.0 to 2.0
TPH	-
BTEX	-
PAH	-

UST-002		
Sample Number:	UST-002-01	UST-002-02
Depth (ft. bgs):	0.0 to 2.0	6.0 to 8.0
TPH	-	-
BTEX	-	-
PAH	0.041	-

UST-003	
Sample Number:	UST-003-01
Depth (ft. bgs):	0.0 to 1.0
TPH	-
BTEX	0.00095
PAH	7.94

UST-004	
Sample Number:	UST-004-01
Depth (ft. bgs):	5.0 to 7.0
TPH	-
BTEX	-
PAH	20.63

UST-005	
Sample Number:	UST-005-01
Depth (ft. bgs):	5.0 to 7.0
TPH	-
BTEX	-
PAH	24.65



UST-006	
Sample Number:	UST-006-01
Depth (ft. bgs):	6.0 to 8.0
TPH	-
BTEX	-
PAH	0.939

UST-007		
Sample Number:	UST-007-01	UST-007-04
Depth (ft. bgs):	0.0 to 2.0	0.0 to 2.0
TPH	-	-
BTEX	-	-
PAH	2.538	0.302

UST-008	
Sample Number:	UST-008-01
Depth (ft. bgs):	0.0 to 2.0
TPH	-
BTEX	-
PAH	9.53

UST-009		
Sample Number:	UST-009-01	UST-009-02
Depth (ft. bgs):	2.0 to 4.0	4.0 to 6.0
TPH	-	-
BTEX	-	-
PAH	0.215	0.76

UST-010	
Sample Number:	UST-010-01
Depth (ft. bgs):	0.0 to 2.0
TPH	-
BTEX	-
PAH	0.067

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-19 -- Soil Contaminant Distribution at the Former UST Locations

Creation Date: 02/01/1999
Rev. Date: 07/23/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

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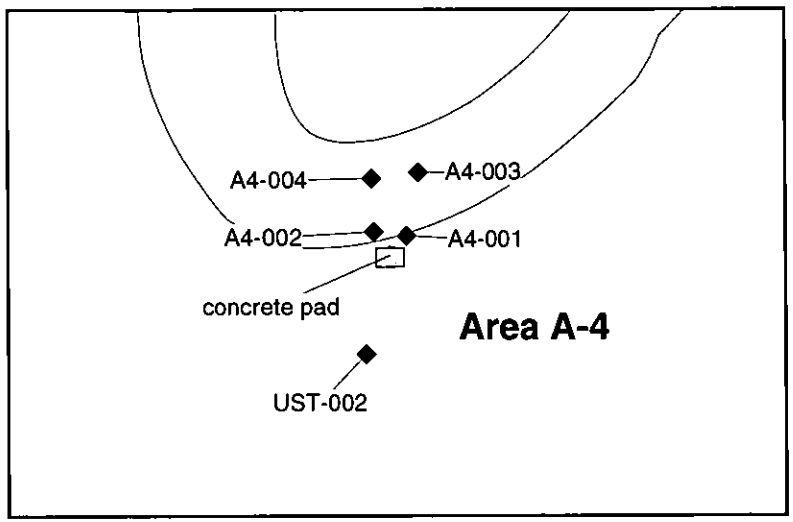
A4-001		
Sample Number:	A4-001-01	A4-001-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
TPH	-	-
BTEX		
Toluene	0.012	-
PAH		
Benzo(a)anthracene	0.027	-
Benzo(a)pyrene	0.036	-
Benzo(b)fluoranthrene	0.041	-
Benzo(k)fluoranthrene	0.022	-
Indeno(1,2,3-cd)pyrene	0.090	-

A4-002		
Sample Number:	A4-002-01	A4-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
TPH	-	-
BTEX		
Toluene	0.03	-
PAH		
Benzo(a)anthracene	0.019	-
Benzo(a)pyrene	0.027	-
Benzo(b)fluoranthrene	0.030	-
Benzo(k)fluoranthrene	0.017	-
Indeno(1,2,3-cd)pyrene	0.048	-



A4-003			
Sample Number:	A4-003-01	A4-003-04	A4-003-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.0
TPH	-	-	-
BTEX			
Toluene	0.011	0.0063	-
PAH			
Benzo(a)anthracene	0.013	0.010	-
Benzo(a)pyrene	0.016	-	-
Benzo(b)fluoranthrene	0.016	0.015	-

A4-004		
Sample Number:	A4-004-01	A4-004-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
TPH	-	-
BTEX		
Toluene	0.014	-
PAH		
Benzo(a)anthracene	0.028	-
Benzo(a)pyrene	0.038	-
Benzo(b)fluoranthrene	0.043	-
Benzo(k)fluoranthrene	0.024	-
Indeno(1,2,3-cd)pyrene	0.042	-

- = Analyzed but not detected above background $UTL_{95,95}$.
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- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-20 -- Soil Contaminant Distribution at Vehicle Fueling Area A-4

Creation Date: 02/01/1999
Rev. Date: 07/23/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

198 331

TRF-001	
Sample Number:	TRF-001-01
Depth (ft. bgs):	0.0 to 0.5
Pesticides/PCBs	-

TRF-002	
Sample Number:	TRF-002-01
Depth (ft. bgs):	0.0 to 0.5
Pesticides/PCBs	0.011 (F)

TRF-003		
Sample Number:	TRF-003-01	TRF-003-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-

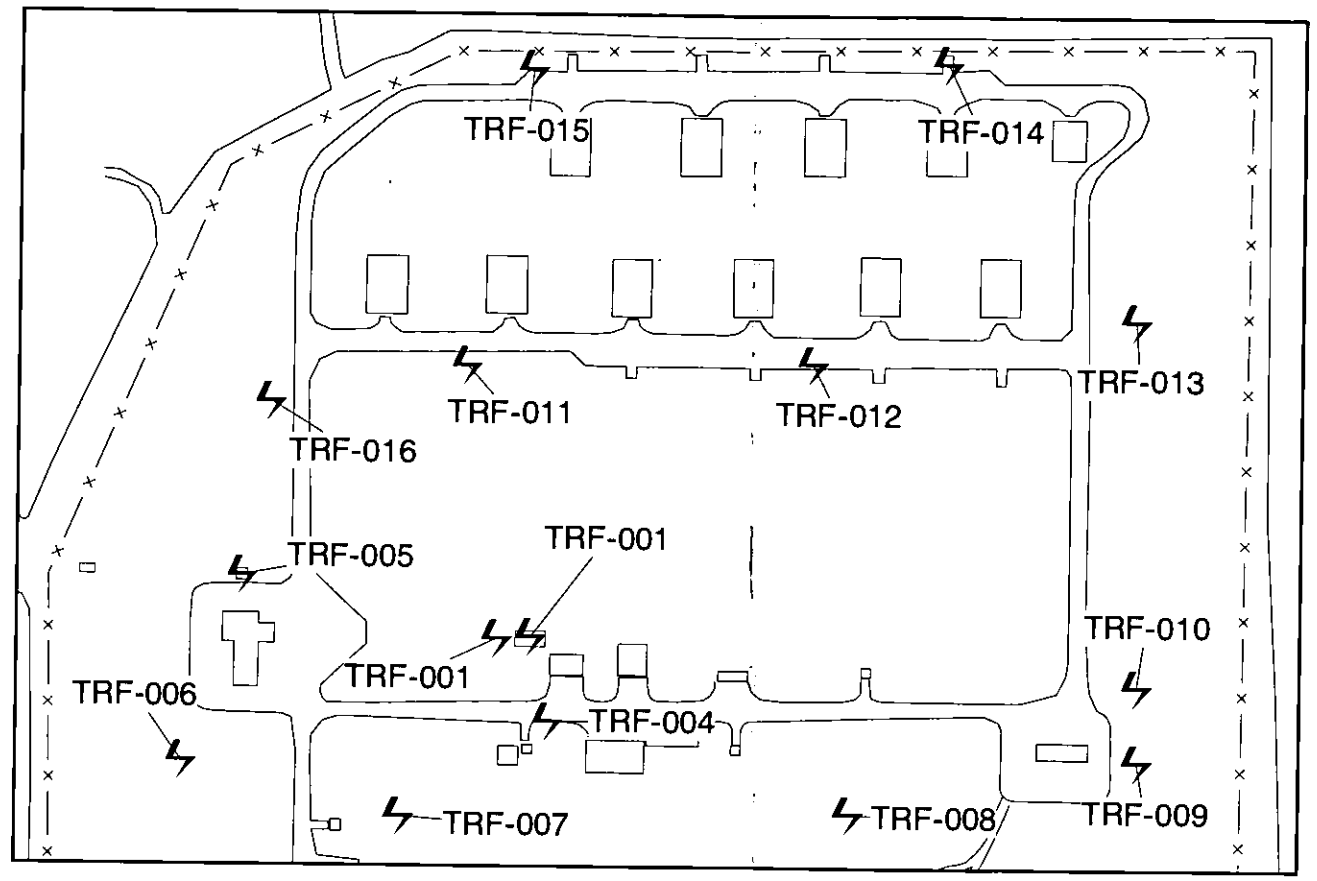
TRF-004		
Sample Number:	TRF-004-01	TRF-004-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-

TRF-005		
Sample Number:	TRF-005-01	TRF-005-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-

TRF-006		
Sample Number:	TRF-006-01	TRF-006-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-

TRF-007		
Sample Number:	TRF-007-01	TRF-007-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-

TRF-008		
Sample Number:	TRF-008-01	TRF-008-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-



TRF-009			
Sample Number:	TRF-009-01	TRF-009-02	TRF-009-05
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.7	0.5 to 1.7
Pesticides/PCBs	-	-	-

TRF-010		
Sample Number:	TRF-010-01	TRF-010-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Pesticides/PCBs	-	-

TRF-011		
Sample Number:	TRF-011-01	TRF-011-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 10.5
Pesticides/PCBs	-	-

TRF-012		
Sample Number:	TRF-012-01	TRF-012-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Pesticides/PCBs	-	-

TRF-013		
Sample Number:	TRF-013-01	TRF-013-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Pesticides/PCBs	-	-

TRF-014		
Sample Number:	TRF-014-01	TRF-014-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.2
Pesticides/PCBs	-	-

TRF-015		
Sample Number:	TRF-015-01	TRF-015-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 1.5
Pesticides/PCBs	-	-

TRF-016		
Sample Number:	TRF-016-01	TRF-016-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.0
Pesticides/PCBs	-	-

The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-21
Soil Contaminant Distribution at the Electrical Transformer Locations

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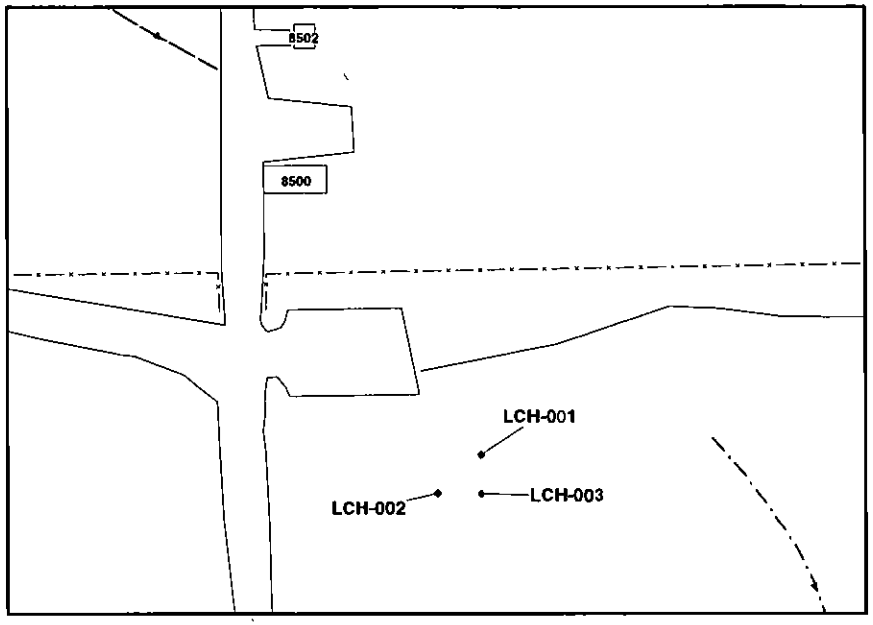
LCH-001	
Sample Number:	LCH-001-01
Depth (ft. bgs):	2.8 to 3.0
Inorganics	-
Semivolatiles	0.91 (F)
Volatiles	-
Pesticides/PCBs	-
Explosives	-



LCH-003		
Sample Number:	LCH-003-01	LCH-003-02
Depth (ft. bgs):	0.0 to 0.5	1.0 to 2.5
Inorganics		
Antimony	-	0.93 (F)
Cadmium	-	0.57
Semivolatiles	-	0.35 (F)
Volatiles	0.0084	0.0069 (F)
Pesticides/PCBs	-	-
Explosives	-	-

LCH-002			
Sample Number:	LCH-002-01	LCH-002-02	LCH-002-03
Depth (ft. bgs):	0.0 to 0.6	1.0 to 2.5	1.0 to 2.5
Inorganics			
Antimony	-	1.3	0.98 (F)
Cadmium	-	0.66	0.64
Semivolatiles	2.52 (F)	2.05 (F)	3.65 (F)
Volatiles	0.0059 (F)	0.0058 (F)	0.0076
Pesticides/PCBs	-	-	-
Explosives	-	-	-

- = Analyzed but not detected above background $UTL_{95,95}$.

- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.

- All concentrations reported in mg/kg.

- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

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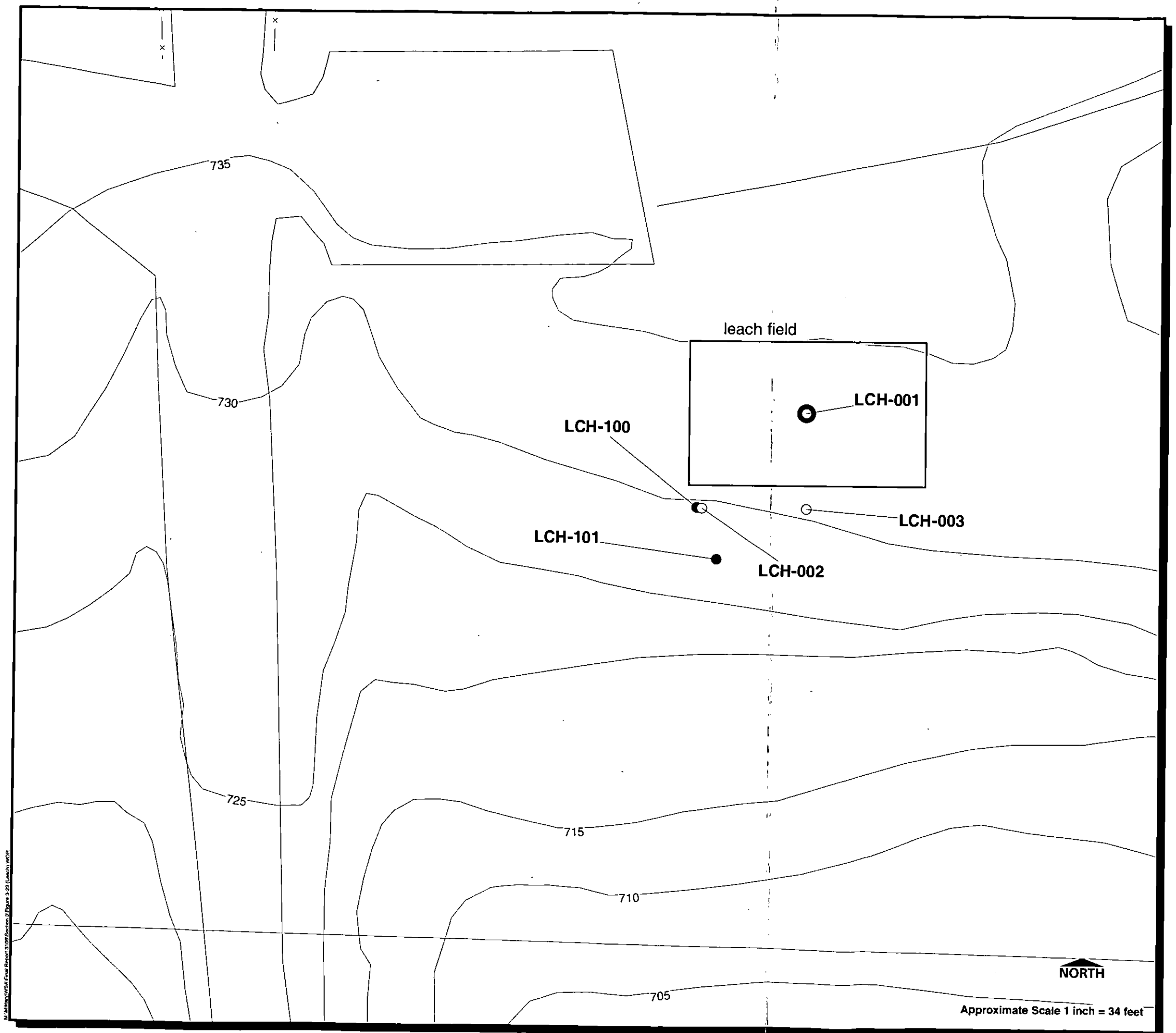
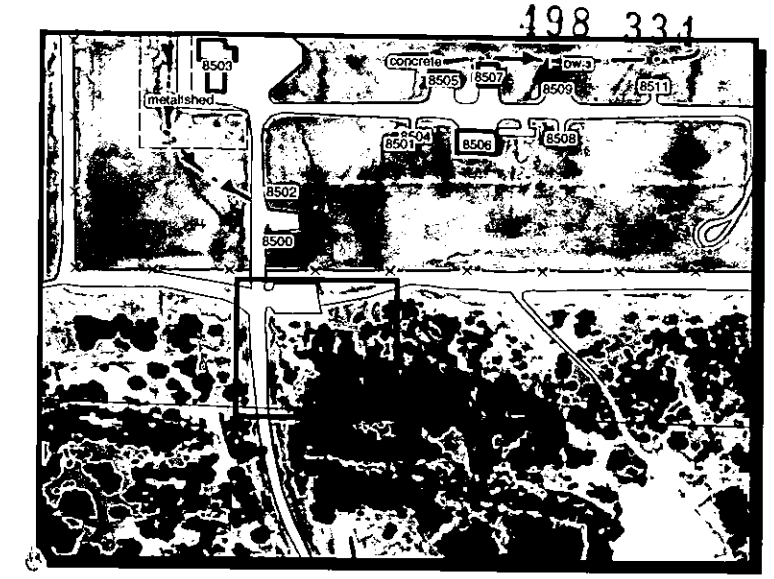
The Environmental Company, Inc.

Figure 3-22 -- Soil Contaminant Distribution in the Leach Field

Creation Date: 02/01/1999
Rev. Date: 07/23/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

498 333





Antimony Conc ntrati n Relative to Background UTL$_{95,95}$

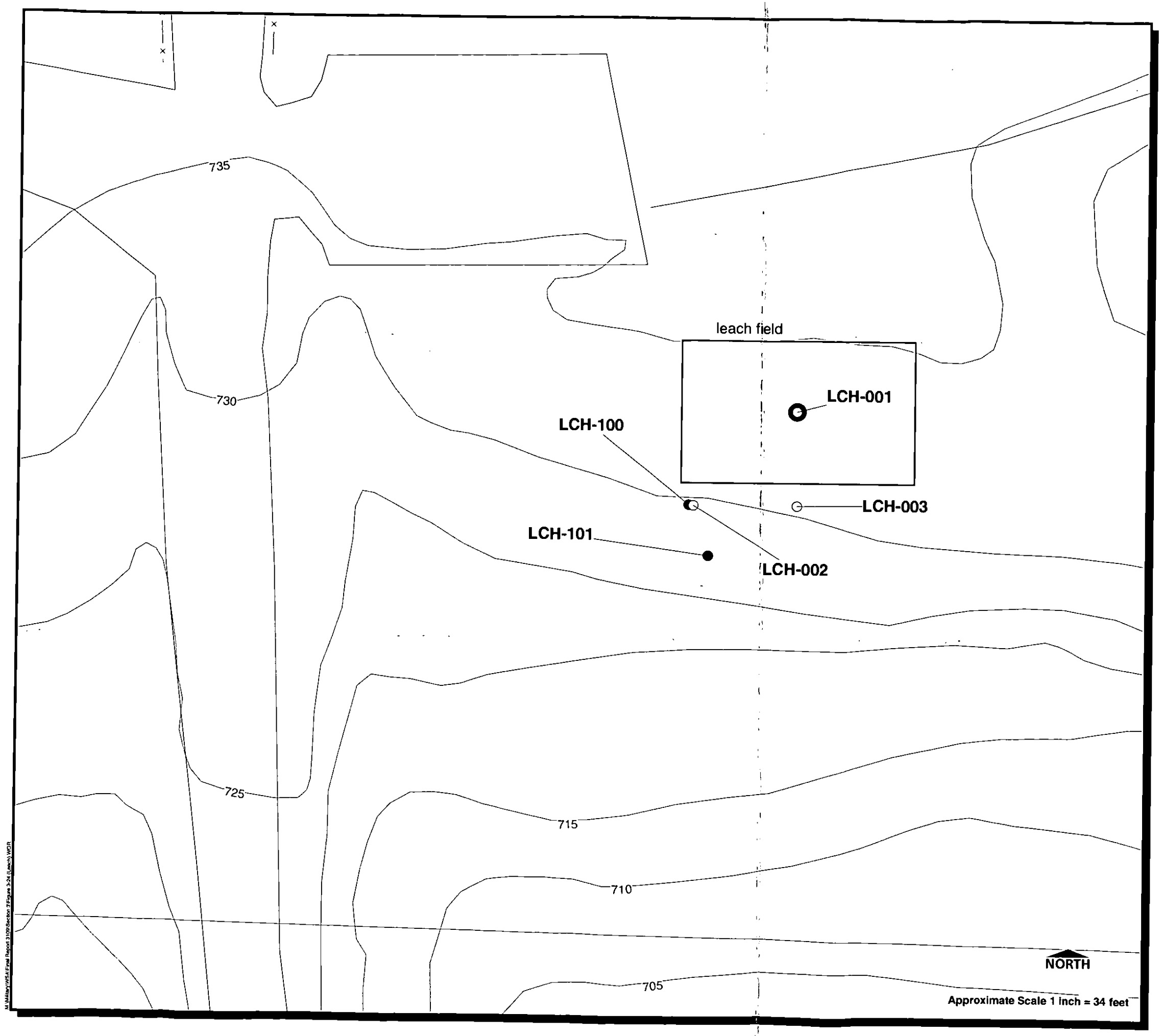
- ● Less than background
- ● Not detected; detection limit above background
- ○ Detected at concentration less than 10 times background

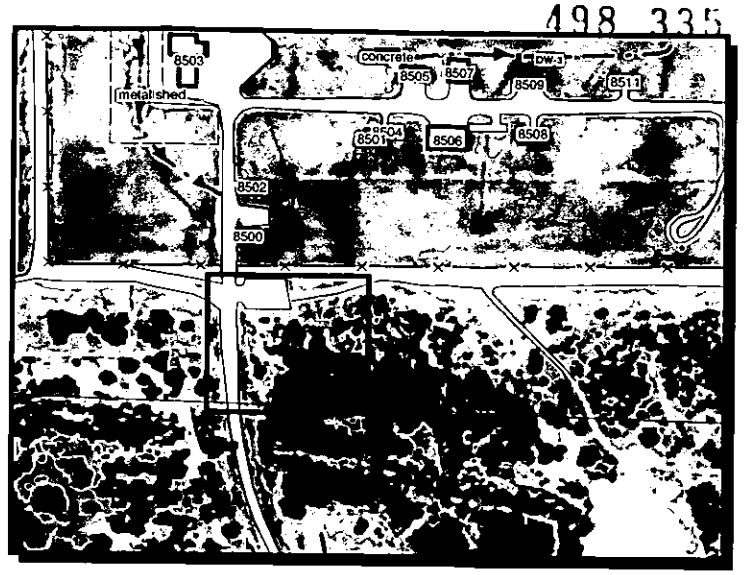
Inner color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-23
Subsurface Soil Antimony Levels in the Vicinity of th Leach Fi ld

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109





Cadmium Conc ntration Relative to Backgr und $UTL_{95,95}$

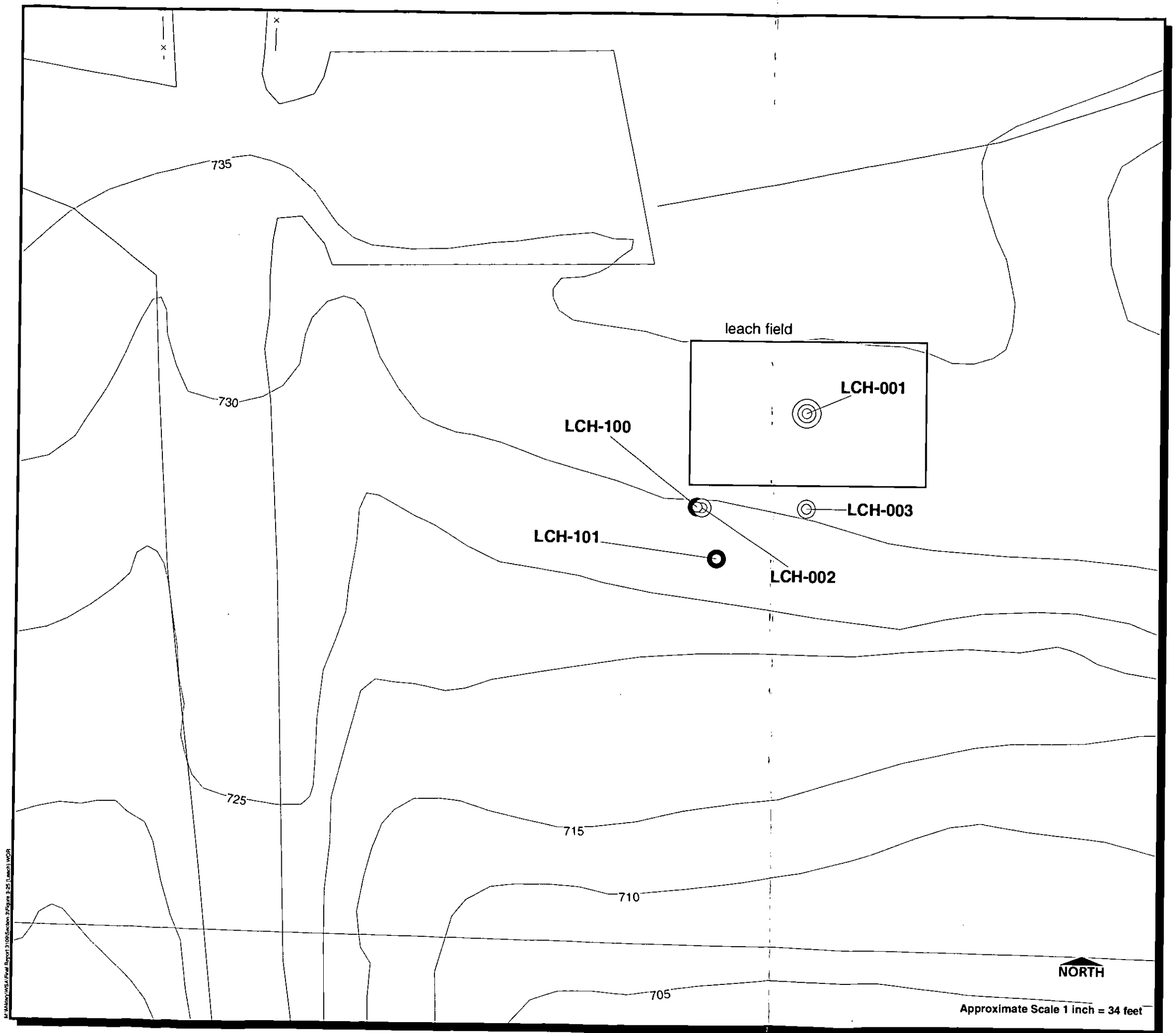
- ● Less than background
- ○ Detected at concentration less than 10 times background

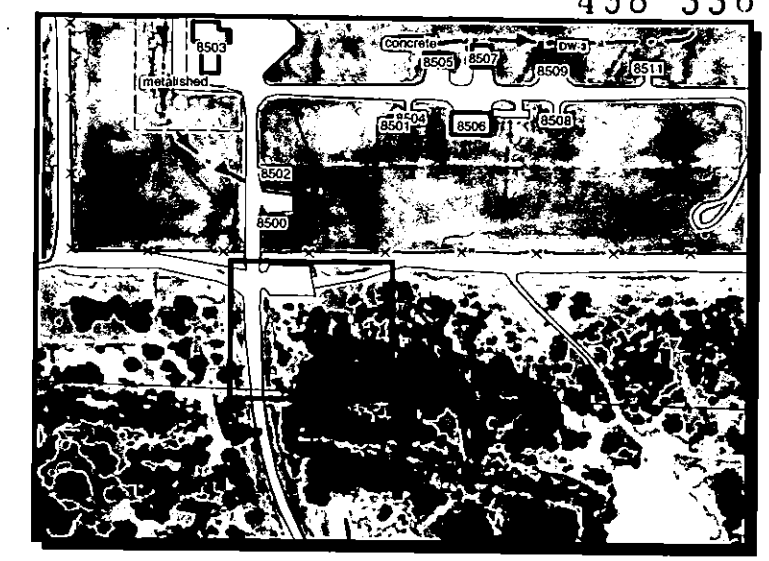
Inner color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-24 Subsurface Soil Cadmium Levels in the Vicinity of the L ach Field

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/05/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedard
Project No:	P-3109





2-Methylnaphthalen and Naphthalene Concentration Relative to Background

- ● Less than background
- ○ Detected at concentration less than 10 times background

Inner color indicates Surface (0.0-0.5 ft. bgs)
Middle color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-25
Subsurface Soil 2-Methylnaphthalene and Naphthalene Levels in the Vicinity of the Leach Field

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/26/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

DW1-001		
Sample Number:	DW1-001-01	DW1-001-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Arsenic	24.6	-
Cadmium	-	0.75
Copper	23.2	18
Zinc	74.9	42.5
Semivolatiles	-	1.62
Volatiles	-	-
Pesticides/PCBs	0.0082	-
Explosives	-	-

DW1-002		
Sample Number:	DW1-002-01	DW1-002-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	2.3	0.9
Chromium	-	19.6
Copper	26.4	-
Lead	35.8	-
Mercury	0.12	-
Zinc	85.5	82.8
Semivolatiles	-	-
Volatiles	-	-
Pesticides/PCBs	-	-
Explosives	-	-

DW1-003			
Sample Number:	DW1-003-01	DW1-003-02	DW1-003-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 4.0
Inorganics			
Antimony	-	1.3	-
Arsenic	8.6	-	-
Cadmium	4.9	0.51	-
Chromium	-	16.8	-
Copper	60.1	-	-
Lead	31.2	-	-
Mercury	0.054 (F)	-	-
Molybdenum	14.7	-	-
Zinc	98.1	-	-
Semivolatiles	4.89	-	-
Volatiles	-	-	-
Pesticides/PCBs	-	-	-
Explosives	-	-	-

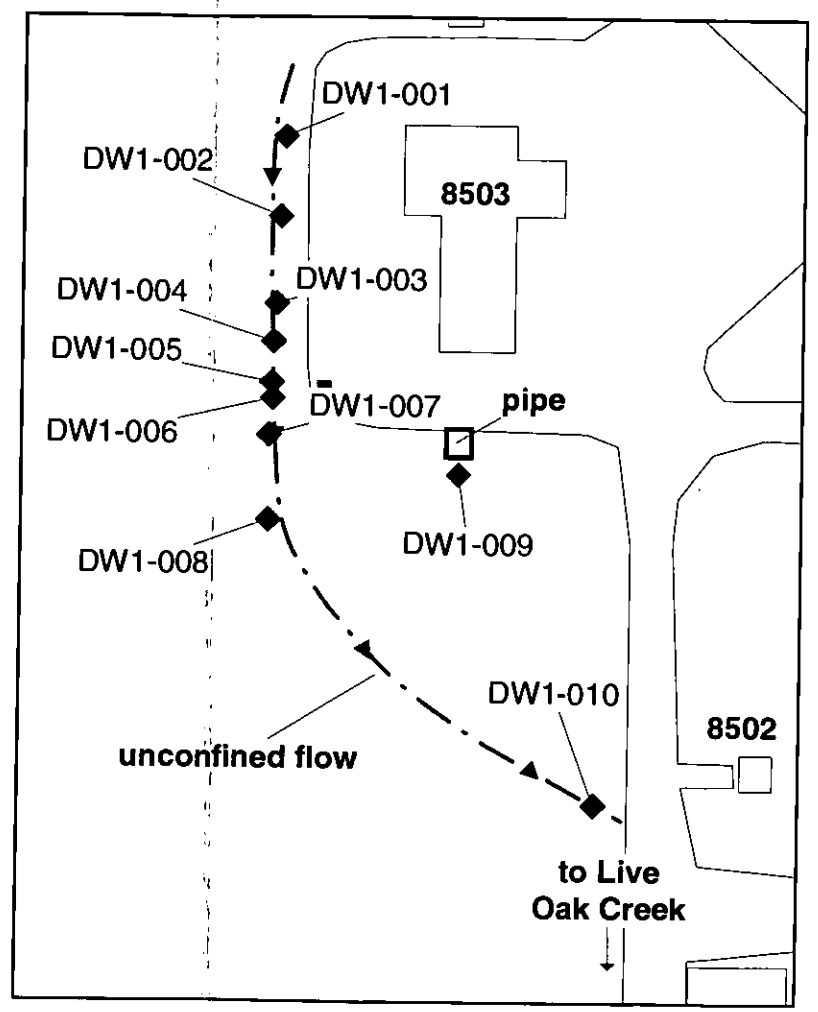
DW1-004			
Sample Number:	DW1-004-01	DW1-004-02	DW1-004-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.7
Inorganics			
Arsenic	9.9	-	-
Cadmium	2.6	0.88	-
Chromium	185	32.9	22
Mercury	0.064 (F)	-	-
Molybdenum	9.2	-	-
Zinc	287	51	-
Semivolatiles	1.94	-	-
Volatiles	0.0034	-	-
Pesticides/PCBs	-	-	-
Explosives	-	-	-

DW1-005		
Sample Number:	DW1-005-01	DW1-005-02
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5
Inorganics		
Cadmium	2.1	-
Zinc	114	-
Semivolatiles	5.1	-
Volatiles	0.0086	-
Pesticides/PCBs	0.032 (F)	-
Explosives	-	-

DW1-006				
Sample Number:	DW1-006-01	DW1-006-04	DW1-006-02	DW1-006-05
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5	0.5 to 2.5	0.5 to 2.5
Inorganics				
Antimony	-	-	0.95 (F)	-
Arsenic	11	11.5	-	-
Cadmium	-	-	-	3.8
Chromium	-	-	-	43.3
Lead	-	-	-	23.7
Molybdenum	-	-	-	13.5
Zinc	72.2	-	-	-
Semivolatiles	2.14	3.76		
Volatiles	0.021	0.0058		
Pesticides/PCBs	-	-	-	-
Explosives	-	-	-	-

DW1-007			
Sample Number:	DW1-007-01	DW1-007-02	DW1-007-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	8.0 to 10.0
Inorganics			
Antimony	-	0.93 (F)	-
Arsenic	13.1	-	-
Cadmium	2.1	0.83	-
Chromium	-	19.8	18.2
Iron	-	-	26000
Lead	-	-	22.5
Magnesium	2830	-	-
Selenium	-	-	1.7
Zinc	75.4	-	-
Semivolatiles	0.51	-	-
Volatiles	-	-	0.134
Pesticides/PCBs	-	-	-
Explosives	-	-	-

DW1-008			
Sample Number:	DW1-008-01	DW1-008-02	DW1-008-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	6.5 to 8.5
Inorganics			
Arsenic	11.7	-	-
Chromium	-	15.3	-
Magnesium	2810	-	-
Mercury	-	0.1	-
Zinc	73.3	-	-
Semivolatiles	4.58	-	-
Volatiles		0.0016 (F)	0.0033 (F)
Pesticides/PCBs	-	-	-
Explosives	-	-	-



DW1-009			
Sample Number:	DW1-009-01	DW1-009-02	DW1-009-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	6.5 to 8.5
Inorganics			
Arsenic	8.2	-	-
Cadmium	1.9	-	-
Calcium	-	2530000	-
Chromium	49.1	-	-
Lead	97.2	-	-
Zinc	72.9	-	-
Semivolatiles	3.787	-	-
Volatiles	0.0094	-	-
Pesticides/PCBs	0.0274	-	-
Explosives	-	-	-

DW1-010			
Sample Number:	DW1-010-01	DW1-010-02	DW1-010-03
Depth (ft. bgs):	0.0 to 0.5	0.5 to 2.5	2.5 to 3.5
Inorganics			
Iron	-	-	25000
Magnesium	2640	-	-
Molybdenum	-	-	8.4
Semivolatiles	-	-	-
Volatiles	0.014	-	-
Pesticides/PCBs	-	-	-
Explosives	-	-	-

The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

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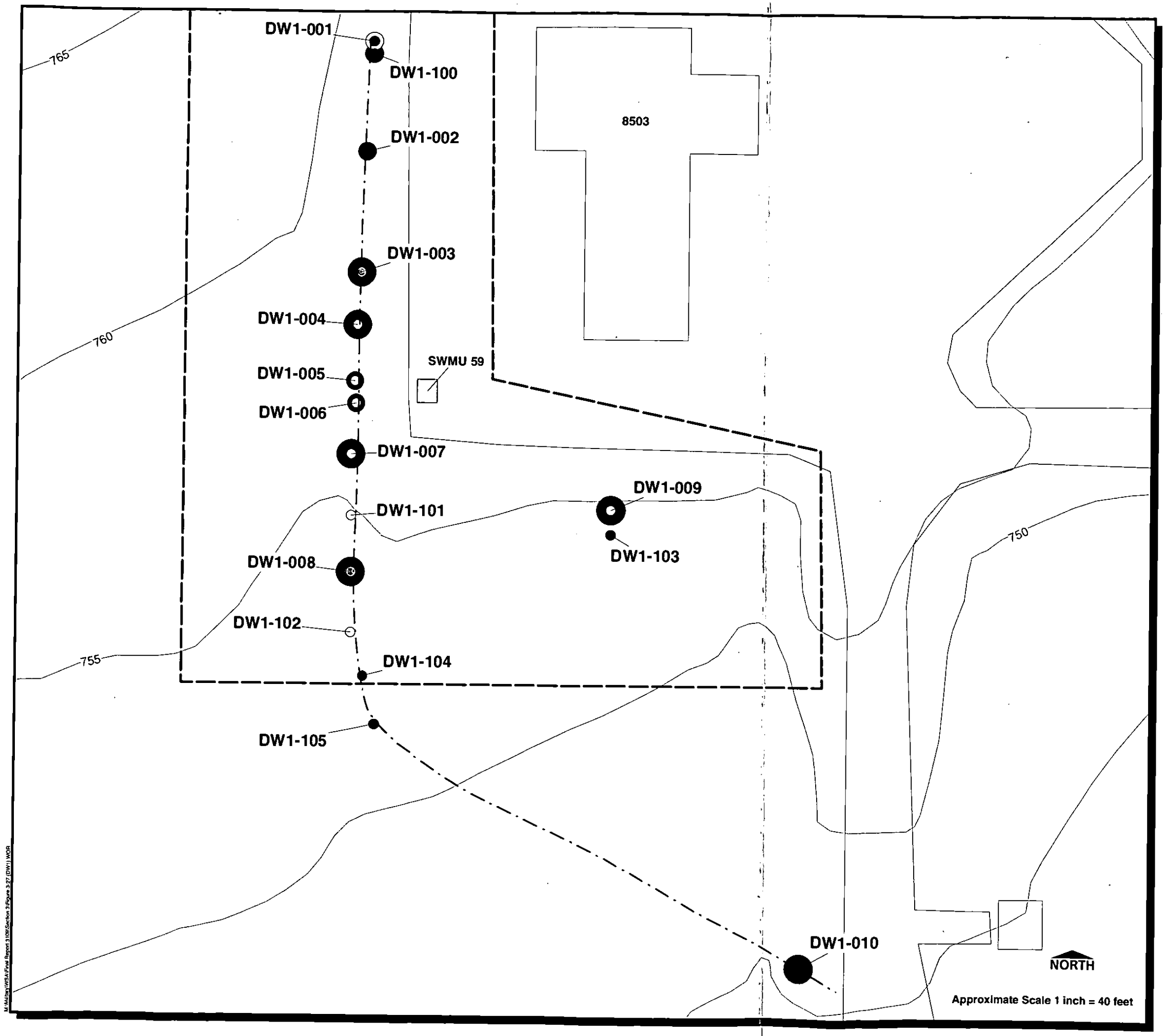
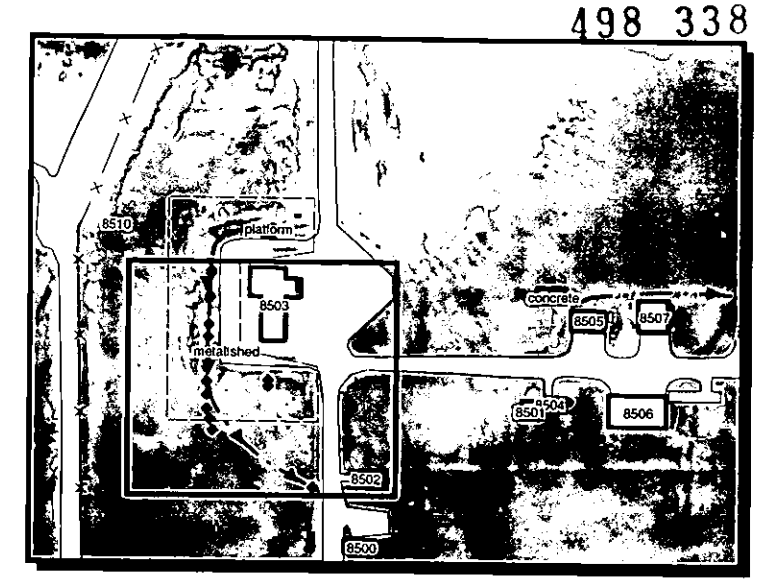
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-26
Soil/Sediment Contaminant Distribution in Drainageway DW-1





PAH Concentrati n Relative to Background

- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Inner color indicates Surface
Middle color indicates Upper Subsurface (0.5-2.5 ft. bgs)
Outer color indicates Lower Subsurface (>2.5 ft. bgs)

Figure 3-27
Surface and Subsurface Soil PAH Lev ls in Drainag way 1 (DW-1)

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/10/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

DW2-001	
Sample Number:	DW2-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	0.0027 (F)
Pesticides/PCBs	-
Explosives-(ug/Kg)	-

DW2-002	
Sample Number:	DW2-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	0.0089
Pesticides/PCBs	-
Explosives	-

DW2-003	
Sample Number:	DW2-003-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW3-001	
Sample Number:	DW3-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Mercury	0.061 (F)
Zinc	169
Semivolatiles	23.082
Volatiles	0.01
Pesticides/PCBs	0.031
Explosives	-

DW3-002	
Sample Number:	DW3-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Magnesium	2720
Selenium	1
Semivolatiles	-
Volatiles	0.0022
Pesticides/PCBs	-
Explosives	-

DW3-003	
Sample Number:	DW3-003-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	0.0035
Pesticides/PCBs	-
Explosives	-

DW4-001	
Sample Number:	DW4-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Cadmium	1.4
Lead	71.6
Manganese	661
Zinc	80.2
Semivolatiles	15.84
Volatiles	0.0043
Pesticides/PCBs	0.0182
Explosives	-

DW4-002	
Sample Number:	DW4-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Lead	26.8
Selenium	1.6
Semivolatiles	-
Volatiles	0.0091
Pesticides/PCBs	-
Explosives	-

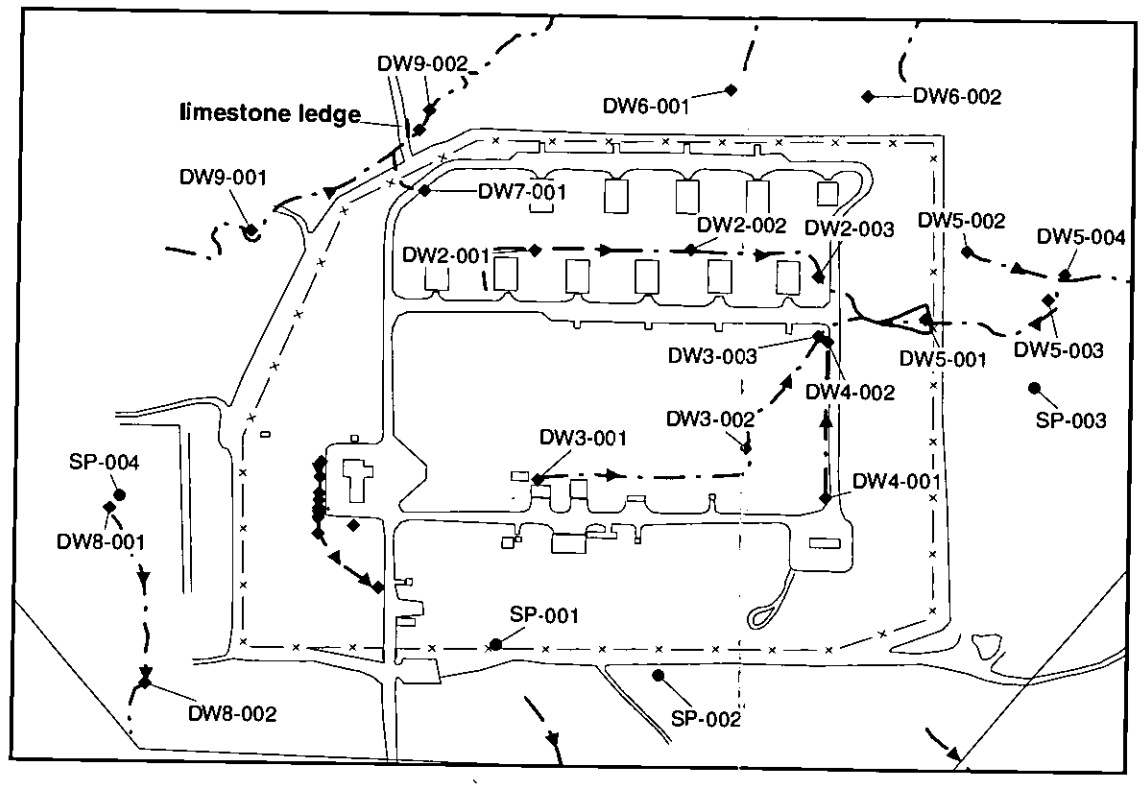
DW5-001	
Sample Number:	DW5-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	0.002
Pesticides/PCBs	-
Explosives	-

DW5-002	
Sample Number:	DW5-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	0.0026
Pesticides/PCBs	-
Explosives	-

DW5-003	
Sample Number:	DW5-003-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW5-004	
Sample Number:	DW5-004-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

SP-001		
Sample Number:	SP-001-01	SP-001-02 DUP
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5
Inorganics		
Zinc	90.1	93.7
Semivolatiles	-	-
Volatiles	-	-
Pesticides/PCBs	-	-
Explosives	-	-



SP-002	
Sample Number:	SP-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

SP-003	
Sample Number:	SP-003-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

SP-004	
Sample Number:	SP-004-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW6-001	
Sample Number:	DW6-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	0.033
Pesticides/PCBs	-
Explosives	-

DW6-002	
Sample Number:	DW6-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW7-001		
Sample Number:	DW7-001-01	DW7-001-02
Depth (ft. bgs):	0.0 to 0.5	0.0 to 0.5
Inorganics	-	-
Semivolatiles	-	-
Volatiles	0.018	0.003
Pesticides/PCBs	-	-
Explosives	-	-

DW8-001	
Sample Number:	DW8-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Magnesium	2920
Explosives	-

DW8-002	
Sample Number:	DW8-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Magnesium	2680
Explosives	-

DW9-001	
Sample Number:	DW9-001-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	-
Explosives	-

DW9-002	
Sample Number:	DW9-002-01
Depth (ft. bgs):	0.0 to 0.5
Inorganics	
Arsenic	10.5
Chromium	371
Cobalt	12.2
Copper	64.6
Iron	49100
Lead	106
Manganese	744
Molybdenum	15.3
Nickel	207
Semivolatiles	-
Volatiles	0.0042
Pesticides/PCBs	-
Explosives	-

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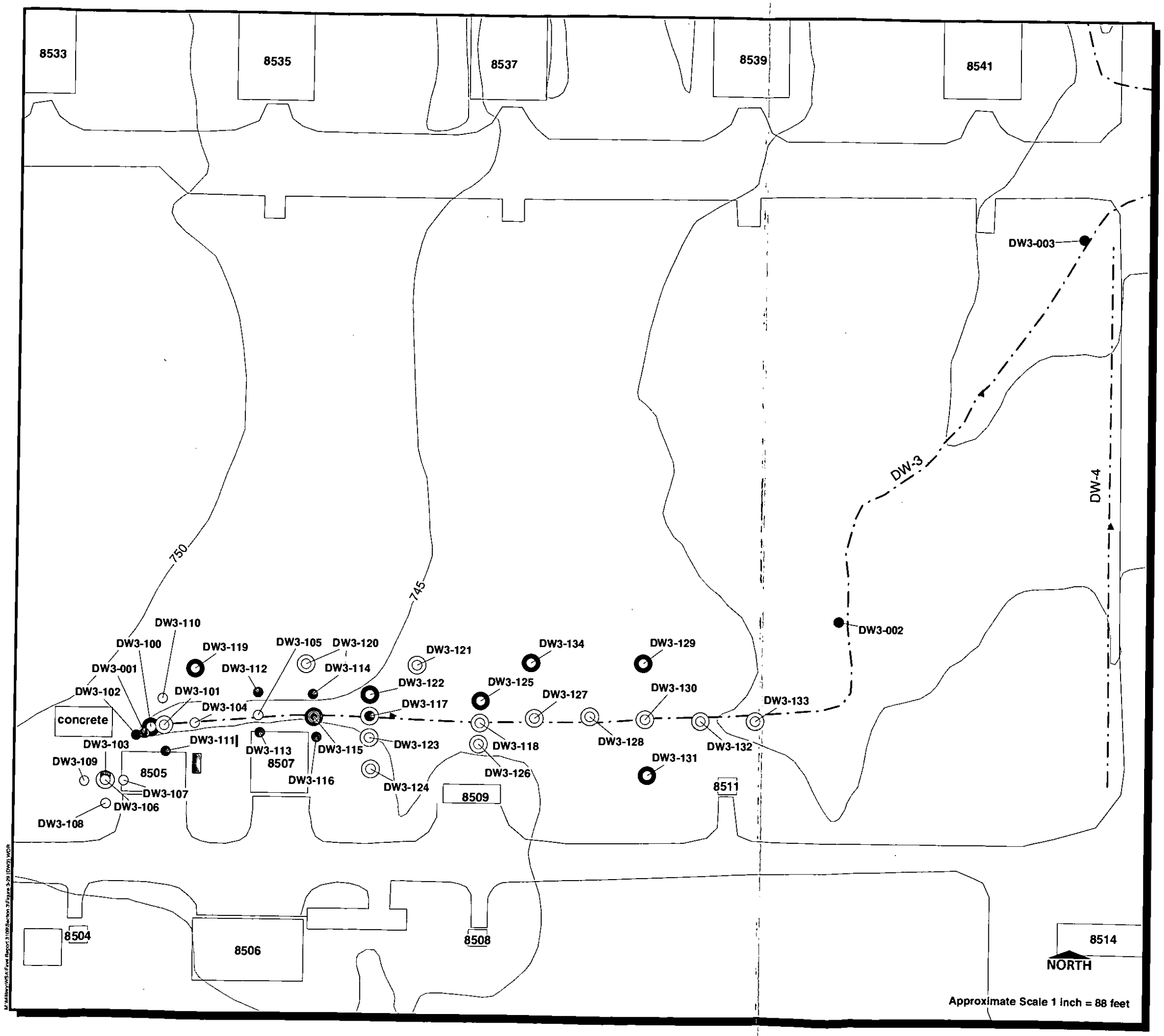
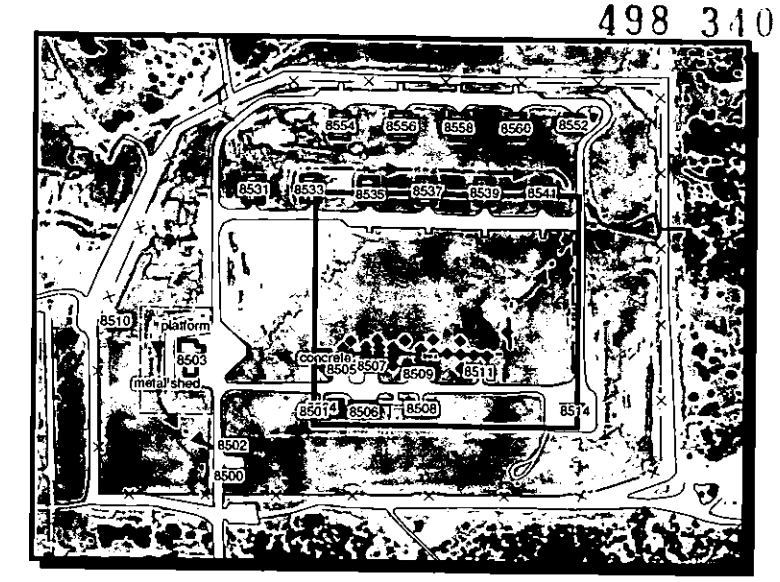
The Environmental Company, Inc.

Creation Date: 02/01/1999
Rev. Date 07/16/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

- = Analyzed but not detected above background $UTL_{95,95}$.
- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.
- All concentrations reported in mg/kg.
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

Figure 3-28
Sediment Contaminant Distribution in Drainageways DW-2 through DW-9 and Seeps





PAH Concentrati n
Relative to Backgr und

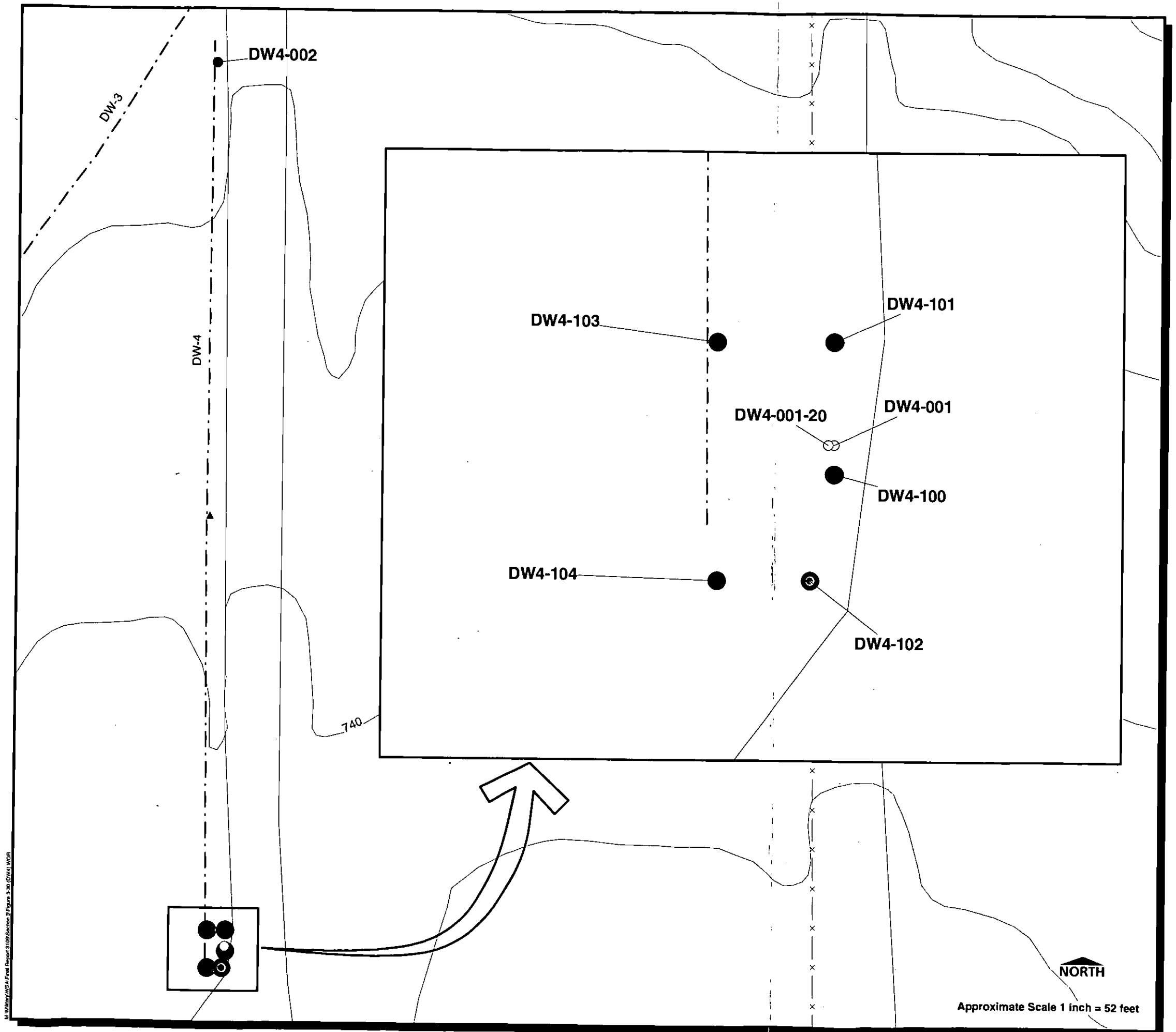
- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

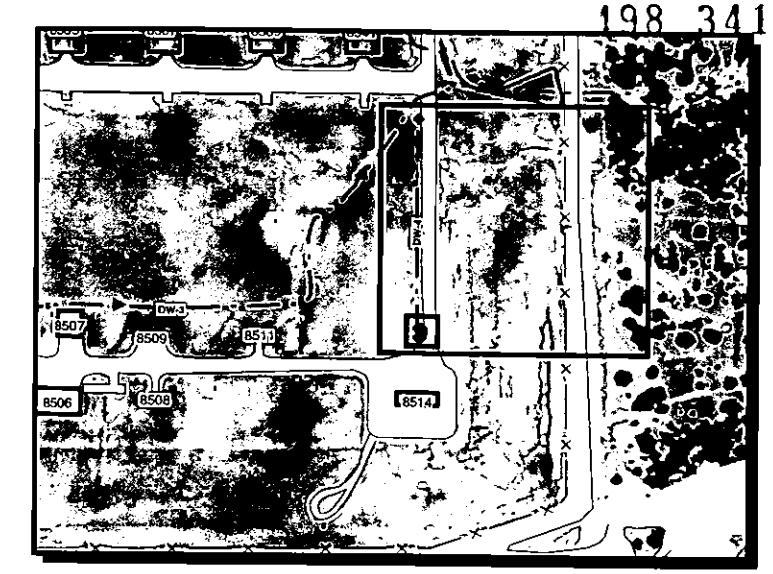
Inner color indicates Surface
Outer color indicates Upper Subsurface (0.5-2.5 ft. bgs)

Figure 3-29
Surface and Subsurface Soil PAH Levels in Drainageway 3 (DW-3)

The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/17/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109





PAH Concentration Relative to Background

- ● Less than background
- ○ Detected at concentration less than 10 times background
- ● Detected at concentration less than 100 times background

Inner color indicates Surface
Outer color indicates Upper Subsurface (0.5-2.5 ft. bgs)

Figure 3-30
Surface and Subsurfac Soil PAH Levels in Drainageway 4 (DW-4)

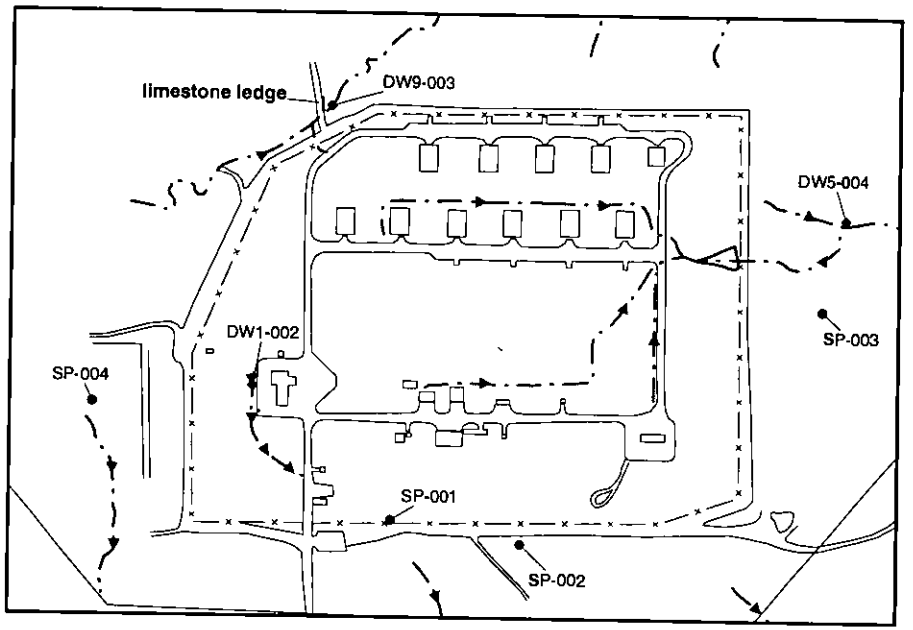
The Environmental Company, Inc.

Creation Date:	12/14/1998
Rev. Date:	05/11/1999
Project Manager:	B. Duffner
Prepared By:	D. Bedarf
Project No:	P-3109

SP-001	
Sample Number:	SP-001-10
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

SP-002		
Sample Number:	SP-002-10	SP-001-12 DUP
Inorganics		
Copper	-	0.013
Nickel	-	0.0064
Semivolatiles	-	-
Pesticides/PCBs	-	-
Explosives	-	-

SP-003	
Sample Number:	SP-003-10
Inorganics	-
Semivolatiles	0.0003
Volatiles	-
Pesticides/PCBs	-
Explosives	-



SP-004	
Sample Number:	SP-004-10
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW1-002	
Sample Number:	DW1-002-10
Inorganics	
Magnesium	9.8
Sodium	33.8
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW5-004	
Sample Number:	DW5-004-10
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

DW9-003	
Sample Number:	DW9-003-10
Inorganics	-
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

- = Analyzed but not detected above background $UTL_{95,95}$.

- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.

- All concentrations reported in mg/kg.

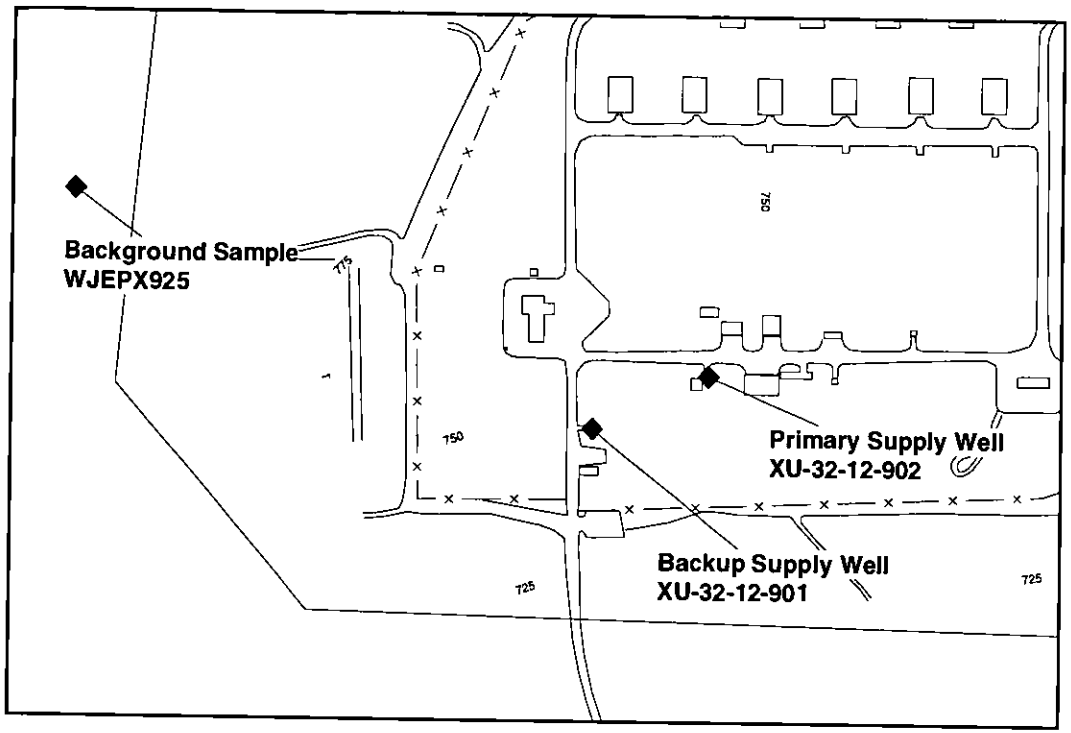
- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-31 -- Surface Water Contaminant Distribution in Drainageways and Seeps

Creation Date: 02/01/1999
Rev. Date: 07/23/1999
Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

498 342



MW-925	
Sample Number:	MW-925-01
Inorganics	-
Aluminum	0.068
Barium	0.11
Calcium	76.2
Iron	0.48
Magnesium	11.3
Molybdenum	0.0046 (F)
Potassium	2.4
Sodium	11.2
Zinc	.0047 (F)
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

XU-32-12-902		
Sample Number:	XU-32-12-902-01	XU-32-12-902-02
Inorganics		
Aluminum	0.07	0.078
Copper	0.014	0.012
Iron	1.2	1.1
Lead	0.0037 (F)	-
Magnesium	23.3	23
Manganese	0.025	0.024
Potassium	4.5	4.6
Sodium	31.2	31.2
Zinc	0.03	0.029
Semivolatiles	-	-
Volatiles	-	-
Pesticides/PCBs	-	-
Explosives	-	-

XU-32-12-901	
Sample Number:	XU-32-12-901-01
Inorganics	
Aluminum	0.07
Magnesium	23.3
Manganese	0.022
Potassium	4.5
Sodium	30.7
Zinc	0.032
Semivolatiles	-
Volatiles	-
Pesticides/PCBs	-
Explosives	-

- = Analyzed but not detected above background $UTL_{95,95}$.

- Only values detected above the background $UTL_{95,95}$ are included. All detected values provided in Section 3.0 data tables.

- All concentrations reported in mg/kg.

- Total values provided for SVOCs, VOCs, explosive compounds, and PAHs. Individual detected constituents provided in Section 3.0 data tables.

The Environmental Company, Inc.

Figure 3-32 -- Contaminant Distribution in Paluxy Aquifer Groundwater

Creation Date: 02/01/1999
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Project Manager: B. Duffner
Prepared By: D. Bedarf
Project No: P-3109

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TAB

4

4.0 MIGRATION PATHWAYS

4.1 SITE SPECIFIC ENVIRONMENTAL CONDITIONS

This section provides a discussion of the environmental conditions encountered at the Offsite WSA during the RFI. Particular attention is paid to those features that may influence contaminant migration, including topography, surface water features, subsurface geology, and site hydrogeology. Information provided in this section expands on material presented in Section 1.0 of this report.

4.1.1 Topography

Topography of the Offsite WSA region reflects the influence of local bedrock, whereas the area inside the fenced Offsite WSA reflects the additional influence of man's activities. As discussed in Section 1.2.4.2, most of the Offsite WSA sits on a gently sloping plateau (see Figure 4-1). Bedrock in this area consists of the Walnut Formation, a fossilized limestone. Drainages to the north, south, and east of the Offsite WSA have much steeper slopes, and bedrock in these areas consists of the Paluxy Formation, a poorly cemented sandstone with shale and claystone layers. The more resistant limestone serves as a cap on the poorly cemented sandstones. Once that cap is breached, the Paluxy Formation is swiftly eroded, producing the steeper slopes. Within the fenced area of the Offsite WSA, the land surface was modified in many places. These modifications generally produced flattened contours around buildings and paved areas, as the land surface was leveled and fill added to allow for building construction (see Figure 4-1).

During the RFI, samples were collected outside the fenced Offsite WSA in the EOD Range, at background sites, and in drainages (see Figures 2-1 and 2-2). The EOD Range occurs on a ridge to the west of the Offsite WSA. This ridge broadens to the east to become the plateau that underlies the Offsite WSA itself. A tributary of Live Oak Creek drains the EOD Range to the northeast. Slopes are much steeper in this drainage. Background samples were collected to the north of the EOD Range in rolling hills. Drainages in this area are steeper than those found inside the Offsite WSA proper, yet not as steep as in the tributary of Live Oak Creek, which runs along the northern side of the Offsite WSA.

Within the fenced Offsite WSA, the areas sampled during the RFI were situated atop the plateau that extends eastward from the EOD Range (see Figure 4-1). Area A-1 lies on the plateau directly east of the EOD Range. Elevations change approximately 15 feet across this area of concern from 735 feet MSL to 750 feet MSL over a distance of 500 feet. The land surface beneath the munitions bunkers and Area A-2 slopes gently to the north and east of Area A-1, with elevations changing from 760 feet in the southwest to approximately 735 feet in the northeast. Elevations change less than 5 feet in the southeastern section of the Offsite WSA, which contains Bldg. 8514 and Area A-4.

Topography at much of the Offsite WSA was apparently modified during construction. Based on field observations and on the pronounced flattening of mapped topographic contours, it has been assumed that the ground surface was leveled in many places to allow for building construction. Areas affected by the construction activities include many of the munitions bunkers, Bldg. 8503 and its concrete pad, and the cluster of buildings to the east of Bldg. 8503. Topography in the area around Bldg. 8514, in the

southeastern corner of the Offsite WSA, may also have been modified during construction of the building and its surrounding concrete pad.

To the east and southeast of Bldg. 8514, the ground rises gently to a small hill, which slopes off into drainages to the north and south. Area A-5, which is on the southern slope of this small hill, was apparently created when materials were removed from the site by heavy equipment for use as fill elsewhere. The contours show a pronounced flattening at this location due to removal of surface material.

4.1.2 Surface Water

The primary surface water features in the vicinity of the Offsite WSA are Live Oak Creek and one of its tributaries (see Figure 1-5). The main branch of Live Oak Creek is roughly 400 feet south of the southern perimeter fence. Live Oak Creek flows northwest from the Offsite WSA before entering Lake Worth approximately 2 miles to the northeast. A large tributary occurs just to the north of the northern boundary fence. This tributary is intermittent, with water flow only during rainy periods. The other prominent surface water feature in the vicinity of the Offsite WSA is a flooded gravel pit located 200 feet southwest of the southernmost perimeter fence.

A series of drainageways and ditches convey surface water from the Offsite WSA into tributaries of Live Oak Creek (see Figure 4-1). Drainageways DW-6, DW-7, and DW-9 empty directly into the northern tributary of Live Oak Creek. Drainageways DW-2, DW-3, and DW-4 flow into Drainageway DW-5, which eventually drains into that same northern tributary. Drainageway DW-8, which flows south from the EOD Range, eventually empties into Live Oak Creek itself. Drainageway DW-1 flows to the south and has a distinct channel while still to the west of Bldg. 8503. South of the building, the drainage becomes less distinct and surface water is presumably transmitted by overland flow. It should be stressed that all of these drainageways are often dry; they contain water only during the rainy periods.

There are several seeps associated with Live Oak Creek and its tributaries within the general vicinity of the Offsite WSA (see Figure 4-1). These seeps are ephemeral springs that usually flow during the spring or after periods of heavy rainfall. These seeps occur at the upper ends of ravines, where the bedrock surface is exposed. The seeps feed into Live Oak Creek, the Live Oak Creek tributary, and the gravel pit. Most of the seeps are within 100 feet of the perimeter fence.

The gravel pit located to the southwest of the site covers more than 4 acres and is approximately 400 feet long, 500 feet wide, and up to 40 feet deep. Water sources that feed into the gravel pit appear to be from several springs located between the pit and the Offsite WSA and groundwater. The amount of water in the gravel pit fluctuates due to seasonal changes in rainfall and depth to groundwater.

Other surface water features in the vicinity of the Offsite WSA include a natural wetland, a stock watering pond, and two excavated areas (see Figure 4-1). A small natural wetland area was identified off the northwestern corner of the perimeter fence. The wetland is associated with a spring that forms the headwaters for the northern tributary of Live Oak Creek and that seasonally discharges into the tributary. An impoundment used as a water source for livestock is approximately 200 feet northwest of this

wetland. The impoundment collects surface water run-off from a small basin northwest of the Offsite WSA. Overflow from the impoundment is directed through the adjacent wetland and into the tributary of Live Oak Creek. East of the perimeter fence at the Offsite WSA is an excavated areas that collect surface water run-off. The excavated area has been identified as Area A-5. During a site visit in October 1997, Area A-5 contained 3 to 6 inches of water. The topographic features of Area A-5 indicate that it would not collect surface run-off from the fenced Offsite WSA.

4.1.3 Geology

In all the areas drilled at the Offsite WSA during the RFI, two geologic characteristics are apparent. First, depth to bedrock is shallow across the Offsite WSA. Of the 148 boreholes drilled during the initial characterization effort, only 25 (17 percent) were advanced below a depth of 6 feet. Depth to bedrock in the remaining 123 boreholes was generally less than 4 feet. Of the deeper holes, 14 were drilled in Area A-3 or in Drainageway DW-1, where fill material was probably placed prior to building construction. The remaining deep holes were drilled at UST locations, where holes were apparently excavated into the bedrock for the fuel tanks, at Area A-1, and at the EOD Range.

The second salient geologic characteristic is the presence of calcium carbonate concretions in much of the soil recovered. The concretions range in size from very coarse sand (greater than 1 mm in diameter) to medium pebbles (less than 16 mm in diameter). These nodules are spherical in shape and consist of concentric layers of carbonate material. Although the concretions occur throughout the soil column, they are generally most abundant from 1 to 3 feet bgs. The presence of the concretions indicates the occurrence of alternating very wet and very dry conditions. During the wet periods, the soil is saturated and carbonate is dissolved from the bedrock, as well as from previously formed concretions. During the dry periods, almost all water evaporates from the soil, and the carbonate precipitates out of solution. Eventually, the concretions reach a size where they are no longer completely dissolved during the rainy periods and become sites for further precipitation during the dry periods.

The surficial material at the Offsite WSA has been subdivided into different geologic zones, as shown in Figure 4-2. These zones generally correspond to the soil zones shown in Figure 1-7, but have been defined according to information obtained during subsurface drilling. Characteristics used to delineate the zones included the depth to bedrock, the composition and physical parameters of each subsurface unit, the amount of moisture, and the amount of fill material present. Each of the geologic zones delineated at the Offsite WSA is described below and is shown in Figure 4-2. Cross-sectional views of the subsurface of Zones 1 through 5 are shown in Figures 4-3 and 4-4.

Zone 1 covers an area of minimal soil development in the western portion of the Offsite WSA. This zone includes the western half of Area A-1 and the surface beneath bunker Bldg. 8531. Depth to bedrock in this zone is very shallow, generally less than 2 feet, and outcrops of fossilized limestone are common. Subsurface material consists of limy silt and clay with pieces of more indurated limestone, in essence a limestone rubble zone. Minor amounts of more cohesive clay can occur directly above the contact with more indurated limestone (see Figure 4-3). Small amounts of sand and gravel are also

present in boreholes located near the roads. Water was not encountered in this zone during the RFI drilling.

Zone 2 covers an area of greater soil development surrounding Zone 1. Zone 2 includes the eastern portion of Area A-1, the western end of the bunker area, and the northern section of Area A-3 (see Figure 4-2). Depth to bedrock in this zone ranges from 2 to 6.5 feet. Subsurface material consists of two layers: an upper layer of silty clay with variable organic content, and a basal layer of weathered limestone and silty clay that grades into unweathered limestone bedrock (see Figure 4-4). The upper layer is between 0.5 and 2.0 feet thick. It consists of nonplastic silty clay that becomes darker with increasing organic content. Grain size analysis and total organic carbon (TOC) content measured at TRF-005 on the north side of Bldg. 8503 indicate that the basal layer consists of lean clay (ASTM classification) or silty clay (American Geological Institute [AGI] classification) and has a TOC content of less than 1 percent. The basal clay is moderately plastic and pale yellow or gray in color. Patches of more indurated limestone are generally found in the basal clay in Zone 2. The number and thickness of these patches increase with depth and with proximity to Zone 1. Neither fill material nor water was encountered in Zone 2 during the RFI drilling.

Zone 3 corresponds with the Bolar-Urban land complex described in the Soil Survey of Tarrant County (Ressel, 1981). This zone covers the southern half of Area A-3 and Drainageway DW-1 (see Figure 4-2). Water was encountered at a depth of 8 to 9 ft bgs in three boreholes on the south side of Bldg. 8503. Surficial overburden water is discussed in more detail in Section 4.1.4. Although the soil units are similar to those in Zone 2, the subsurface layers are better developed in Zone 3. The upper soil layer in Zone 3 can be up to 4.5 feet thick. It generally consists of moderately plastic, brown silty clay with limestone fragments and calcium carbonate concretions. The lower subsurface unit is similar to the basal clay observed in Zone 2. It consists of up to 6 feet of pale colored, moderately plastic to plastic silty clay. The basal clay in Zone 3 also contains calcium carbonate concretions in distinct layers, probably the result of seasonal fluctuations in the overburden water. Patches of indurated limestone are rarely found in the Zone 3 basal clay. In addition to the two clay layers, the subsurface of Zone 3 contains fill material (see Figure 4-3). Gravel was logged in the upper portions of several boreholes in this zone. Large voids and poor recoveries were also common for the upper 5 feet bgs in this zone, possibly the result of differential settling of fill material used to level the building site prior to construction.

Zone 4 covers Area A-2 (see Figure 4-2) and correlates with the Aledo soils described in the Soil Survey of Tarrant County (Ressel, 1981). Depth to bedrock is shallow, ranging from 1 to 3 feet, yet there are no outcrops in this zone. The soil material consists of brown silty clay with a high organic content and limestone fragments up to 60 percent by volume. In some of the boreholes in this zone, a thin layer of pale gray clay exists directly above the unweathered limestone bedrock. Neither fill material nor water was encountered in Zone 4 during the RFI drilling.

Zone 5 corresponds with the Aledo-Urban land complex described in the Soil Survey of Tarrant County (Ressel, 1981). This zone covers the bunker area east of Bunkers 8533 and 8554 (see Figure 4-2). Depth to bedrock in this zone is similar to that of Zone 4. Although some boreholes in this area extend to depths of 4.5 feet, most have depths in the range of 1.5 to 3.0 feet. The soil consists of brown silty clay as in Zone 4.

In Zone 5, however, the soil has usually been modified with the addition of rounded pieces of fine gravel and yellow to orange sand, presumably added when the sites were leveled prior to building construction. In some cases, as at Bunker 8558, there is a basal layer of sand mixed with chunks of limestone scraped from the bedrock surface (see Figure 4-3). No water was encountered in Zone 5 during the RFI drilling.

Zone 6 corresponds roughly to the Sanger-Urban land complex area described in the Soil Survey of Tarrant County (Ressel, 1981). This zone covers most of the southern portion of the Offsite WSA (see Figure 4-2) and includes boreholes drilled beneath transformers, at former UST locations, and at Area A-4. Depth to bedrock is variable, ranging from 1.5 to 10 feet. Material in boreholes beneath the transformers is Sanger soil, consisting of dark grayish-brown silty clay with trace fine gravel, which becomes lighter in color and contains more clay with depth. Grain size analysis performed at TRF-003 west of the power-generating substation indicates the soil is a lean clay (ASTM classification) or silty clay (AGI classification). Measurement of the TOC content at the same site reveals less than 1 percent carbon. Material at the former UST sites and at Area A-4 is part of the Urban land complex in this zone. At locations UST-002 through UST-009, subsurface material consists almost entirely of fill. This mix of silt, clay, sand, and gravel generally contains a higher percentage of silt and a lower percentage of clay than material found elsewhere at the Offsite WSA. At Area A-4, bedrock occurs at a depth of 1.5 feet bgs in all four holes drilled. The soil consists of stiff, dry, black silty clay with root material and trace calcium carbonate concretions. Because similar soil occurs at UST-004, mixed with gravel, it is assumed that the soil at Area A-4 is also fill material, probably introduced when the former vehicle fueling station was created. No water was encountered in Zone 6 during the RFI drilling.

Zone 7 corresponds roughly to the Brackett clay loam soils described in the Soil Survey of Tarrant County (Ressel, 1981), although the zone has been modified by human activities. This zone covers the southeastern corner of the Offsite WSA and Area A-5 (see Figure 4-2). Depth to bedrock in the boreholes drilled in this area ranged from 1.7 to 4.5 feet. The subsurface material consists of olive-colored, moderately plastic silty clay with moderate to abundant calcium carbonate concretions and little if any organic material. Surficial material has been removed from Area A-5, presumably for use as fill elsewhere. What near-surface material remains is either a small portion of the original soil or has developed since the removal of the overlying material. No water was encountered in Zone 7 during the RFI drilling.

Zone 8 covers an area of minimal soil development that corresponds to the Aledo soil described in the Soil Survey of Tarrant County (Ressel, 1981). This zone consists of a semicircular slice of area at the top of the EOD Range near the bunker (see Figure 4-2). Depth to bedrock is no greater than 2.5 feet, with scattered bedrock exposures. Subsurface material consists of either a limestone rubble zone, as in Zone 1, or a brown silty clay with organic material, traces of fine gravel, and up to 30 percent calcium carbonate concretions or limestone fragments. No basal clay unit was detected in any of the boreholes in this zone. No water was encountered in Zone 8 during the RFI drilling.

Zone 9 covers an area of deeper weathering to the north of and largely encircled by Zone 8 (see Figure 4-2). As in Zone 2 inside the fenced Offsite WSA, the subsurface material contains two distinct layers. The upper layer ranges in thickness from 0.5 to 3.5 feet and consists of a yellow to brown silty clay with variable organic content. This clay also

contains a high percentage of calcium carbonate concretions and limestone fragments, up to 60 percent of the material by volume. The lower unit is the more typical basal clay layer, consisting of yellow to white, moderately plastic to plastic silty clay with scattered calcium carbonate concretions. Grain size analysis performed on material from the lower soil layer at EOD-011 indicates the soil is a lean clay (ASTM classification) or silty clay (AGI classification). Measurement of the TOC content at the same site reveals less than 1 percent carbon. No water was encountered in Zone 9 during the RFI drilling.

4.1.4 Hydrogeology

Previous studies at the Offsite WSA have identified four hydrogeologic units at the site (see Section 1.2.4.2). Three impact potential contaminant migrations at the site and are discussion given below.

Surficial Overburden

An indication of water within the surficial overburden was rarely encountered during the RFI drilling. Previous investigations at the Offsite WSA found shallow groundwater at a depth of 5 feet bgs directly west and south of the concrete pad associated with Bldg. 8503 (RFI Area A-3 and Drainageway DW-1) (Radian, 1989). During the RFI, saturated soil was encountered in only eight of the 148 boreholes drilled. These include two advanced in Area A-3, one in DW-1, and five at former UST locations. Figure 4-5 shows the location and depth to saturated soil at each of these eight boreholes.

At Bldg. 8503, localized saturated soil was identified at a depth of 8 feet bgs in boreholes drilled directly south of the concrete pad. Bedrock in this area increased from approximately 8.5 feet bgs at boreholes immediately to the west (A3-010) to greater than 10 feet in boreholes DW1-009, A3-013, and A3-014. Saturated soil was identified in this bedrock depression below depths of 8 and 9 feet.

At the former UST locations, localized increased depth to bedrock was noted at selected UST tank locations (UST-006, UST-009, and UST-002) and at locations along an associated building (UST-004 and UST-005). It is assumed that surficial material and bedrock were excavated to allow the placement of the tanks or building foundation, producing depressions in the bedrock surface. During periods of heavy precipitation, water percolating through the soil to the bedrock interface would be expected to pool in these depressions. Two to 4 feet of saturated soil were found 4 to 5 feet bgs at these locations.

Walnut Aquitard

The Walnut Formation is estimated to be approximately 26 to 30 feet thick beneath the Offsite WSA (Jacobs, 1997b) (see Appendix T). As described in Section 1.2.4, previous studies completed approximately 4 miles east of the Offsite WSA in the vicinity of Plant 4 have reported the Walnut Formation Aquitard hydraulic conductivity to be 7.0×10^{-10} centimeters per second (cm/sec). Hydraulic conductivity values in this range are indicative of relatively impermeable conditions.

Paluxy Aquifer

As described in Section 1.2.4, the Paluxy Formation is composed of sandstone. The formation was measured to be between 170 and 190 feet thick during the installation of upgradient background monitoring wells (Jacobs, 1997b). Productive zones within the Paluxy are in its lower portion, which is generally coarser grained than the upper portion. The upper 35 feet of the Paluxy was unsaturated. Hydraulic conductivities in the lower Paluxy were measured at the background monitoring well locations to be approximately 2.2×10^{-3} to 3.5×10^{-3} cm/sec.

During the RFI, three groundwater samples were collected from the Paluxy Aquifer. Figure 4-5 shows the locations of the sampled wells and the depth to groundwater in each well. Past studies at the Offsite WSA and in the Fort Worth region have determined an eastward groundwater flow in the Paluxy Aquifer (Jacobs, 1997b; Rivers *et al*, 1996). RFI data confirm a strong easterly component in the groundwater flow direction; however, an exact determination of flow direction could not be made due to the configuration of the wells at the site. The gradient in the Paluxy Aquifer between the background well and the two on-site wells was approximately 1.9 feet per 100 feet. Table 4-1 summarizes measurements taken at the three wells sampled during the RFI.

4.2 CONTAMINANT MIGRATION

Potential contaminant migration is discussed below. Migration pathways include subsurface, surface, and air.

4.2.1 Subsurface Migration

As indicated in Sections 1.2.4.2, 4.1.3, and 4.1.4, subsurface media includes a thin soil horizon (0 to 10 feet thick), the Walnut Formation limestone aquitard (26 to 30 feet thick), and the Paluxy Formation sandstone aquifer (170 to 190 feet thick) (see Appendix T). Section 2.0 describes those activities potentially related to contamination identified in Section 3.0. As mentioned in these sections, potential contaminant sources at the Offsite WSA were generally surficial in nature. The only known potential subsurface contaminant sources were the former USTs.

Data collected during this RFI indicate that, in general, contamination introduced from the surficial sources remain within the top portion of the soil horizon. Results from Area A-3 and Drainageway DW-1 are used to illustrate the historical contaminant migration. As discussed in Section 3.0, inorganics, SVOCs, and VOCs were identified in these areas. In order to identify subsurface migration that may have occurred since contaminants were first introduced, the distributions of four representative contaminants are examined. Soil samples from Area A-3 and Drainageway DW-1 were collected from the surface (0 to 0.5 feet), upper subsurface (0.5 to 2.5 feet) and lower subsurface (below 2.5 feet and directly above the limestone bedrock). The concentrations of cadmium, lead, benzo(a)pyrene, and TCE within each of these soil horizons are graphically represented in Figures 4-6, 4-7, 4-8, and 4-9, respectively.

Both metals (cadmium and lead) show nearly identical relative distribution patterns in soil in Area A-3 and Drainageway DW-1 samples (see Figures 4-6 and 4-7). In each case, the higher concentrations are only visible in the surface indicating adsorption

effects that limit vertical migration. Concentrations decrease to background levels after 0.5 feet bgs.

The lack of benzo(a)pyrene contaminant migration is illustrated in Figure 4-8. Surface contamination around the perimeter of the concrete pad drops off to near detection limits in subsurface samples.

Evidence of TCE volatilization and vertical migration is shown in Figure 4-9. In contrast to the distribution patterns displayed by cadmium, lead, and benzo(a)pyrene, VOCs at Area A-3 and Drainageway DW-1 are found at greater concentrations in the lower soil horizon when present. TCE was not detected in Area A-3 and DW-1 surface samples and was detected in only one upper subsurface sample. **A locationally related pattern of TCE contamination does not become apparent until the lower subsurface is reached.**

Contaminant distributions associated with the former subsurface UST sources are different than those associated with the surficial sources discussed above. Samples were collected at locations associated with both the USTs and the connecting pipes. Contaminants identified were primarily limited to SVOCs at these sampling locations and were present in both surface and subsurface samples. The vertical distributions of these contaminants are most likely related to the depth of the tank or pipe and extent of excavation and fill placement.

All of the data discussed above is limited to that generated from samples collected above the bedrock surface. Further vertical migration of any contaminants will be significantly retarded by the limestone formation. Therefore, vertical migration of any potential contaminants through the 26- to 30-foot thick Walnut Formation aquitard and into the underlying Paluxy Formation is not expected.

4.2.2 Surface Migration

A series of drainageways transmit surface water run-off associated with potential contaminant sources directly off site. The areas served by these drainageways and potential contaminants of concern identified in them are described in Section 3.3. In addition to this direct potential surface migration route, seasonal seeps discharge water that percolates though the soil and across the bedrock surface. All surface water associated with the site is collected in the perimeter ravines that eventually discharge into Live Oak Creek. Live Oak Creek flows northeast before discharging into Lake Worth, approximately 10 miles to the east.

Sediment sample results indicate that contaminants are generally not being transported offsite via this pathway. Although contaminants were identified at concentrations above background in drainageway location within the Offsite WSA fenced boundary, contaminants with elevated concentrations either were not present or decreased in number and concentration significantly at downgradient locations.

Four drainageways identified in this RFI transmit surface water off-site. These include DW-1, DW-5, DW-8, and DW-9 (see Figure 2-5). Figures 4-6, 4-7, 4-8, and 4-9 illustrate downgradient decreases in cadmium, lead, benzo(a)pyrene, and TCE concentrations in Drainageway DW-1. None of the four contaminants shown are present

at location DW-010, the most downgradient location. The majority of the surface water generated onsite is discharged to the east via Drainageway DW-5. Toluene was the only parameter measured at a concentration above background in this drainageway. Magnesium was the only analyte present **above background** at the downgradient Drainageway DW-8 location. Although samples collected at DW9-002 contained contaminants at concentrations **above background**, they are believed to be residuals associated with the soil and debris remediation effort and were not carried down from the Offsite WSA facilities.

4.2.3 Air Transport

The combination of surface contamination and a regional climate typified by hot summers and relatively dry winters requires consideration of the air pathway. With an average annual rainfall of 31.5 inches, an average annual air temperature of 66 degrees Fahrenheit (°F), and an average wind speed of 8 knots, relatively dry windy conditions have the potential to mobilize contaminants by air transport. Wind erosion is minimized to some degree onsite by the dense grass vegetation that covers most of the area.

4.3 POTENTIAL RECEPTORS

4.3.1 Potential Human Receptors

Potential human receptors present in the vicinity of the Offsite WSA are identified in this section based on current and future land use, comprehensive land use plans, likely groundwater and surface water use, and the potential migration evaluation (see Section 4.2.1).

The site and surrounding acreage (approximately 500 acres) is private property and is characterized as rural, with creeks, drainageways, ponds, and vegetation throughout the area. Within a 1- to 2-mile radius surrounding this property, land use is generally residential with pockets of rural areas. A relatively new neighborhood with vacant undeveloped lots for sale is located south of the site across the street (White Settlement Road) from the site entrance. To the immediate east, west, and north of the site property are ranch-style homes on approximately one-plus acre lots. Further to the east (approximately 2 miles) is a tract housing neighborhood circa 1970s. Surrounding the outfall of Live Oak Creek into Lake Worth (northeast of the site) is another small neighborhood. A plant nursery is located within one-half mile of the entrance to the site. According to the West Fort Worth district plan, neighborhoods, schools, and commercial activity centers exist in some areas and are planned in other areas for this region (City of Fort Worth, 1991). The district plan indicates that this area will continue to be developed as a suburban area of Fort Worth that will include natural areas, as well as commercial, industrial, and residential development. This vision of growth is consistent with the population trends and projections discussed in Section 1.2.4.4.

Currently, no people are living or working on site other than workers associated with environmental site investigations. Potential exposure to site-related contaminants for these individuals are addressed in Health and Safety Plans prepared specifically for environmental investigation and remediation activities. These workers, therefore, will not be considered in the risk evaluation.

A large tract of rural private property surrounds the site. Residents live adjacent to the site, near the site entrance on the south side of site. Although the site is fenced around the perimeter, which generally limits access, two sections of the fence are cut and pulled back to create holes, providing easy human access to the site. Therefore, current receptors may include the residents of the private property and trespassers/site visitors. The private property surrounding the fenced portion of the site is currently used for grazing cattle. The vegetation in the study areas is composed of weedy and brushy plant species that are not suitable as cattle feed. There are viable foraging areas away from the site and not in contact with site-related contamination. Therefore, the cattle currently grazing in the vicinity of the site are expected to have very limited contact with site-related contamination.

Because of the abundance of surface water bodies (creeks, drainage ditches, and ponds) in the vicinity of the site, recreational users and nearby residents could potentially be exposed to site-related contaminants via contact with surface waters used for recreational purposes (swimming and wading) and consumption of fish. Stormwater drains overland, discharges into on-site drainage ditches, and infiltrates shallow groundwater. This transported water discharges into Live Oak Creek and its tributaries. The Live Oak Creek terminus discharges into Lake Worth, located approximately 2 miles northeast of the site. Stormwater runoff and shallow groundwater seepage from the site also discharges into the quarry located southwest of the site. Enough water is present in the quarry to support fish and other biota. During a site visit, people were fishing at the quarry and indicated that in the past they had fished at that location on a subsistence basis (Nelson and Lakey, 1997). These individuals indicated that they have not observed swimmers in the quarry water. Consumption of fish could present a potential route of exposure to contaminants if the COPCs have the potential to bioconcentrate in biota.

The aquifer is a source of municipal water supply for the City of White Settlement, which is located approximately 3 miles downgradient from the site to the east (Rivers et al., 1996). Because of these uses, the most beneficial use of the Paluxy groundwater assumed in this RFI is as a domestic drinking water supply (Groundwater Use Category I under the PSTD program). Of significant importance is the potential for contaminants to migrate from the site soils to the Paluxy Aquifer. As indicated above, the Walnut Formation will retard any downward migration of contaminants. On this basis, it is unlikely that current and future residents would be exposed to contaminants from the site via a groundwater pathway. However, for comparative purposes and consistency with TNRCC Subchapter S standards, the soil to groundwater cross media protection pathway was evaluated in this RFI.

As discussed in Section 1.0, the Offsite WSA property will be transferred back to private property as part of the NAS Fort Worth property disposal/reuse process. The property may remain private or may be sold and developed. If developed, the most likely future land use of the site is residential and commercial (City of Fort Worth, 1991). Future residents, commercial workers, and short-term construction workers could potentially be exposed to contaminants via direct contact with shallow groundwater, soil, surface water, and sediments. Although not a potable source, seasonal shallow groundwater flowing on top of the Walnut Formation is expected. Thus, future populations may contact the groundwater when it discharges through seeps around the site or during construction activities associated with future development of the site. Similar to current conditions, recreational users of the area, as well as local residents could be

potentially exposed to site-related contaminants via contact with surface waters and sediments in Live Oak Creek and its tributaries when used for recreational purposes (swimming and wading) and via consumption of fish.

In summary, current human receptors potentially exposed to site-related contaminants at the Offsite WSA site include:

- Area Residents
- Recreational Users
- Trespassers/Site Visitors

Potential future human receptors include:

- Residents
- Commercial Workers
- Construction Workers
- Recreational Users

4.3.2 Potential Ecological Receptors

Potential receptors are generally defined as species that play a key role in the ecosystem being evaluated. This could include species that are an integral part of the food chain, usually the principal prey species or species (plants or animals) that constitute the major food item of the principal species. Potential receptors could also include species that have a unique life history or feeding habits, threatened or endangered species, or species for which exposure data is readily available.

The mobility of a receptor should always be considered when evaluating its potential for exposure (Will and Suter, 1995). The mobility of a specific receptor is directly correlated to the average foraging range of an individual within the species under consideration (Sample et al., 1996a). Flightless invertebrates (worms) and vegetation are considered stationary due to the small area that they occupy. Small invertebrates, amphibians, reptiles, and small arboreal and burrowing animals are considered mobile receptors. These mobile receptors can have foraging ranges that could cover up to several acres. Transient receptors are larger invertebrates such as coyote, fox, raccoon, deer, cattle, and migratory avifauna or raptors. Foraging ranges for these transient species could cover several square miles up to thousands of square miles.

If the root systems of any vegetation contact or intercept contaminants, foliage and fruit produced by these individuals could contain contaminants. Contaminants that are transported by surface water run-off could also be taken up by a variety of herbaceous species and shallow-rooted shrubs. Contaminants that accumulate in these plants could be consumed by grazing animals or grainivorous birds. Deep-rooted trees such as bur oak and hackberry are potential ecological receptors. In prairie areas such as the Fort Worth area, roots from these species have been found at depths of 10 to 20 feet (USDA, 1965). In one reported case, a 43-year-old bur oak had a lateral spread of 41 feet although the tree was only 20 feet tall United States Department of Agriculture (USDA) (USDA, 1965).

Instead of evaluating all of the species that could potentially occur at the Offsite WSA, representative receptors or endpoint species were selected for the assessment. **The receptors or endpoint species identified for evaluation in the ecological screening assessment (see Section 5.2) include an herbivore, the cottontail rabbit, and an insectivore, the short-tailed shrew, that are prey species for predators. Predators chosen as endpoint species were the red-tailed hawk and the coyote, species for which exposure data are readily available. Endpoint species were selected for the screening assessment that have low NOAEL-based benchmarks.** Selecting species that are sensitive to the harmful effects of the contaminants allows for a conservative measure of negative impacts potentially experienced by the ecosystem. The trophic relationships among the selected potential receptors were established to represent food-chain pathways for terrestrial habitats (see Figure 4-10). These site-specific conceptual models are used to describe how a contaminant might impact potential ecological receptors.

Potential receptors could also include species aquatic species. Aquatic species observed in the numerous small pools along Live Oak Creek and its tributaries are small arthropods such as whirligig beetles and water striders. Fish species identified in an abandoned gravel pit immediately south of the Offsite WSA include perch, crappie, and channel catfish. These species are also present in the lower reaches of Live Oak Creek and Lake Worth. The trophic relationships for selected aquatic receptors habitats is illustrated in Figure 4-11).

4.4 CONCEPTUAL SITE MODEL

Based on information generated from previous investigations and during this RFI, conceptual site models for the site have been developed. These models include a physical conceptual model based on the discussion of site-specific environmental conditions presented in Section 4.1. In addition, a human and ecological exposure conceptual site model is presented.

4.4.1 Physical Conceptual Site Model

Figure 4-12 depicts the physical conceptual site model for the Offsite WSA based on the discussion of contaminant migration pathways presented in Section 4.2. Shown on the model are the surficial source areas and subsurface UST sources. As an example of potential subsurface migration, a three-dimensional block view of Area A-3 is presented.

4.4.2 Human and Ecological Exposure Conceptual Site Model

The human and ecological exposure conceptual site model in tabular format is presented in Table 4-2. The model summarizes the contaminants, contaminated media, and migration and exposure pathways for the Offsite WSA based on the findings of the site investigation results (see Section 3.0) and risk evaluation (see Section 5.0). Information on receptors presented in Section 4.2 is used in conjunction with the exposure pathway analysis to identify current and future exposure scenarios for developing clean-up levels in the risk evaluation (see Section 5.0).

Table 4-1. Groundwater Level Measurements Taken During Offsite Weapons Storage Area RFI

Well ID	Surface Elevation	Top of Casing Elevation	Depth to Groundwater Below Top of Casing	Water Level Elevation
WJEPX925 (background well)	787.02	789.72	101.64	688.08
XU3212-901 (backup well)	744.16	746.81	95.85	650.96
XU3212-902 (main supply well)	744.16	746.94	97.08	649.86

All measurements in feet.
Elevations given in feet above mean sea level.

Table 4-2. Conceptual Site Model Summary (continued)

Site ID	Site Description	Contaminated Media and Detected Compounds	COPCs	Potential Migration Pathway	Potential Receptors	Potentially Complete Exposure Pathways
A-1	Outdoor materiel storage and maintenance	Soil: metals, PAHs, toluene	Antimony, chromium, selenium, molybdenum	Soil to groundwater leaching; surface run-off and subsurface seepage to surface water and sediment; volatilization	Future/current residents, future commercial and construction workers, current site visitors; terrestrial & aquatic biota	Soil and Paluxy groundwater ingestion, inhalation, dermal contact
A-2	Outdoor materiel storage and maintenance	Soil: metals, toluene	Antimony, arsenic, molybdenum	Soil to groundwater leaching; surface run-off and subsurface seepage to surface water and sediment	Future/current residents, future commercial and construction workers, current site visitors; terrestrial & aquatic biota	Soil and Paluxy groundwater ingestion, inhalation, dermal contact
A-3	Waste accumulation area and Bldg. 8503	Soil: metals, PAHs, toluene, pesticides, chlorinated solvents	Metals	Soil to groundwater leaching; surface run-off and subsurface seepage to surface water and sediment; volatilization	Future/current residents, future commercial and construction workers, current site visitors; terrestrial & aquatic biota	Soil and Paluxy groundwater ingestion, inhalation, dermal contact
A-5	Disturbed surface area southwest of control fence	Soil: metals	Antimony, molybdenum, selenium	Soil to groundwater leaching; surface run-off and subsurface seepage to	Future/current residents, future commercial and construction workers,	Soil and Paluxy groundwater ingestion, inhalation, dermal

PAH - polycyclic aromatic hydrocarbon
COPC - chemical of potential concern
NA - not applicable
TPH - total petroleum hydrocarbon

Table 4-2. Conceptual Site Model Summary (continued)

Site ID	Site Description	Contaminated Media and Detected Compounds	COPCs	Potential Migration Pathway	Potential Receptors	Potentially Complete Exposure Pathways
				surface water and sediment	current site visitors; terrestrial & aquatic biota	contact
EOD Range	Explosives ordnance deposition located west of the site	Soil: metals, explosives	Antimony, arsenic, selenium, vanadium	Soil to groundwater leaching; surface run-off to surface water and sediment; volatilization	Future/current residents, future commercial and construction workers, current site visitors, terrestrial & aquatic biota	Soil and Paluxy groundwater ingestion, inhalation, dermal contact
Bunker Drains	Floor drain outlets at 11 munitions storage bunkers	Soil: metals	Metals	Soil to groundwater leaching; surface run-off and subsurface seepage to surface water and sediment	Future/current residents, future commercial and construction workers, current site visitors; terrestrial & aquatic biota	Soil and Paluxy groundwater ingestion, inhalation, dermal contact
USTs	Five USTs located across site	Subsurface soil: TPH, PAHs, toluene	Carcinogenic PAHs	Soil to groundwater leaching; groundwater seepage to surface water and sediment; volatilization	Future/current residents, future commercial and construction workers, current site visitors; terrestrial & aquatic biota	Soil and Paluxy groundwater ingestion, inhalation, dermal contact
A-4	Vehicle fueling area	Soil: TPH, toluene, PAHs	None	NA	NA	NA

PAH - polycyclic aromatic hydrocarbon
COPC - chemical of potential concern
NA - not applicable
TPH - total petroleum hydrocarbon

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Table 4-2. Conceptual Site Model Summary (continued)

Site ID	Site Description	Contaminated Media and Detected Compounds	COPCs	Potential Migration Pathway	Potential Receptors	Potentially Complete Exposure Pathways
Transformers	Areas beneath transformers located across site	Soil: 4,4'-DDE	None	NA	NA	NA
Leach Field	Sewer drain field outside of fenced portion of WSA	Soil: metals, PAHs	None	NA	NA	NA

PAH - polycyclic aromatic hydrocarbon
COPC - chemical of potential concern
NA - not applicable
TPH - total petroleum hydrocarbon

Table 4-2. Conceptual Site Model Summary (continued)

Site ID	Site Description	Contaminated Media and Detected Compounds	COPCs	Potential Migration Pathway	Potential Receptors	Potentially Complete Exposure Pathways
Seeps	Seasonal seeps around perimeter of site.	Surface water: metals Sediment: metals	None	NA	NA	NA
Drainage ways	Drainageways and ditches located throughout site	Sediment: metals, PAHs, toluene, TCE, pesticides Surface Water: metals	Metals, PAHs	Soil to groundwater leaching; surface run-off to surface water and sediment; volatilization	Future/current residents, future commercial and construction workers, current site visitors; terrestrial & aquatic biota	Soil/sediment, Paluxy groundwater, and surface water ingestion, inhalation, dermal contact; biota consumption

PAH - polycyclic aromatic hydrocarbon
COPC - chemical of potential concern
NA - not applicable
TPH - total petroleum hydrocarbon

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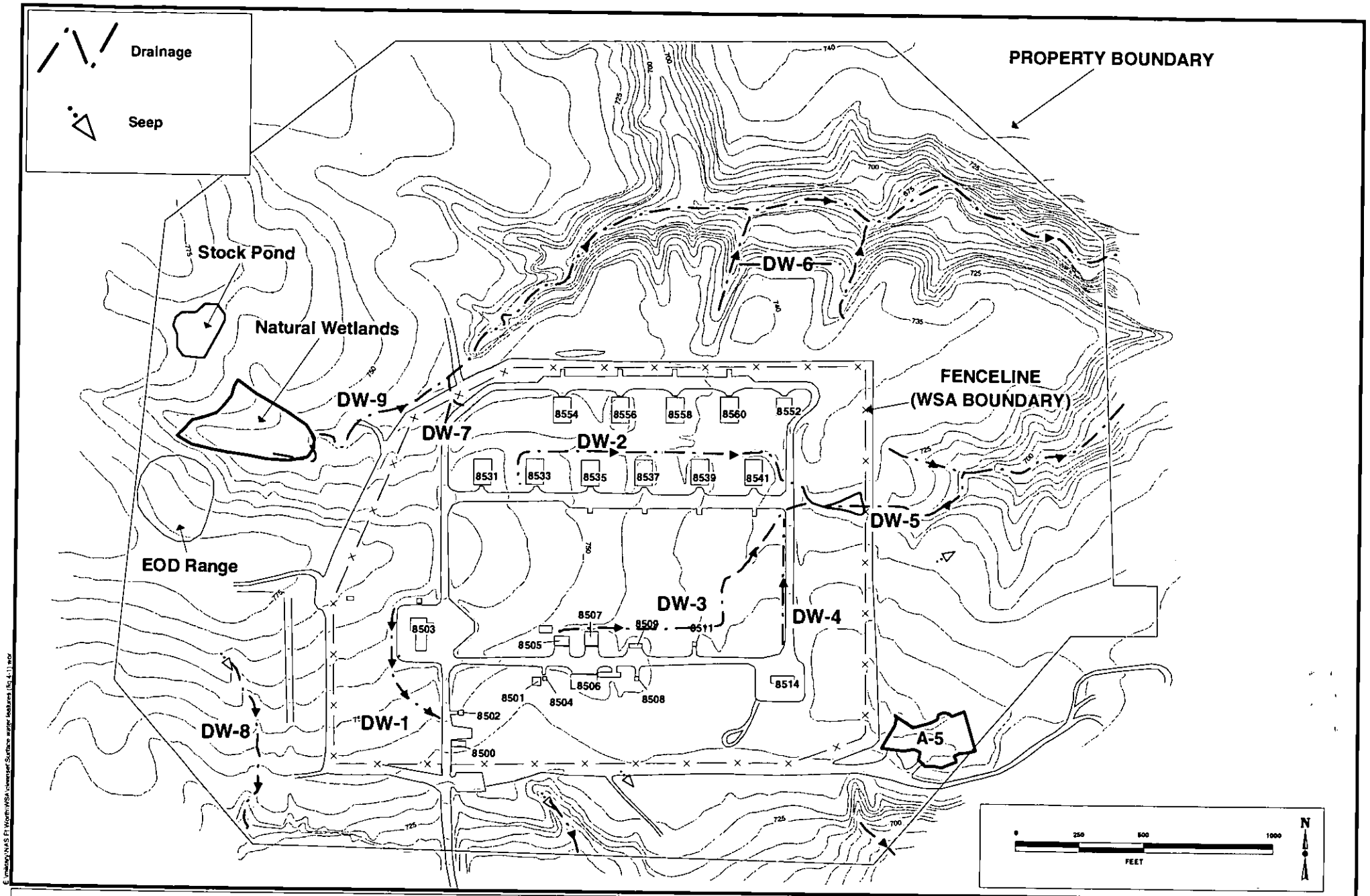

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Figure 4-1 -- Surface Water Features

Creation Date:	12/01/1997
Rev. Date:	07/16/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109

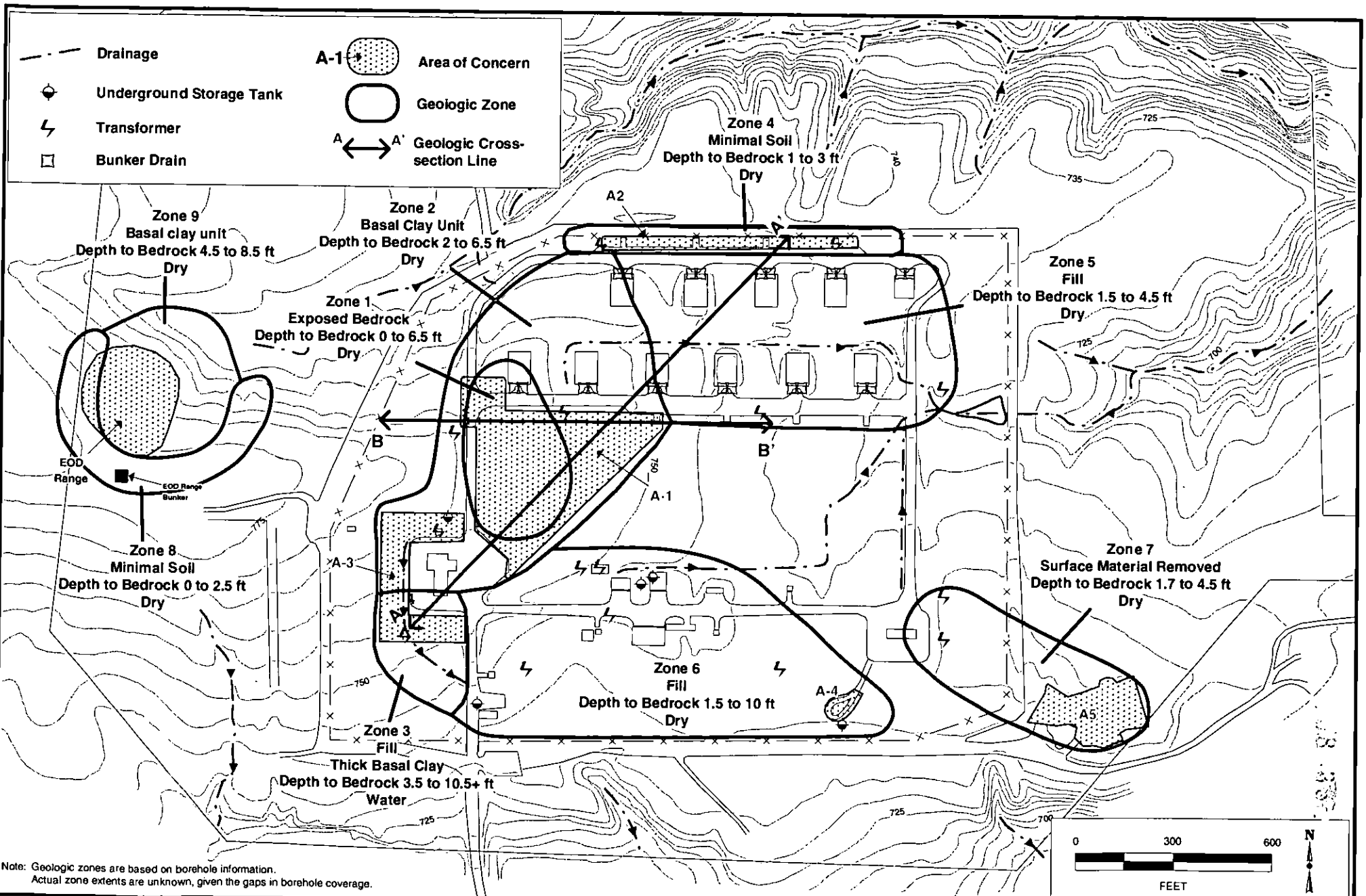

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Figure 4-2 -- Geologic Zones in Investigation Areas

Creation Date: 12/01/1997
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

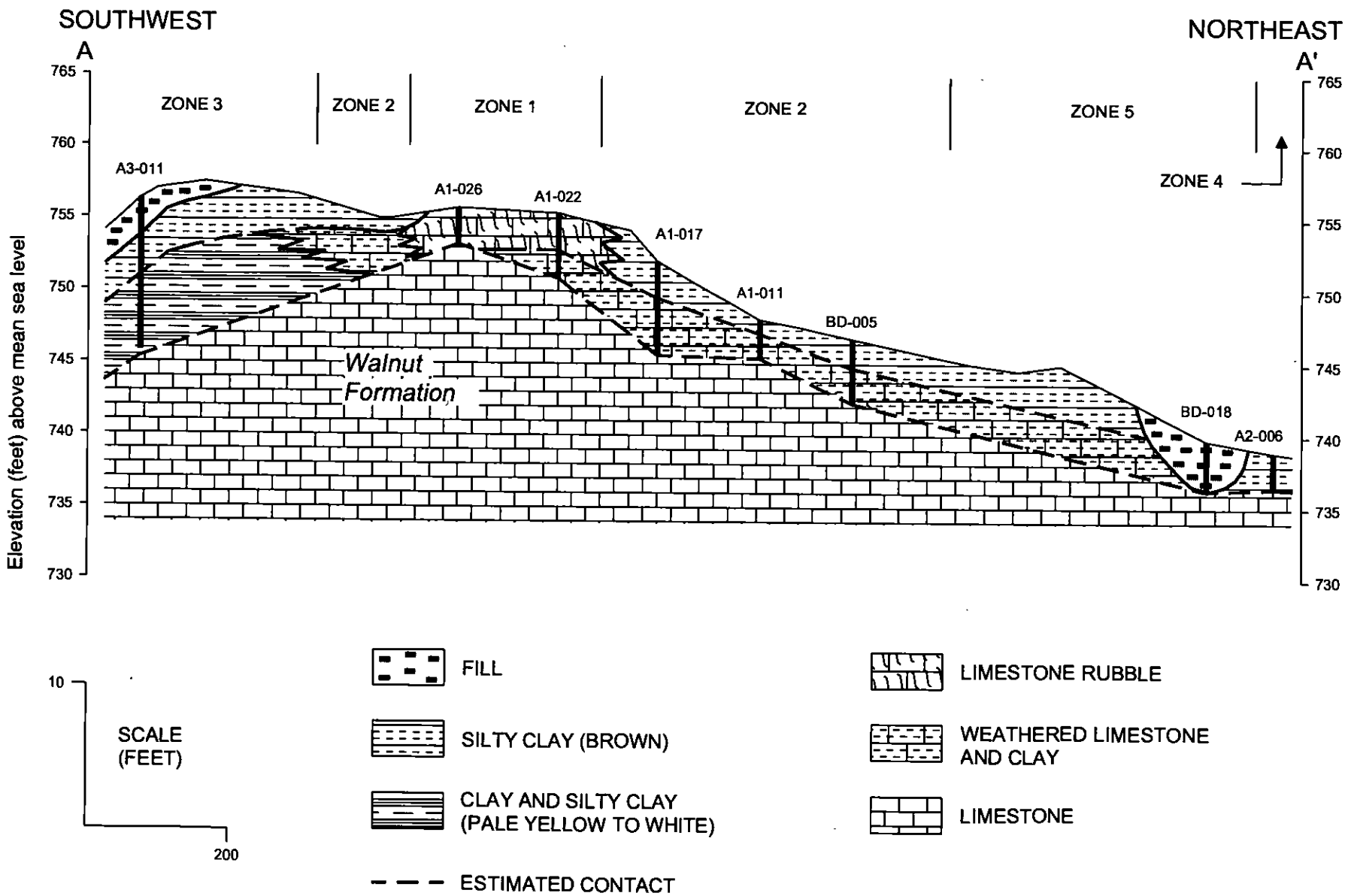

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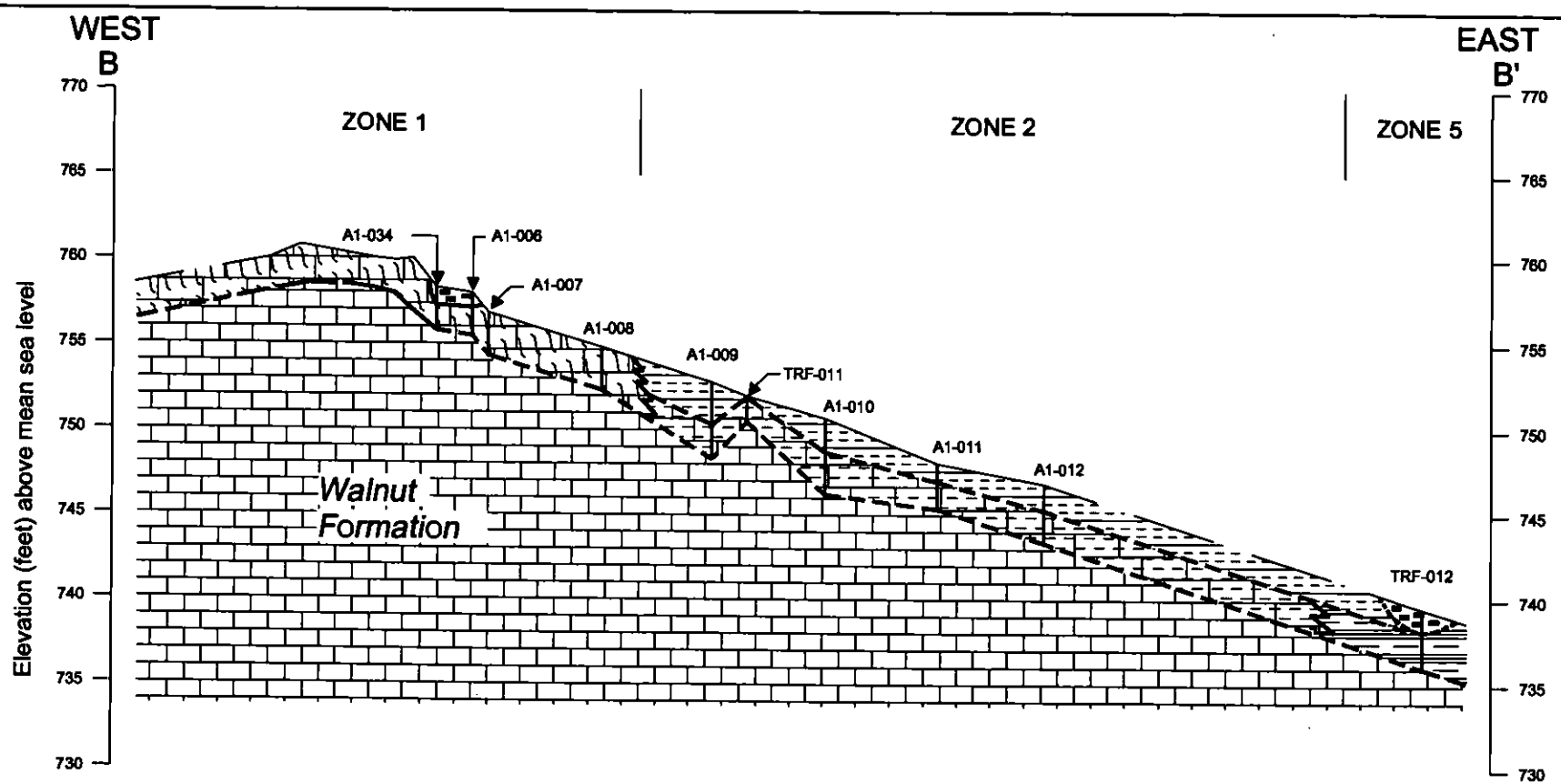
Figure 4-3 -- Geologic Cross - Section A - A'

Date: March 1999
Project Manager: B. Duffner
Prepared By: L Myers / A. Long
Project No: 3109



10

SCALE
(FEET)

150

FILL

SILTY CLAY

CLAY AND SILTY CLAY

ESTIMATED CONTACT

LIMESTONE RUBBLE

WEATHERED LIMESTONE
AND CLAY

LIMESTONE

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Figure 4-4 -- Geologic Cross - Section B-B'

Date: March 1999
Project Manager: B. Duffner
Prepared By: L. Myers / A. Long
Project No: 3109

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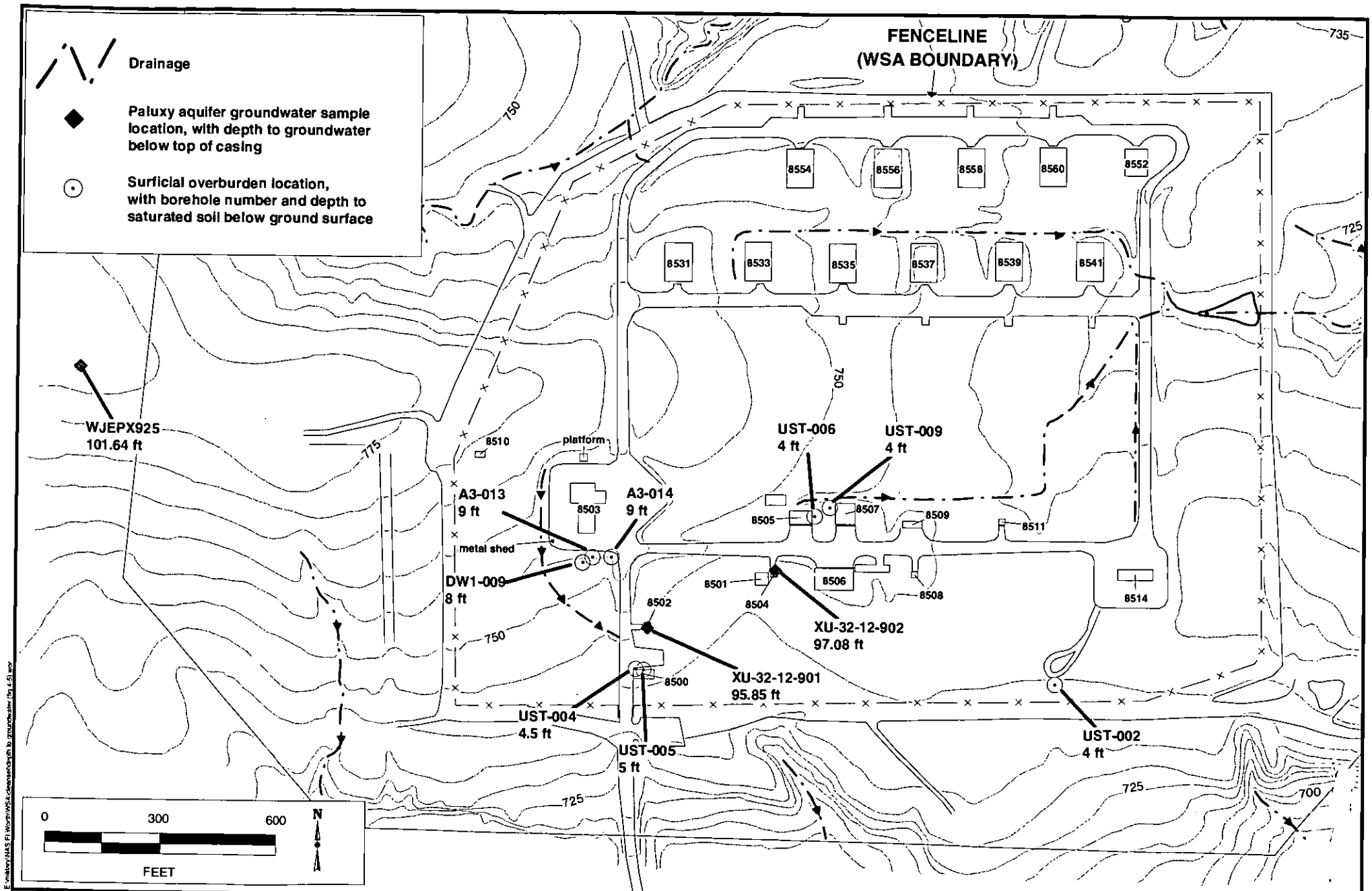

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Figure 4-5 -- Depth to Groundwater in Paluxy Aquifer and Saturated Soil in Surficial Overburden

Creation Date: 12/01/1997
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

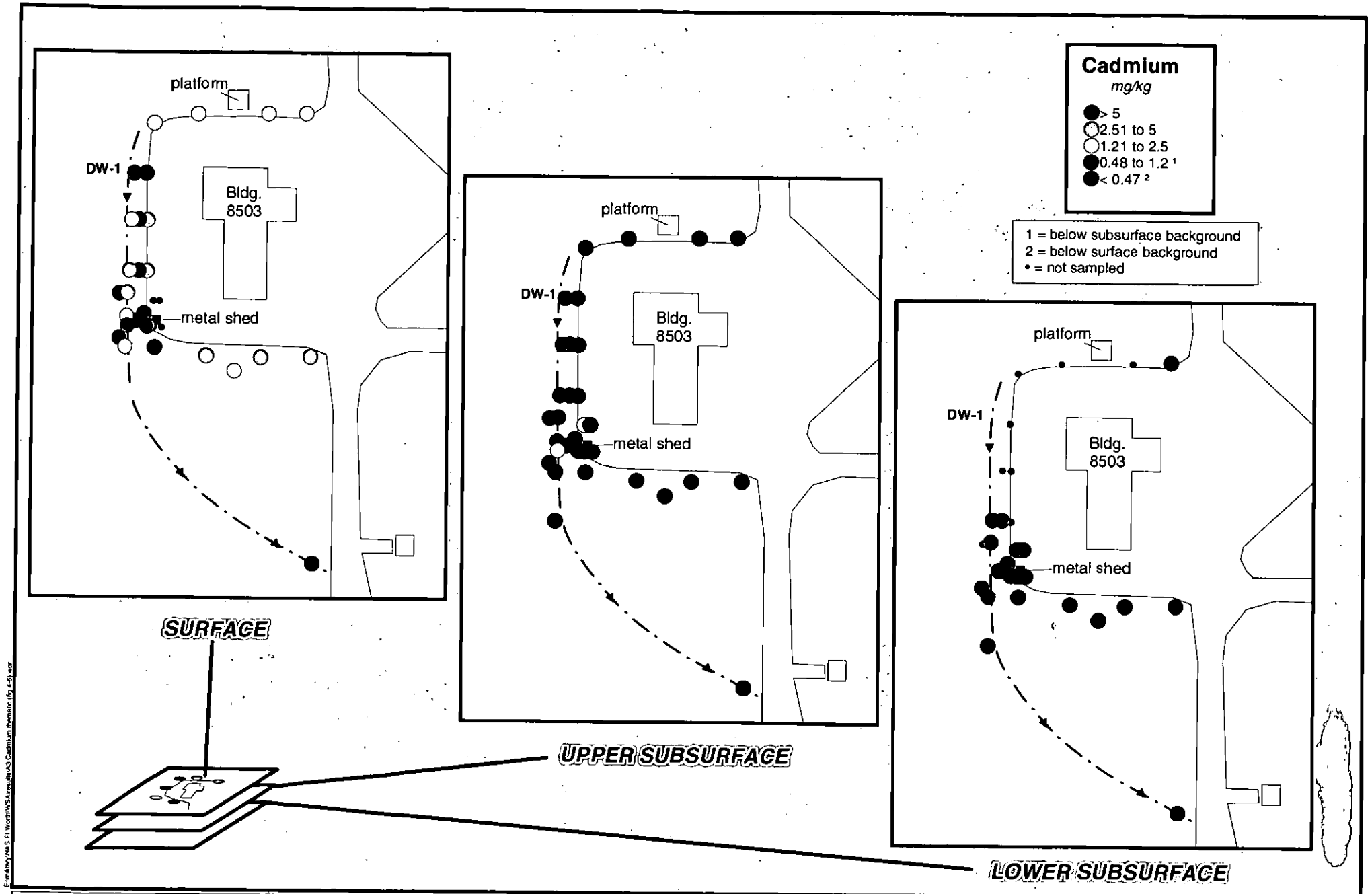

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Figure 4-6 -- Cadmium Distribution in Surface, Upper Subsurface, and Lower Subsurface Soils at Area A-3

Creation Date: 01/10/1998
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

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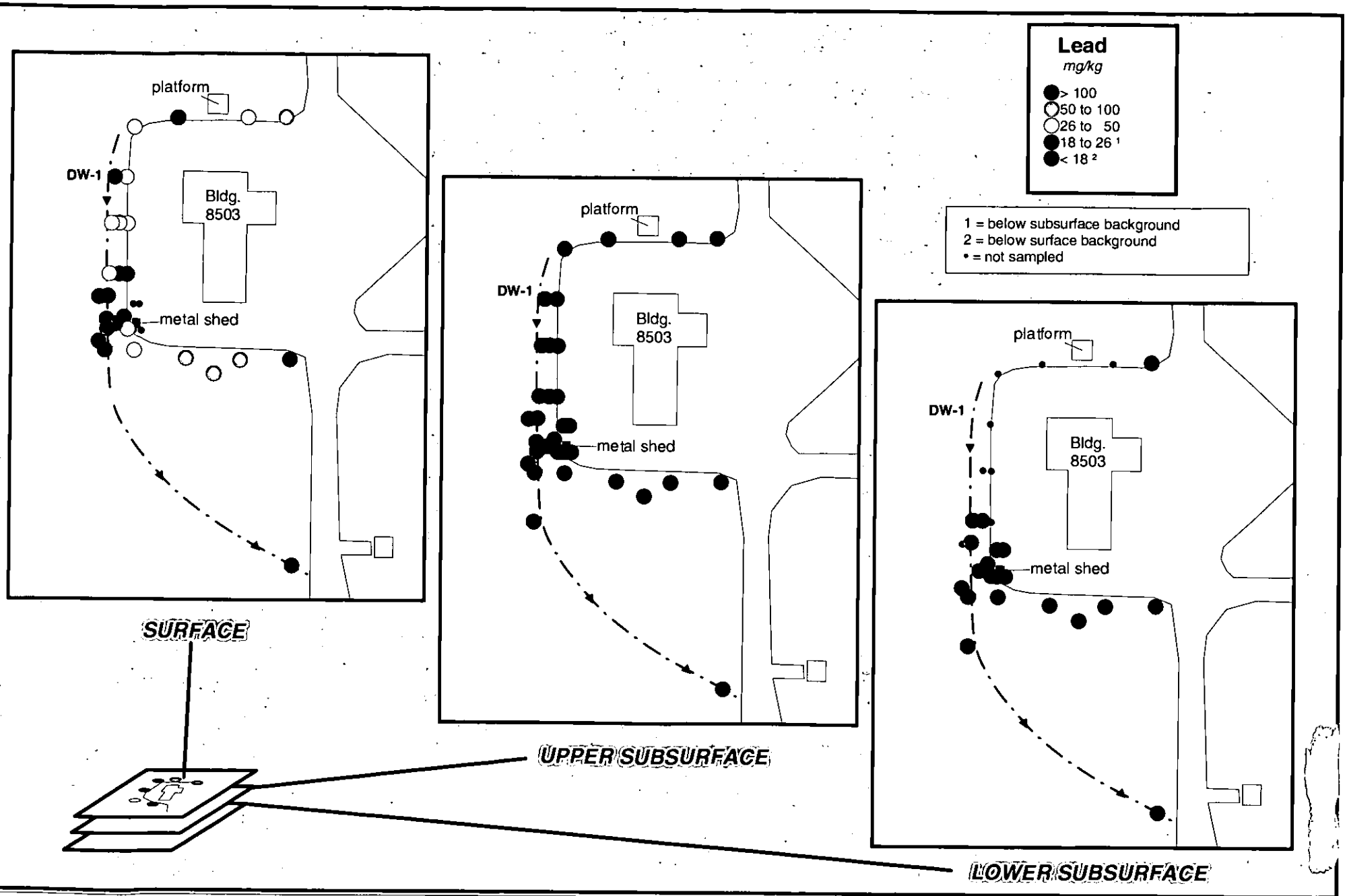

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Figure 4-7 -- Lead Distribution in Surface, Upper Subsurface, and Lower Subsurface Soils at Area A-3

Creation Date: 01/10/1998
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

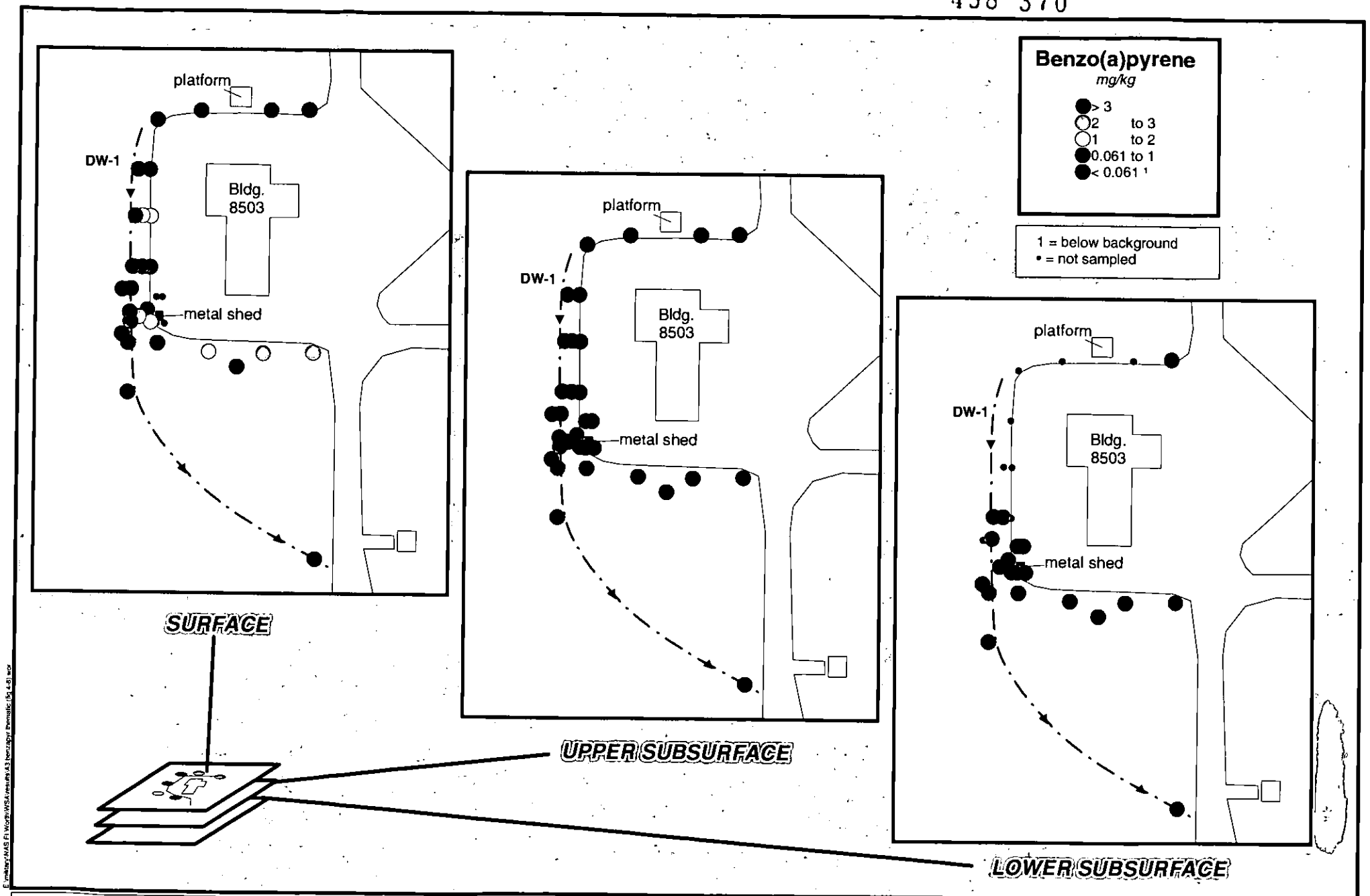

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Figure 4-8 -- Benzo(a)pyrene Distribution in Surface, Upper Subsurface, and Lower Subsurface Soils at Area A-3

Creation Date:	01/10/1998
Rev. Date:	07/16/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109

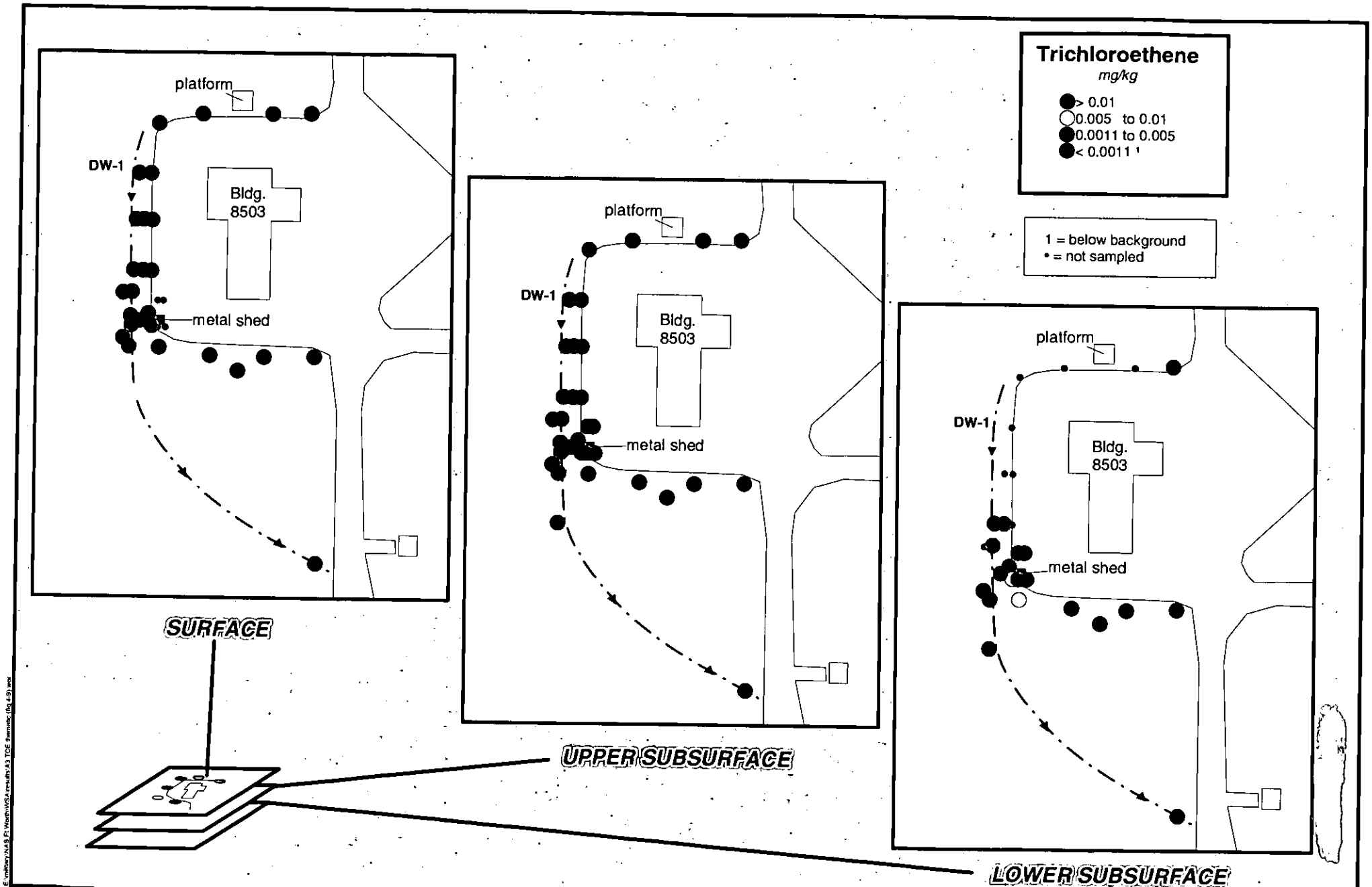

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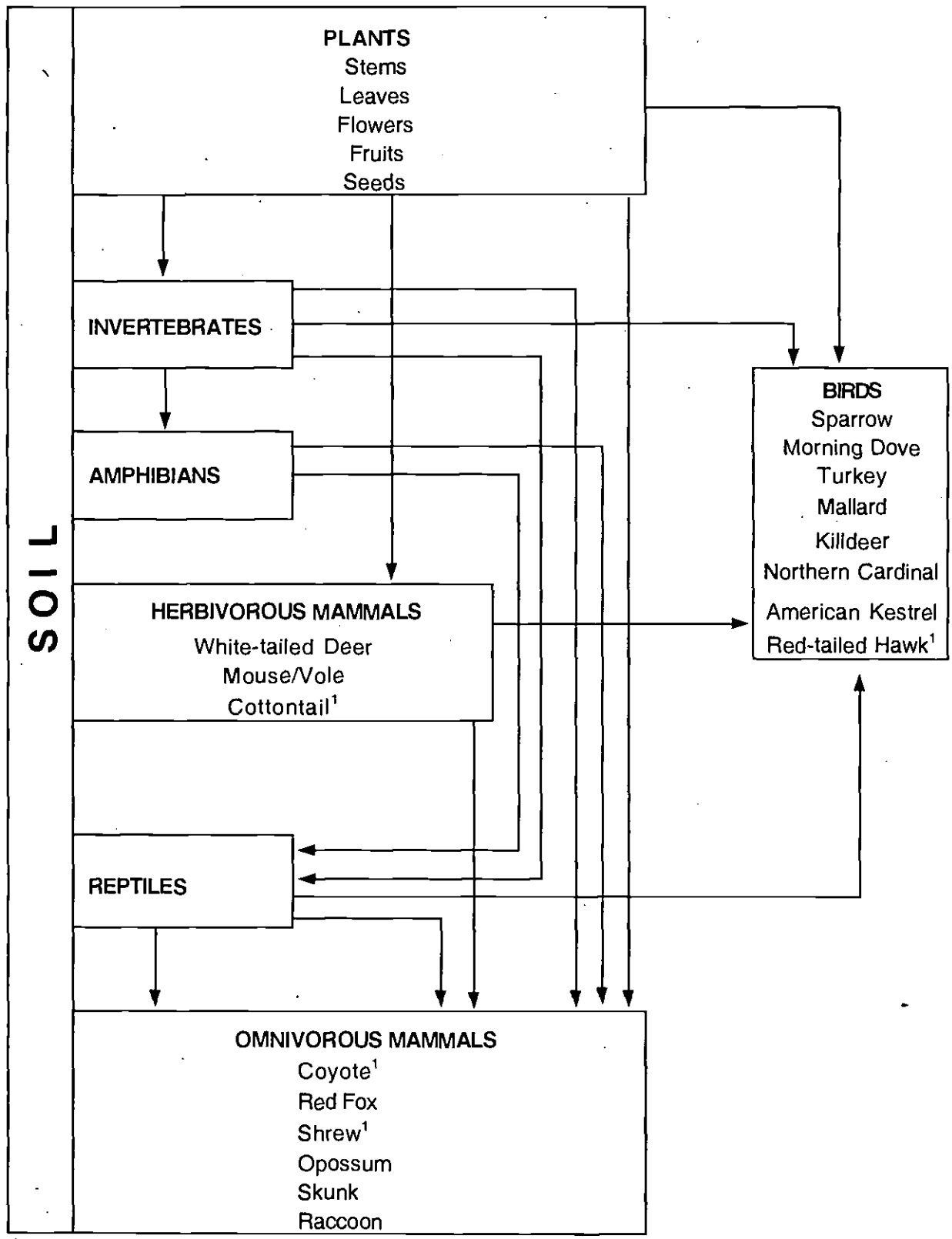
Figure 4-9 -- Trichloroethene Distribution in Surface, Upper Subsurface, and Lower Subsurface Soils at Area A-3

Creation Date:	01/10/1998
Rev. Date:	07/16/1999
Project Manager:	B. Duffner
Prepared By:	W. Mitchell
Project No:	P-3109



[1] Receptors or endpoint species identified for evaluation in the ecological screening assessment.

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Figure 4-10
Representative Terrestrial Food Web Connections

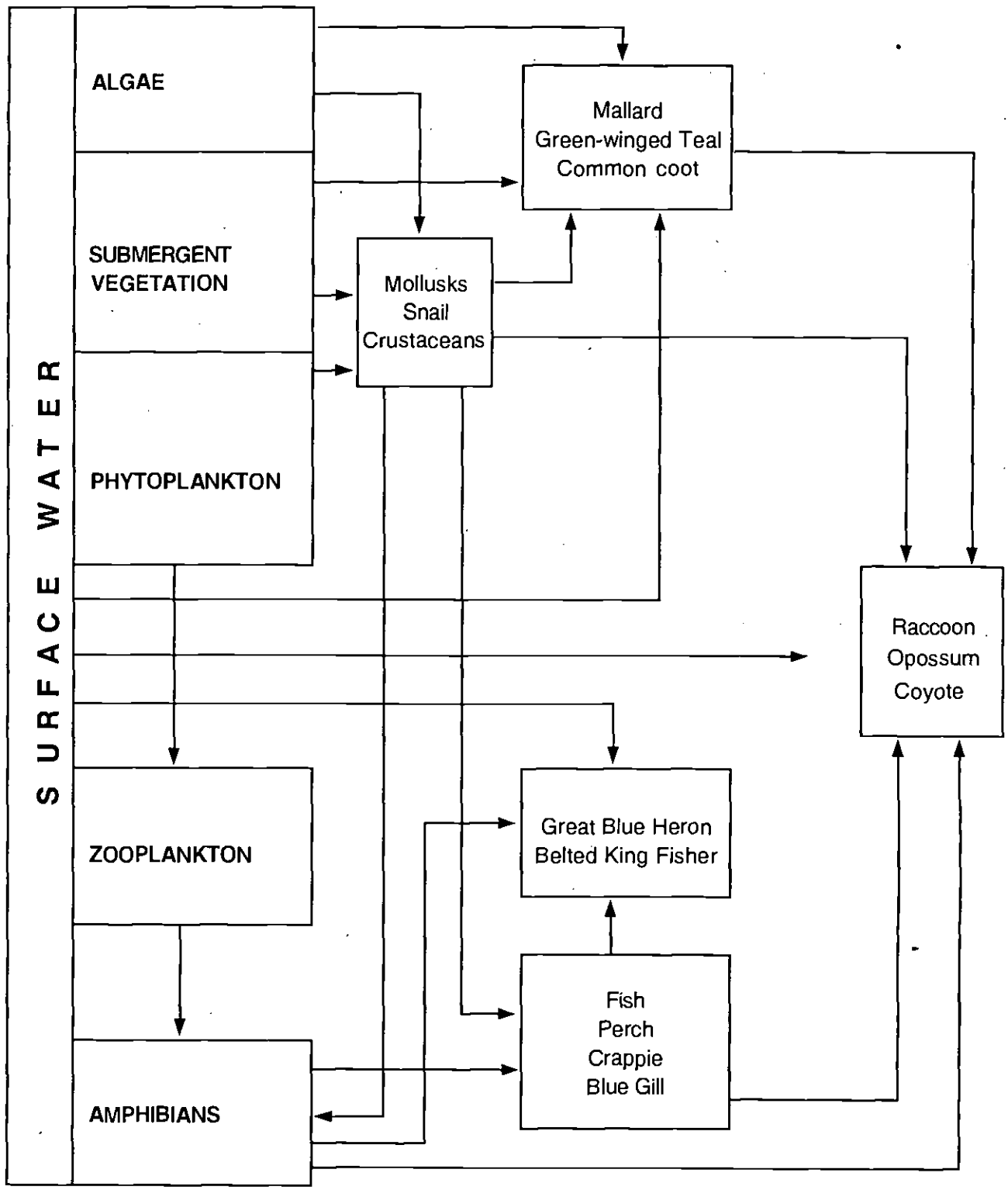

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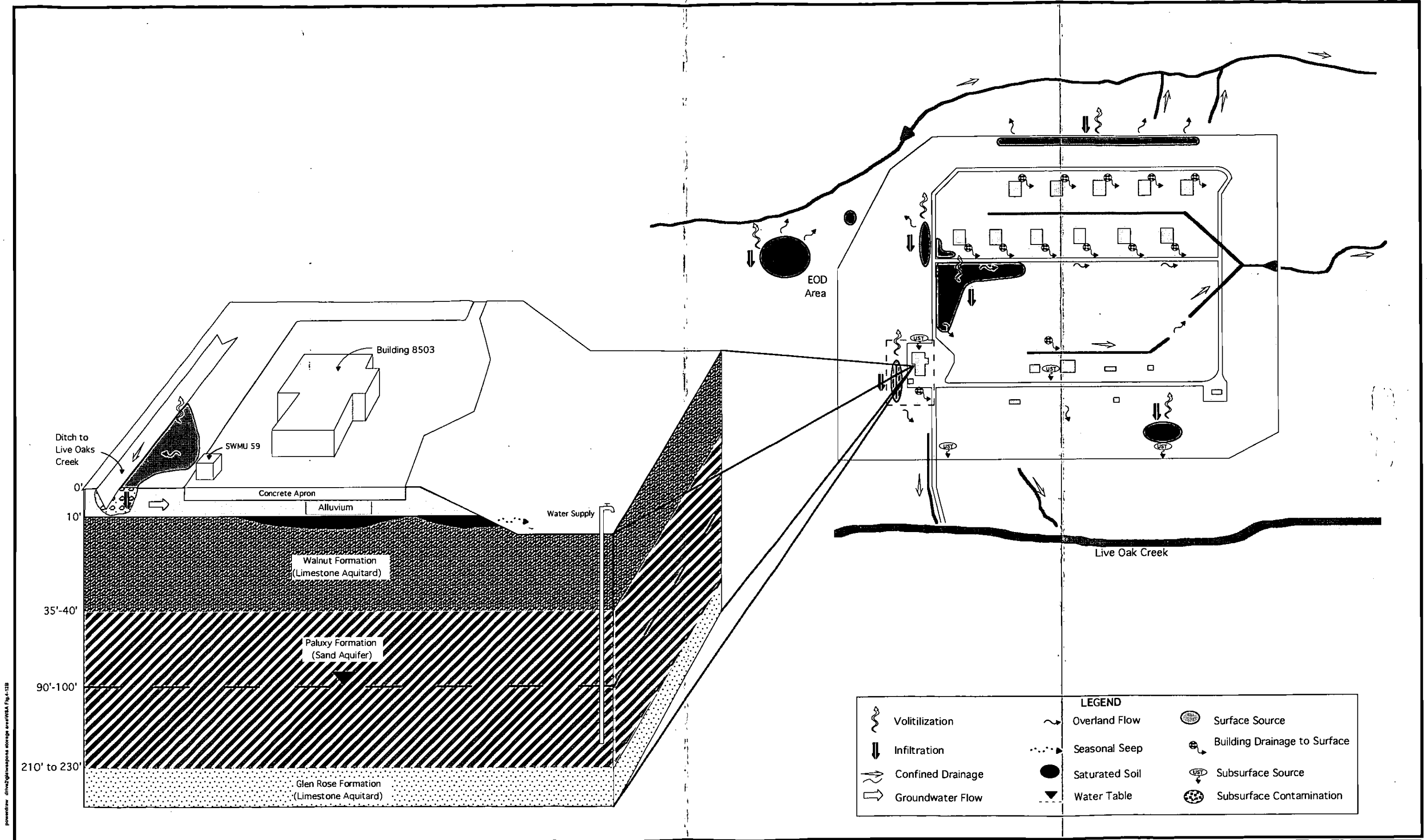
Figure 4-11

Representative Aquatic Food Web Connections



The Environmental Company, Inc.

Date: March 1999
Project Manager: B. Duffner
Prepared By: D.Hurt
Project No.: P3109

FIGURE 4-12
CONCEPTUAL PHYSICAL SITE MODEL

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TAB

5

5.0 RISK EVALUATION

The Risk Evaluation is divided into the Human Health Evaluation (see Section 5.1) and the Ecological Evaluation (see Section 5.2). Section 5.1 identifies COPCs, potential human receptors, and exposure pathways, and develops RRSN2 CULs for protection of human health. Section 5.2 discusses the biological resources present at the Offsite WSA and surrounding area and evaluates potential ecological impact using toxicological benchmarks. Section 5.3 summarizes potential uncertainties associated with the Human Health and Ecological Evaluations.

A general description of the methodologies used in the Risk Evaluation is discussed in Section 2.4.3.

5.1 HUMAN HEALTH EVALUATION

In this section, human health risks are evaluated through development of CULs based on exposure scenarios, acceptable risk levels, risk based concentrations, and standards identified in the Risk Evaluation. These CULs were compared to site-specific exposure concentrations as a means to identify potential impacts to human health. Chemicals for which CULs were developed were identified through the background screening evaluation conducted in Section 3.0. The Risk Evaluation was completed for all WSA areas listed in Sections 2.2.1 to 2.2.4.

5.1.1 Identification of Chemicals of Potential Concern

As described in Section 3.0, both surface (0-0.5 ft bgs) and subsurface soil samples were collected during the current RFI for laboratory analysis based on suspected contamination. Because of the potential for subsurface soil contamination and subsequent contaminant migration, groundwater in the Paluxy formation was sampled in three locations. **In addition, drainageways present onsite transport surface water runoff associated with potential source areas directly offsite and seasonal seeps discharge water from soil to the surface.** Therefore, the environmental media of potential concern for this Risk Evaluation are surface soil, subsurface soil, sediment, surface water, and Paluxy groundwater.

The soil and water data collected during the current RFI were used to identify COPCs and evaluate attainment of cleanup levels. Because sufficient numbers of data were collected during this RFI, data from previous environmental investigations of the Offsite WSA were not incorporated into this Risk Evaluation.

In Section 3.0, detected metal concentrations in surface soil, subsurface soil, **sediment, and surface water** were compared with background $UTL_{95,95}$s. Groundwater concentrations of metals were compared to the maximum detected background concentration because only one background groundwater sample was collected at the site. Exceedances of background $UTL_{95,95}$s are identified with boxes in Tables 3-10 to 3-42. Metals with at least one concentration exceeding background were carried forward in this Risk Evaluation to produce a list of COPCs for developing CULs. As shown in these tables, concentrations of several metals exceeded background $UTL_{95,95}$s in all

areas where samples were analyzed for inorganics. Inorganics were not target analytes for samples collected from Area A-4 and the Transformer and UST areas.

A number of inorganic analytes were reported at concentrations slightly greater than background $UTL_{95,95}$s (i.e., less than 3 times) with no apparent associated source for contamination. For example, across all study areas subsurface concentrations of antimony were consistently above the background $UTL_{95,95}$, while the surface concentrations were below. This occurred because the statistical assessment of antimony background samples yielded a UTL for subsurface (0.92 mg/kg) that was 4.9 times greater than the surface UTL (4.5 mg/kg). After collection of a significantly greater number of field samples, it became apparent that the background levels determined for the two horizons are most likely from the same statistical population. Based on a communication with U.S. EPA Region 6 (EPA, 1997), these concentrations likely represent natural variability in background conditions that were not captured in the relatively limited number of samples collected during the background investigation. EPA Region 6 indicated that natural levels of antimony tend to vary significantly within even small areas. The reported antimony concentrations in the Offsite WSA samples were consistently low in both magnitude (average surface and subsurface detected concentrations were 1.4 mg/kg and 1.8 mg/kg, respectively) and variability (detected concentrations for surface and subsurface ranged from 0.93 to 2.5 mg/kg and 1.3 to 2.5 mg/kg, respectively) across all areas and between horizons. These concentrations, therefore, are considered to be within the actual local background population.

Such exceedances, however, were included in this risk evaluation in order to adequately document the protection of human health and the environment. These analytes were considered further with respect to the closure requirements of TAC 335 Subchapter S in Section 6.0 of this report.

With the exception of PAHs detected at anthropogenic background levels (see Section 3.0), all organic compounds detected in more than 1 percent of the samples collected were carried forward to the Risk Evaluation. A few organic compounds, which were detected above 1 percent, were determined to be either field or laboratory contamination and therefore, not related to site media and not carried forward in the Risk Evaluation. These compounds include bis(2-ethylhexyl)phthalate and methylene chloride in background soil samples, chloroform detected in one seep surface water sample, tetrachloroethene reported in five leach field samples and toluene randomly detected in several samples. Bis(2-ethylhexyl)phthalate and methylene chloride were two of three organic compounds detected in background samples, but were determined to be laboratory or field contaminants because of detects reported in the blank samples. Chloroform was detected in the ambient blank collected during the additional sampling effort at the same concentration as the seep

sample (Table 2-9). Therefore, the chloroform detected in the surface water sample is assumed to be due to sampling-related or ambient air introduction of the compound and is not considered attributable to the site. Similarly, tetrachloroethene and toluene were detected in the ambient air, equipment, and trip blanks. These compounds were not carried forward in the Risk Evaluation.

Several compounds that exceeded the background $UTL_{95,95}$ in samples collected during the field characterization efforts (August/September 1997, February 1998, and Spring 1998) were not carried forward in this Risk Evaluation because of the results generated from the verification and extent of contamination sampling performed during Fall 1998. This latter sampling indicated that the original detects were either analytical anomalies, existing contamination that was removed during sampling or not representative of site conditions because of sample collection methods. As discussed in Section 3.0, the following compounds were determined to be anomalous detects or anthropogenic background (PAHs only) and are not associated with unpermitted discharges or SWMU related contamination:

- Nickel at A1-028,
- PAHs at A1-019,
- Antimony in Area A-3,
- PAHs in Area A-3 and drainageways DW-1 and DW-4, and
- Thallium and dinitrotoluenes in the EOD Range

Table 3-29 indicates that the reported concentration of calcium exceeds the background $UTL_{95,95}$ in one subsurface (0.5-2.5 ft bgs) sample collected from Drainageway 1 and is one to two orders of magnitude higher than concentrations detected in the other samples. This anomalous concentration is likely due to limestone that is prevalent in this area. Therefore, the concentrations are due to localized geological conditions and calcium was eliminated as a COPC.

Table 5-1 summarizes the soil COPCs for human health according to area and soil horizon sampled. Cleanup levels were developed in Section 5.1.3 for these compounds. As shown in this table, COPCs include metals, PAHs, one phthalate, chlorinated solvents, and four pesticides. The areas with the highest number of COPCs in all chemical categories are the drainageways. In these areas, metals and PAHs are COPCs in both surface and subsurface soil. The PAHs are considered COPCs only in drainageway DW-3. PAHs detected in drainageways DW-1 and DW-4 are associated with roadway runoff and were reported at levels comparable to anthropogenic background. No PAHs were detected in drainageways DW-2 and DW-5 through DW-9. The majority of the VOCs were detected in the surface and subsurface at concentrations ranging from 0.5 to 10 ft bgs, while the pesticides were only detected in surface soil. In the other eleven study areas, metals were also COPCs in both surface and subsurface soil, except those areas in which samples were not analyzed for these compounds (i.e., Area A-4, the Transformers, and

the UST areas). PAHs are COPCs in one other area (the USTs), where they are limited to the subsurface. **VOCs are also COPCs in A-1, A-2, A-4, and the UST areas. Pesticides as COPCs are limited to A-3, the drainageways, and the Transformer (4,4'-DDE only).**

Overall, the chlorinated solvents were limited to the subsurface. Although, in general, there are no obvious patterns with respect to which horizon metals are more often COPCs, antimony is a COPC only in the subsurface in areas where it was detected. It was detected below the background $UTL_{95,95}$ in the surface soil.

As discussed in the work plan (TEC, 1996c), TPH, which was detected in soil samples collected from the UST area and Area A-4, are represented by individual indicator compounds for which toxicity criteria are available. TPH compounds, which include BTEX and PAHs, were carried through the COPC screening process along with the other detected compounds.

As shown in Table 5-2, only a limited number of inorganic compounds in surface water and Paluxy groundwater were above background and were carried forward as COPCs. No organic compounds were detected in either surface water or groundwater samples.

5.1.2 Human Exposure Pathway Evaluation

Exposure pathways describe the mechanisms through which chemicals released from the source(s) reach potential receptors. Exposure pathways are defined by the following elements, all of which must be present to have a complete exposure pathway.

- Contaminated environmental media
- Receptor
- Point of contact with the contaminated medium
- Feasible route of exposure at the point of contact.

Chemicals with concentrations above background levels were identified in surface soil, subsurface soil, surface water, sediment, and groundwater. Current human receptors, described in Section 4.3.1, may contact contaminants in the surface soil (0-0.5 feet bgs), but are not expected to contact them in the subsurface. Soil may be excavated and brought to the surface during future development and uses of the site, allowing future populations to contact contaminants currently located and undisturbed in the subsurface soil. Exposure to contaminants in soil may occur via inhalation, ingestion, and dermal contact. Although inhalation is considered a feasible current route of exposure for this Risk Evaluation, exposure via this route is expected to be limited because the majority of the site is covered with either vegetation or pavement. All elements described above are present and soil exposure pathways are complete for both current and future receptors.

As discussed in Section 4.3.1, the Paluxy aquifer is a source of municipal water supply for the City of White Settlement. Because of this use, this Risk Evaluation assumes domestic drinking water to be the most

beneficial use of the groundwater in the aquifer. With the presence of possible COPCs in the groundwater, residential and industrial consumption of the groundwater are considered complete exposure pathways. Exposure may occur via ingestion, inhalation of volatiles, and dermal contact. Although the Walnut Formation below the site will likely retard any downward migration of contaminants, the soil to groundwater cross-media protection pathway was evaluated to be consistent with TNRCC Subchapter S standards. Therefore, soil cleanup levels protective of groundwater were developed to prevent possible future contaminant migration from soil to groundwater.

Because of the accessible nature of the seasonal and permanent surface water bodies (creeks, drainage ditches, seeps, and ponds) in the vicinity of the site and the presence of limited COPCs, the potential exposure pathways associated with surface water and sediment are considered complete for this evaluation. As discussed in Section 4.3.1, recreational users and nearby residents could be exposed to site-related compounds via contact with surface waters used for recreational purposes (swimming and wading) and consumption of fish.

Based on information provided in Sections 1.2.4.4, 4.0, and 5.1.1, the following exposure scenarios, which are graphically illustrated in Figure 5-1, are considered complete for this Risk Evaluation.

- Current Area Residents: Ingestion of, inhalation of, and dermal contact with COPCs in surface soil, surface water, sediment, and leaching from soil to the Paluxy groundwater; consumption of aquatic biota.
- Current Trespassers/Site Visitors: Ingestion of, inhalation of, and dermal contact with COPCs in surface soil, surface water and sediment; consumption of aquatic biota.
- Future Residents: Ingestion of, inhalation of, and dermal contact with COPCs in surface and subsurface soil, surface water, sediment, and leaching from soil to the Paluxy groundwater; consumption of aquatic biota.
- Future Commercial/Industrial Workers
  - Ingestion of, inhalation of, and dermal contact with COPCs in surface and subsurface soil, surface water, sediment.
  - Ingestion of and dermal contact with COPCs leaching from oil to the Paluxy groundwater.
- Future Construction Workers:
  - Ingestion of, inhalation of, and dermal contact with COPCs in surface and subsurface soil.
  - Inhalation of and dermal contact with COPCs in seep surface water via excavation of subsurface.

5.1.3 Cleanup Levels Development and Screening

CULs for residential soil and industrial soil in non-UST areas were obtained from the most recent TNRCC interoffice memorandum guidance on implementing the existing Subchapter S Risk Reduction Rule (TNRCC, 1998). No other sources of cleanup levels for these media were necessary because the medium-specific concentrations (MSCs) provided in this guidance reflect newly promulgated standards (e.g., MCLs), current toxicity factors, current inhalation emission factor methodologies, and the dermal absorption exposure pathway (TNRCC, 1998). In addition, several compounds that did not have RRSN2 MSCs in the original Appendix II of Subchapter S (TNRCC, 1993), are listed with values in the memo (e.g., dinitrotoluenes).

TNRCC standards are not specifically available for construction worker exposures. Separate MSCs were not derived because it was determined that MSCs for this scenario, if derived based on EPA- and TNRCC-recommended exposure assumptions and algorithms, would be higher than those for the other scenarios. This determination was based on a quantitative comparison of the scenario-specific values generated from using the exposure assumptions that are unique among the possible scenarios (i.e., exposure duration, skin surface area exposed, and ingestion rate). In the comparison, the exposure assumptions for the construction worker scenario were assumed to be 1 year for exposure duration, 4,300 cm^2 for skin surface area, and 480 mg/year for soil ingestion rate. Soil CULs for the trespasser/site visitor scenario were also not developed because exposure frequencies and durations for these receptors would be much lower than for residential populations, resulting in lower risk. Residential CULs are protective of these intermittently exposed populations.

CULs for both surface water and Paluxy groundwater were also obtained from TNRCC (1998). Because the Paluxy aquifer supplies domestic drinking water, groundwater CULs were based on the residential groundwater MSCs in TNRCC (1998) or maximum contaminant levels (MCLs), whichever was lower. The Texas Surface Water Quality Standards were consulted for surface water CULs, as specified by Subchapter S; however, no values were provided for the COPCs in this medium. Therefore, the residential groundwater RRSN2 values provided in TNRCC (1998) were used as surface water CULs.

CULs for the non-heating oil UST areas (USTs at Bldgs. 8505 and 8514) were developed according to procedures outlined for Plan B Target Concentrations in the PSTD guidance (TNRCC, 1994). Similar to the RRSN2 rules, Federal or Texas promulgated health-based standards or criteria are the primary basis for CULs. When these values were not available, risk-based concentrations were obtained from *Risk-Based Corrective Action for Leaking Storage Tank Sites (RG-36)* (TNRCC, 1994). Before applying these concentrations in this risk evaluation, they were verified to ensure that the most current toxicity factors (EPA, 1999) were utilized in the generation of the values.

TNRCC (1998) soil MSCs and Plan B target soil concentrations for both residential and industrial direct contact and soil to groundwater migration were evaluated for their use as CULs in this risk evaluation. The direct contact MSCs are risk-based and reflect three exposure routes: ingestion, inhalation of volatiles and particulates, and dermal contact. The soil to groundwater migration MSCs were derived by TNRCC (1998) by multiplying the respective risk-based target groundwater concentration with a dilution factor of 100. In contrast, the PSTD risk-based guidance incorporates a soil-water partition factor (in addition to the use of a default dilution factor of 100) when determining groundwater protective concentrations. For the PAHs, this partition factor increases the groundwater protective concentration because it reflects the lower vertical mobility of the compounds. Thus, residential direct soil contact becomes the more significant pathway for potential exposure to PAHs in the removed UST locations.

The MSCs and Plan B target concentrations were derived using reasonable maximum exposure (RME) assumptions and algorithms. Residential RME assumptions reflect a combined early childhood (6 years) and adult exposure for both carcinogens and noncarcinogens in soil and adult exposures only (30 years) for COPCs in groundwater. For the industrial scenario, adult exposure assumptions, consistent with standard work conditions, were used to generate the industrial direct soil contact soil MSCs. These MSCs reflect a standard default exposure frequency of 250 days/year for 25 years. The target risk levels corresponding to the MSCs are consistent with EPA guidelines and TNRCC standards, which define the noncarcinogenic risk level as a hazard quotient (HQ) of 1; and the carcinogenic risk level as $1x10^{-6}$ for Class A and B carcinogens and $1x10^{-5}$ for Class C carcinogens.

The risk-based concentrations and standards considered as potential CULs for both the residential and industrial scenarios are summarized in Table 5-3. The lowest concentrations for each medium are boxed. As shown in this table, the concentrations corresponding to the groundwater protection pathway are the lowest for all soil COPCs except for those associated with mercury and the UST sites. Given that the vertical migration of COPCs from soil to groundwater are significantly retarded by the Walnut Formation aquitard and only a limited number of inorganics in groundwater were identified, using the default MSCs as CULs for the soil to groundwater pathway is a highly conservative approach for this site. Furthermore, as demonstrated in Section 4.2, site contamination is generally limited to the surficial layer of soil and vertical migration is not occurring. As a result, potential exposures and risks are likely to be limited to direct surface soil contact pathways for both current and future receptors and not the groundwater migration pathway.

Risk-based concentrations or standards were not available for some of the COPCs (four inorganics and two PAHs). Three of these compounds, magnesium, potassium, and sodium are not expected to pose a risk to

human health because they have low toxicity and/or are essential dietary minerals. They therefore are not carried further in the Risk Evaluation. For the two PAH compounds, benzo(g,h,i)perylene and phenanthrene, CULs of similar compounds were substituted in the site concentration CUL comparison presented in Section 5.1.5. A CUL for iron was developed using the synthetic precipitation leachate procedure (SPLP) results addressed below.

The groundwater protection soil concentrations for several metals are below the background $UTL_{95,95}$, resulting in highly conservative human health values for the metals. Therefore, the SPLP (Method 1312 of SW 846, Test Methods for Evaluating Solid Waste, U.S. EPA) was performed on several soil samples collected during the 1997 RFI field efforts to develop site-specific soil cleanup levels for the soil to groundwater cross-media pathway, as allowed for in TAC Chapter 335, Subchapter S (TNRCC, 1993). The SPLP was performed on a number of archived soil samples, as well as on the potential hot spot verification samples collected in February 1998 (due to holding time restrictions, SVOC and mercury analyses were performed only on samples collected in February 1998). The results of the SPLP and corresponding soil concentrations are presented in Table 5-4. The analysis was conducted for metals and PAHs. As specified in TNRCC (1993), soil concentrations corresponding to leachate concentrations that are detected below the residential RRSN2 groundwater concentration (i.e., groundwater MSC) can be used as soil CULs in place of the default groundwater protection standards. Therefore, in Table 5-4 the leachate concentrations are compared to the RRSN2 concentrations, except as noted on the table, and all leachate results below the respective standard are highlighted. The highest soil concentration corresponding to a leachate level below the standard is identified as the potential SPLP-based groundwater protection soil CUL for the WSA Risk Evaluation. SPLP-based values were identified for arsenic, cadmium, chromium, iron, lead, mercury, nickel, and vanadium. Leachate concentrations for antimony and the PAHs were all above the RRSN2 groundwater concentrations.

A comparison of all the potential concentrations that may be used as the WSA CULs for metals in soil is presented in Table 5-5. These concentrations, one of which was selected as the CUL for each metal, include the residential direct soil contact, residential groundwater protection, background, and SPLP concentrations. The logic in selecting the most appropriate cleanup levels is illustrated in Figure 5-2. Initially, the lower of the two risk-based concentrations shown in Table 5-5 was selected as the CUL. If this value was below the background, the background was identified as the potential CUL. Because the CULs for the majority of the metals defaulted to background levels, the SPLP was performed on several soil samples to develop more site-specific CULs for the soil to groundwater migration pathway. The most appropriate soil

concentration resulting from this procedure was selected as the CUL if it was above the background or risk-based level. Due to soil characteristic differences at Draingeway DW-9 (gravel versus silty clay), CULs based on SPLP results (if higher than background) were determined separately for this area. Separate Drainageway DW-9 CULs were selected for arsenic, chromium, iron, lead, and nickel.

The final soil, groundwater, and surface water CULs for the Offsite WSA are summarized in Table 5-6. The CULs were compared to maximum detected concentrations of COPCs as an additional screening tool to reduce the number of chemicals for which site-specific exposure point concentrations (EPCs) would be calculated. This comparison is presented in Appendix N. COPCs with maximum concentrations above the CULs were further compared to EPCs in Section 5.1.5. This latter analysis formed the basis for determining whether areas would require further characterization and/or removal actions in order to meet the closure requirements of RRSN2 (See Section 6.0). EPCs are derived in the following section (Section 5.1.4).

5.1.4 Derivation of Exposure Point Concentrations

Site concentrations of both human health and ecological COPCs from each area were compared to CULs and ecological Tier 2 Level C values ($T_{2\text{-}c}Ls$) to characterize potential human health risks and ecological impacts that may exist in site media, and to determine whether site-related contamination is above levels of concern (Sections 5.1.5 and 5.2, respectively) . To accomplish this, surface and subsurface soil data from all RFI sampling efforts were grouped separately for each area and were used to derive EPCs for the human health evaluation. The soils were treated in this manner to assist in risk management decisions on appropriate depths to which remedial actions may need to be conducted. The site concentrations for the bunker drains, USTs, and drainageways were further divided into the separate sample locations because they are located in discrete locations or have some barrier separating the sample locations. For the ecological evaluation, surface and subsurface soil data were combined to derive EPCs because plants and wildlife may be in contact with both surface and subsurface soil at the same time (e.g., plant roots, burrowing mammals). Human health EPCs were not derived for surface water and groundwater because the maximum concentrations of COPCs were below the human health CULs. Surface water EPCs for the ecological evaluation equaled the maximum detected concentration because the data set contained less than six samples.

TNRCC (1993) allows the use of the 95 percent upper confidence limit (UCL) to represent the EPC when demonstrating attainment of RRSN2. Therefore, EPCs were derived as the 95 percent UCL of the mean concentration according to the data distribution for each data set (i.e., normal, lognormal, or not identifiable), or were designated as the maximum detected concentration, depending on the size of the data set and the frequency of nondetects. If a data set contained fewer than six samples or

was comprised of a high number of nondetects, the maximum detected concentration was used as the EPC. For data sets with six or more samples, the 95 percent UCL was calculated unless the data distribution was not evident from the normality tests described below. All data points qualified as estimated were included in calculations and undetected values were replaced by one-half the analytical sample detection limits (EPA, 1989b, 1992a). Field duplicates were averaged for EPC calculations.

Both the Shapiro-Wilk test and normal probability plots were employed to test the normality of each data set and identify appropriate data distribution for calculating the EPCs. These tests were conducted using the Statgraphics software application (Manuguistics, 1997) and were applied to both the raw data and the log-transformed data. The highest Shapiro-Wilk test statistic, combined with the observation of the plot, provided the basis for selecting the most appropriate distribution. Critical Shapiro-Wilk statistics were obtained from EPA (1992a). For data sets containing 50 or fewer samples, the Shapiro-Wilk test is valid (EPA, 1992a). Normal probability plots were relied upon for data sets containing 50 or more samples. The data distribution and EPCs for both human health and ecological receptors are compiled in the tables provided in Appendix O for each COPC in each study area.

In some cases, potential outliers representing high concentrations relative to the rest of the data set were identified in the normal probability plots. These data points were treated separately if the data distribution of the whole data set, including the potential outlier, was unidentifiable and the distribution of the data set excluding the outlier was a good fit under normal or lognormal conditions. These data points were assumed to represent a single EPC and were compared to CULs similar to the other EPCs. The outliers and the sample locations in which they were reported are noted in the EPC tables. In addition, relatively large data sets containing only one detect (in which the EPC equals the maximum detected concentration) are noted in the tables. The locations of these detects are noted in parentheses next to the COPCs.

5.1.5 Comparison of RRSN2 Human Health CULs with EPCs

Tables 5-7 to 5-10 compare the soil EPCs for each COPC in each area to the CULs. Boxes around the exceeding concentration denote CUL exceedances. **No COPCs in Areas A-1, A-2, A-4, and A-5, and the EOD Range had maximum concentrations above the CULs. Overall, the groups of COPCs that exceeded CULs were the carcinogenic PAHs and metals. The most prevalent COPCs above CULs were the PAHs in the UST areas and DW-3. The metal COPCs exceeded CULs at single locations and were either not detected, below background, or below CULs at all other locations.**

Table 5-7 presents the comparison for Areas A-1 and A-3. Maximum concentrations in A-1, A-2, A-4, and A-5 were below CULs, as demonstrated in Appendix N. Iron and mercury exceed respective CULs in Area A-3. The iron and mercury exceedances represent outlier concentrations at sample locations A3-011 and A3-006, respectively.

Table 5-8 summarizes CUL exceedances for the bunker drains. **Mercury, cadmium, and copper are the only COPCs with CUL exceedances among the bunker**

drain sample locations. Mercury exceeds the CUL by one order of magnitude at one surface sample location associated with Bunker 8531 (BD-002). The other sample collected next to this bunker had no detectable levels of mercury. At BD-017 and BD-018, the mercury concentration only slightly exceeds the CUL. The copper concentration, reported in the subsurface sample collected from BD-005, is considered an outlier relative to the remaining data set associated with Bunker 8535. The exceedance is less than 1.5 times. All other copper concentrations at the bunker drains were either below background, below the CUL, or not detected. Cadmium exceeds the cleanup level at four individual bunker drain sample locations, adjacent to Bldgs. 8552, 8554, 8556, and 8558.

Exceedances for the USTs are presented in Table 5-9. Samples collected at the UST associated with Bldg. 8500 contain the highest number of exceedances of carcinogenic PAH CULs, followed by the UST at Bldg. 8507. The benzo(a)pyrene EPC at the UST associated with Bldg. 8505 exceed the CUL, but all other PAHs are below CULs. **EPCs for the USTS are represented by maximum detected concentrations because of the small number of samples collected. The exceedances of the benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene CULs shown for the former UST associated with Bldg. 8500 are limited to sample location UST-004. Benzo(a)pyrene concentrations exceed the CUL in all samples collected from former UST locations associated with Bldgs. 8500, 8505, and 8507.** No COPCs were identified in samples collected from the USTs adjacent to Bldgs. 8503 and 8514.

CUL comparisons for Drainageways 1, 3, 4, and 9 are presented in Table 5-10. COPC concentrations in samples collected from Drainageways 2, 5, 6, 7, and 8 were either below background $UTL_{95,95}$s, not detected, or not tested. **EPC exceedances of CULs are limited to carcinogenic PAHs in drainageway DW-3. The concentrations of four of the PAHs (benz[a]anthracene, benzo[a]pyrene, chrysene, and indeno[1,2,3-c,d]pyrene) reported for the subsurface soil collected from location DW3-115 were considered outliers relative to the remaining DW-3 data set. These are addressed separately in Table 5-10. PAHs reported in DW-1 and DW-4 samples were detected at anthropogenic background levels due to roadway runoff. PAHs were reported in DW-9 samples as not detected.**

To evaluate the CUL exceedances in context of their magnitudes, particularly for risk management decision making, Table 5-11 summarizes the ratio of the EPC to the CUL for each COPC boxed in Tables 5-7 to 5-10. **Of the nine metal CUL exceedances, five of them only slightly exceed the CULs (1.3 times or less). These include iron at A3-011, copper at BD-005, mercury at BD-018, and cadmium at BD-130 and BD-149. Mercury exceeds the CUL by 99 and 5 times at two sample locations, A3-006 and BD-002, respectively. Cadmium exceeds the cleanup level by 2 to 2.5 times in surface soil at two bunker drains (BD-137 and BD-138). PAH CUL exceedances in the UST areas range**

from 3 to 125 times in magnitude. The CUL exceedances for UST-8507 are less than ten times the cleanup level. PAH CUL exceedances among DW-3 samples are relatively high in many cases, particularly for the DW3-115, where concentrations were considered outliers. With two exceptions, PAH CUL exceedances in surface soil (excluding outliers) ranged from 20 to 40 times. The dibenzo(a,h)anthracene EPC, however, exceeded the CUL by 200 times because of the stringent cleanup level. The benzo(k)fluoranthene EPC for surface soil exceeded the CUL by less than two times. Exceedances in subsurface soil samples were about an order of magnitude less than those in surface soil (except for DW3-115).

5.2 ECOLOGICAL EVALUATION

The approach followed in this Ecological Risk Assessment (ERA) is consistent with methods outlined in the *Draft Guidance for Conducting Ecological Risk Assessment Under the Texas Risk Reduction Program* (McBee et al., 1996). Potential risks to ecological receptors from contaminants identified at the Offsite WSA were evaluated using the TNRCC three-tiered approach. The three-tiered approach proposed by the TNRCC is based on concepts described in the *Framework for Ecological Risk Assessment* (EPA,1992b), hereafter referred to as the *Framework*. TNRCC's approach also incorporates methodologies outlined in the step-by-step ERA process outlined in EPA (1992b), which is also derived from the *Framework*. This tiered approach builds upon previous work by the TNRCC in support of the existing Risk Reduction Rules. The methodology as described by TNRCC consists of three components:

- Tier 1 - Ecological Assessment Checklist
- Tier 2 - Screening - Level Ecological Risk Assessment
  - Level A - Screening Assessment: Using Established Ecological Benchmarks
  - Level B - Screening Assessment: Using Toxicity Reference Values (TRV)
  - Level C - Screening Assessment: Reducing the Hazard Quotient (HQ)
- Tier 3 - Quantitative Ecological Risk Assessment

The goal of the TNRCC approach is to provide a methodology for evaluating potential impacts to environmental resources prior to and possibly in lieu of, performing a detailed quantitative ERA. The three-tiered approach should maximize efficiency and cost-effectiveness by ensuring that the scope of the assessment is consistent with the specific degree of ecological concern. This ERA was completed through a Tier 2, Level C screening assessment.

The following sections of this ERA include a description of the biological resources at the Offsite WSA, a Tier 1 ecological assessment checklist, an evaluation of potential exposure pathways, and a Tier 2 screening assessment which includes an evaluation using established ecological benchmarks, toxicity reference values, and exposure point concentrations.

Section 5.2.1 Tier 1: Ecological Assessment Checklist

In accordance with the TNRCC tiered approach, an ecological assessment checklist, as provided by the TNRCC, was completed during a site visit in October 1997. The purpose of the checklist is to evaluate the ecological setting of the site, the potential receptors, and exposure pathways (see Appendix M). The checklist consists of a series of site-related questions that are designed to determine whether further ecological assessment of the site is warranted.

The ecological checklist was prepared to develop a preliminary problem formulation and evaluate potential ecological effects. During the site visit and preliminary problem formulation the following issues were addressed:

- environmental setting and contaminants;
- contaminant fate and transport;
- toxic mechanisms and potential receptors;
- complete exposure pathways; and
- general assessment endpoints.

Completion of the ecological assessment checklist indicated that exposure pathways are complete, and it was necessary to proceed to Tier 2. The results of the site visit, completion of the ecological assessment checklist, and preliminary problem formulation process are discussed in the following sections.

5.2.2 Biological Resources

The Offsite WSA is located in the Grand Prairie section of the Central Lowlands Physiographic Province. This region is characterized by broad, gently to moderately sloping terraces of sedimentary rock mantled by a thin layer of light brown to black loamy soils. Topography within the fenced portion of the Offsite WSA is gently sloping; the topography surrounding the site is variable, including arroyos or ravines associated with Live Oak Creek and a tributary north and east of the fenced area surrounding the Offsite WSA (see Figure 5-3). Portions of the Offsite WSA lie within the 100-year floodplain of Live Oak Creek.

The Offsite WSA is located in rural Tarrant County, west of NAS Fort Worth and just north of White Settlement Road (see Figure 1-2). Due to the rural nature of the area surrounding the Offsite WSA and its proximity to Live Oak Creek, the study area contains a diversity of habitats and supports a variety of wildlife. For discussion purposes, the environmental settings described in this ecological evaluation are divided into vegetation, wildlife, threatened and endangered species, and ecologically sensitive habitats.

Prior to a reconnaissance of the Offsite WSA, TEC reviewed available background information including maps, aerial photographs, reports, and environmental impact statements. Site-specific information was obtained during a reconnaissance of the site in early October 1997. Aerial photographs taken by the Texas Department of Transportation (TxDOT) and the North Central Texas Council of Governments on 16

March 1994 were used to map and verify habitats and vegetation cover types. A list of observed and potential plant and wildlife species is included in Appendix P. To assist in determining the presence of threatened and endangered species or sensitive habitat, letters were sent to the U.S. Fish and Wildlife Service (USFWS, 1997) and the Texas Parks and Wildlife Department (TPWD, 1997). Their responses are in Appendix Q and a list of potential threatened and endangered species is presented in Table 5-13.

The region of influence (ROI) for this ecological evaluation includes the 247 acres of the Offsite WSA, ecologically sensitive areas adjacent to the site, and Live Oak Creek and its tributaries (see Figure 1-6). These areas are subject to the transport of potential contaminants from the Offsite WSA. Potential transport mechanisms, receptors, and complete exposure pathways were also evaluated.

5.2.2.1 Vegetation

Urbanization and other human activities have altered the seral plant communities at and around the Offsite WSA. Vegetation cover types in the study area include rangeland, riparian forest (arroyos), wetland, and developed land (see Figure 5-3). Species within these vegetation cover types are discussed in the following paragraphs and a species list presented in **Appendix P (*scientific names are given in Appendix P only*).**

The main portion of the Offsite WSA is developed and surrounded by a 10-foot, three-strand barbed wire fence. This area encompasses approximately 80 acres of buildings, bunkers, and asphalt roads. Areas sampled include Areas A-1, A-2, A-3, A-4, several bunker drains, drainageways, transformer areas, and UST areas. Vegetation in this developed area consists of herbaceous weedy species such as tall wormwood, common lambsquarters, coyote thistle, and field mint. Grasses identified in this portion of the study area include Bermuda grass, switchgrass, Dallisgrass, and Johnsongrass. There are several drainageways containing herbaceous hydrophytic (wetland) vegetation and a small wetland associated with drainageway DW-5 in the northeast corner of the site. Vegetation in this small wetland include narrowleaf cattail, saltgrass, Johnsongrass, rushes, and a few sandbar willows.

Areas outside the main fenced portion of the Offsite WSA consist of grazed rangeland and arroyos associated with Live Oak Creek and its tributaries. Areas sampled outside the perimeter fence include Area A-5, the EOD range , and seeps (see Figures 2-2 and 2-4). The open rangeland is dominated by grasses and a few shrubs. Grasses in the rangeland include big bluestem, hairy grama, buffalo grass, and tall dropseed. Herbaceous weedy species are tall wormwood, coyote thistle, annual sunflower, field mint, and Canada goldenrod.

Plateau live oak, bur oak, and post oak are the dominant trees along the riparian areas and seeps associated with Live Oak Creek. Other trees in the riparian area include white ash, green ash, redbud, and cottonwood. Shrubs common in the understory include southern hackberry, dwarf dogwood, smooth sumac, and yucca. The groundcover is dominated by grass such as hairy grama, tall grama, Canada wildrye, little bluestem, and tall dropseed.

5.2.2.2 Domestic Animals and Wildlife

Historically, cattle grazed in the areas in and around the Offsite WSA. When the Offsite WSA was established, a perimeter fence kept cattle out of the facility; however, grazing around the facility continued. During an October site visit, it was observed that the perimeter fence was cut in two places, allowing cattle to graze within the Offsite WSA. There were approximately 70 heifers of mixed breed grazing at the facility and the surrounding rangeland. Other domesticated animals observed on or near the project vicinity include dogs from the adjoining residential areas, and a few domestic or feral cats.

Wildlife in the vicinity of the Offsite WSA includes a variety of birds, mammals, fish, and reptiles. Birds using the grassy areas in and around the project site include grackle, European starling, Western meadowlark, killdeer, American crow, and mourning dove. Birds of prey that were identified include black and turkey vultures, red-tailed hawk, and American kestrel. The riparian area along Live Oak Creek provides habitat for blue jay, **American robin, Northern mockingbird**, Eastern blue jay, Northern cardinal, and wild turkey.

Large mammals that use the different cover types surrounding the Offsite WSA include coyote and white-tailed deer. Vegetation along Live Oak Creek provides habitat for Eastern cottontail rabbit, squirrel, skunk, and opossum. Other mammals that could be found within the project corridor include **mice, shrews**, raccoon, nine-banded armadillo, red fox, and gray fox.

Large flocks of migratory waterfowl use Lake Worth and other smaller wetlands in the vicinity of the Offsite WSA as a stop-over during migration. Common waterfowl species identified on Lake Worth include wood duck, mallard, pintail, golden eye, and hooded merganser. Wading birds using the pastures and wetlands in the vicinity of the Offsite WSA include snowy egret and cattle egret. Although no great blue herons were observed during the site visit there is a rookery in the Fort Worth Nature Center approximately 3 miles north of the Offsite WSA.

Areas within the project area also provide habitat for reptiles and amphibians. Snakes that may be found on the Offsite WSA include Western cottonmouth, Western diamondback, Western milk snake, and Western ribbon snake. Common lizards that could **be found at or near the Offsite WSA** are the Texas earless lizard, Texas horned lizard, Texas spiny lizard, and the Eastern collared lizard. The limestone outcrops, buildings, and paved areas offer an abundance of places for hiding, thermoregulating, and foraging. Bullfrogs and soft-shelled turtles are the dominant water-dependent species that may use the wetland on the west side of the site and the lower portions of Live Oak Creek.

Aquatic species observed in the numerous small pools along Live Oak Creek and its tributaries are small arthropods such as whirligig beetles and water striders. Fish species identified in an abandoned gravel pit immediately south of the Offsite WSA include perch, crappie, and channel catfish. These species are also present in the lower reaches of Live Oak Creek and Lake Worth.

Appendix P contains a more complete list of potential and observed species that may be found at the site (scientific names are given in Appendix P only).

5.2.2.3 Threatened and Endangered Species

Based on correspondence with USFWS, there are no federally-listed threatened or endangered plant or wildlife species within or adjacent to the Offsite WSA (see Appendix Q). Several threatened and endangered species migrate through the area including interior least tern, bald eagle, and whooping crane (see Table 5-12). These species are migratory and sightings are considered incidental. The TPWD completed a search of the Texas Biological and Conservation Data System and did not identify any state-listed rare species or natural communities (see Appendix Q).

5.2.2.4 Sensitive Habitats

Sensitive habitats include unusual or unique plant communities of limited distribution such as wetlands, or areas that are seasonally important to wildlife. These areas can include, but are not limited to, migration routes, breeding areas, or other critical habitats. Sensitive areas can also include areas associated with a protected plant or wildlife species or areas critical to the needs of a particular species or population.

Wetlands in the study area were identified and evaluated using the U.S. Army Corps of Engineers Wetlands Delineation Manual (USACE,1987). The methodology described in this manual requires that three criteria be present for an area to be identified as a wetland:

- hydrophytic vegetation;
- hydric soils; and
- wetland hydrology.

During the site reconnaissance, several man-made impoundments and natural wetland systems were identified (see Figure 5-4). Some of these areas are identified on the National Wetland Inventory (NWI) maps (USFWS,1981a, b); others were identified during the site visit. During the site investigation, TEC personnel verified the presence and classification of wetlands identified on NWI maps and classified wetland systems that were not identified.

Live Oak Creek and its tributaries are identified on the NWI maps and classified under the USFWS methodology (Cowardin et al., 1979) as riverine, upper perennial, unconsolidated bottom, permanently flooded (R2UBH) wetland systems with areas of palustrine, unconsolidated bottom, permanently flooded, diked impoundments (PUBHh) and palustrine forested, broad-leaved deciduous, temporarily flooded wetland systems (PFO1A). The tributary to Live Oak Creek flows through the northern portion of the study area. It was not classified on the NWI map, but is connected to a section of Live Oak Creek that is classified as a PFO1A. A wetland area was identified during the site visit at the headwaters of the tributary to Live Oak Creek. This area is not identified or

classified on the NWI map but using the USFWS classification system it is a palustrine, emergent, temporarily flooded (PEMA) wetland system.

South of the Offsite WSA is a large water-filled gravel pit that was not identified on the NWI map. The gravel pit is outside of the study area, but surface water from the site drains into it. Using the USFWS classification system, the gravel pit is a palustrine, unconsolidated bottom, permanently flooded, excavated (PUBHx) wetland system.

Two excavated wetland systems were identified east of the Offsite WSA. These wetlands were not indicated on the NWI maps. Using the USFWS classification system, these wetlands were classified as palustrine, emergent, temporarily flooded, excavated (PEMAx) wetland systems. The wetlands were dominated by herbaceous vegetation such as cattails, bulrush, and sedges. One of the areas was inundated with 2 to 3 inches of water. Although the other area was not inundated, water stains on vegetation indicate that the area periodically floods with more than 2 feet of standing water.

A stock pond off the northwest corner of the fence surrounding the Offsite WSA is classified as a palustrine, unconsolidated bottom, permanently flooded, diked impoundment (PUBHh). A smaller pond, upgradient from the main pond, is classified as a palustrine, unconsolidated shore, seasonally flooded, diked impoundment (PUSCh). Areas classified as diked impoundments are usually man-made features within existing drainages that are used to trap and store surface water run-off, usually for domestic livestock.

Because these diked impoundments and the gravel pit are located within Live Oak Creek and its tributaries, they would most likely be considered jurisdictional wetlands. Jurisdictional wetlands are defined as:

> "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE, 1987).

A majority of the wetlands located within the study area for the Offsite WSA are palustrine emergent wetland systems, dominated by narrowleaf cattail and rushes. Other hydrophytic vegetation identified in these areas includes sandbar willow, field mint, and Johnsongrass. The dominant wetland systems located along Live Oak Creek and its tributaries are palustrine forest wetlands with an overstory consisting of ash and cottonwood. Shrubs along the creek include sandbar and black willow, with the herbaceous layer consisting of sedges and rushes.

The Offsite WSA is located in the Central North American Migratory Flyway. Lake Worth, located approximately 3 miles north of the project site, is considered sensitive habitat due to its importance to migratory birds, which include federally and state-listed species. The Silver Creek heron rookery is located in the northeast corner of the lake. The rookery is protected as a sensitive wildlife area by the TPWD.

5.2.3 Exposure Pathways and Selection of Endpoint Species

Potential receptors were presented in Section 4.3.2. **The exposure pathways were determined by conducting a site visit to evaluate habitats and communities in which exposure of wildlife is likely to occur.** For an exposure pathway to be complete, a contaminant must be able to travel from the source to an ecological receptor and be taken up by the receptor via one or more exposure routes (EPA, 1992b).

There are three primary exposure routes for terrestrial animals: ingestion, inhalation, and dermal absorption. Primary exposure routes for aquatic animals (e.g., invertebrates, amphibians, and fish) are dermal or gill absorption through contact with water or sediments and ingestion of water or sediments, **which may result in bioconcentration. Bioconcentration occurs in aquatic organisms as the result of net accumulation of contaminants directly from water (Suter, 1993).** The primary exposure route for terrestrial plants is absorption by roots contacting contaminated soils or water. Direct dermal contact or ingestion of a contaminant may result in the bioaccumulation of contaminants by an organism. Bioaccumulation is the elevated level of a contaminant in plant or animal tissues relative to its background concentration. Food-chain transfer of bioaccumulated contaminants is considered an indirect exposure pathway. Biomagnification occurs when contaminants that persist in the environment are transferred up the food chain, resulting in increased tissue concentrations up the food chain.

Contaminants at the Offsite WSA have been detected in surface and subsurface soils and to a limited degree surface water samples. Therefore, plants growing on the site and animals foraging on the site could potentially contact contaminants detected in these sample areas. Small animals could contact contaminants through ingesting plants growing in contaminated soils, drinking contaminated surface water, or inhaling contaminated dust particles. Predators such as coyotes, bobcats, or raptors consuming these animals could become receptors for chemicals that bioaccumulate or biomagnify. Contaminants could also be transported off site by surface water run-off into the surrounding waterways and water bodies such as Live Oak Creek and its tributaries or the gravel pit and other downgradient wetlands. Contaminated surface water flowing into the gravel pit or Live Oak Creek could potentially be ingested or absorbed through dermal contact by aquatic organisms.

Endpoint species selected for evaluation in this ERA have the potential to occur on-site and include principal prey species, predators, and species that are primarily herbivorous. The availability of exposure data also was considered in the selection. Endpoint species selected are the short-tailed shrew, cottontail rabbit, red-tailed hawk, and coyote. These species have exposure parameters and toxicology data readily available. Ecological receptors and the potential exposure pathways were originally identified and presented in Section 4.3.2.

5.2.4 Tier 2: Screening Level Ecological Risk Assessment

The purpose of this Tier 2 screening level assessment is to identify which, if any, analytes at the Offsite WSA pose potential ecological risk. The TNRCC Tier 2 screening level assessment consists of three levels (Levels A, B, and C), with each level designed to reduce the list of analytes that are COPC to the environment. This is accomplished by demonstrating that negligible risk exists from a particular analyte in a particular medium. To ensure that the decisions made during and at the end of the Tier 2 process are adequate to protect the environment, the TNRCC has incorporated a degree of conservatism into the screening level ERA process. Conservatism is initially high in Level A and is gradually reduced as the process proceeds to Levels B and C.

The Level A assessment is designed to initially identify COPCs on a site and eliminate chemicals that are not of concern. The Level B assessment expands upon the Level A assessment by using additional site-specific data or assuming conservative values when data are lacking and by evaluating literature toxicity data. Level C allows for a more site-specific quantitative assessment with scientifically defensible adjustment of assumptions or by using statistically determined confidence limits for exposure point concentration calculations.

Completion of Tier 2 will provide the information necessary to make a scientific management decision regarding the disposition of ecological risk. These decisions can include:

- a screening level ERA is adequate to determine that ecological risks are negligible,
- ecological risk can be managed by implementing a specified control mechanism (e.g., an engineered cap),
- ecological risk can be minimized by remediation to Tier 2 levels, or
- the process should continue to a Tier 3 ERA.

As the ERA process continues, the screening level assessment serves to reduce the effort needed in a more quantitative assessment by eliminating those contaminants and exposure pathways that do not pose significant risks.

5.2.4.1 Tier 2 Level A and B Screening Assessments

This portion of the ERA is a combination of a Tier 2 Level A Screening Assessment using established ecological benchmarks and a Level B Screening Assessment using toxicity reference values (TRVs). Prior to this step of the ERA process the preliminary problem formulation was started in Sections 4.3.2 and 5.2.1 through 5.2.3. These sections described the environmental setting, determined exposure pathways, and described receptors.

To ensure that potential ecological threats were not missed, conservative assumptions were used in this preliminary screening level assessment. Assumptions and methods used to estimate exposures include:

- **100 percent bioavailability of contaminants,**

- **NOAEL-based benchmarks,**
- **home range of the endpoint species limited to the site, and**
- **100 percent of endpoint species diet consisting of contaminated food and water.**

The Level A and B screening assessments used the maximum concentrations of contaminants detected in a given area. For soils, the combined soil maximum concentration was used because both the surface and subsurface soil sampling was conducted within the root zone of many plants of this environment and the burrowing range of most wildlife. **Maximum levels in soils, sediment, and surface water were compared to screening benchmarks obtained from McBee et al. (1996).**

In addition to the soil screening benchmarks presented by the TNRCC, which include only plants and invertebrates, NOAEL-based TRVs for wildlife were also included in this tier of the ERA. Data used for this assessment were from Sample et al. (1996a). **The Level B assessment used the cottontail rabbit, short-tailed shrew, red-tailed hawk, and coyote as a representative herbivore, insectivore, and avian and mammalian predator, respectively. NOAELs were not available for the coyote, so NOAELs for the red fox, adjusted for body weight according to Sample et al. (1996a), were used instead.**

For the rabbit, dietary exposure was estimated using plant uptake factors for foliage from Baes et al. (1984). However, there is limited published data on the ability of plants to bioaccumulate organic compounds. Therefore, the soil-to-plant transfer coefficients for volatiles and semivolatiles were assumed to be 1.0, or a 100 percent transfer.

Plant uptake of COPCs from soil was estimated using the equation:

$$C_V = B_v \times C_S$$

where;

C_v = element concentration in the vegetative portion of the plant,

B_v = soil-to-plant element transfer coefficient for vegetative portions of plant, and

C_s = contaminant concentration in the root zone of the soil.

For the rabbit, incidental soil intake during consumption of vegetation was also included. An estimate of 2 percent of food intake was assumed for this purpose (Beyer et al. 1994).

For the other species, dietary exposure was estimated by assuming that their food contained the same concentration of contaminants as in soil.

Hazard Quotients (HQs) were calculated for both Level A and B analyses by comparing maximum environmental concentrations in a specific medium with TNRCC soil screening benchmarks or NOAEL-based food TRVs with the following equation:

HQ = Exposure/TRV or benchmark

If the HQ is greater than 1.0, contaminant concentrations are sufficiently high that they may produce adverse effects. All the analytes above background (greater than 95% UTL) are evaluated in Appendices R and S. All analyte/receptor combinations with HQs greater than 1.0 in the Level A/B assessment were retained as COPCs for the Level C assessment (Table 5-13).

The Level A/B assessment for soil identified a total of 14 inorganics and three SVOCs (benzo[a]pyrene, fluorene, and acenaphthene) as COPCs for the Level C assessment, with the one organic of concern only in the UST area. Ecotoxicological data for many of the organics were not readily available. These analytes were evaluated to human health standards in Section 5.1. In the Level A/B assessment, the coyote was most often the endpoint with the highest HQ, except for chromium, iron, mercury, and manganese, where the invertebrate receptor was most sensitive, and nickel and zinc, where the plant receptor was most sensitive.

Minimal contamination was found in surface water and sediments (see Appendix R). Copper in one surface water sample was identified at a level equal to the TNRCC screening benchmark. Based on only a single isolated occurrence of an environmental concentration above background approaching the benchmark value, no further evaluation was performed for surface water and sediments in the Level C screening evaluation.

5.2.4.2 Tier 2 Level C Screening Assessment: Reducing the Hazard Quotient

If an HQ greater than 1.0 for a given COPC/receptor combination was obtained from the Level A/B assessment, the COPC was evaluated further in this section. This Level C assessment focuses on the most common exposure route, oral ingestion. Information on wildlife exposure through inhalation and dermal exposure is limited (Sample et al., 1996b) and was not considered in this assessment. Site-specific information and more realistic exposure assumptions were used to reduce the HQ. Site-specific data used in this portion of the ERA includes the 95 percent UCL EPCs developed in Section 5.1.4 for COPCs from each sampling area. Using the EPC was the only adjustment used for the Level C assessment for plant and invertebrate receptors. **HQs for these endpoints are listed in Tables 5-14 to 5-16.**

For vertebrate receptors, two additional adjustments were made to obtain the final HQs. The first adjustment accounted for the fact that the home range of a receptor may be larger than a given contaminated area, such that the receptor obtains only a portion of its food from the area. Species-specific home ranges were obtained from the literature. The adjustment was made by multiplying the HQ (already adjusted by using the EPC and the uptake models) by the ratio of the contaminated area to the species home range. Table 5-17 lists the site land areas, animal

home ranges, and ratios that were used to make the adjustments. Results of these calculations are shown in Table 5-18.

The second adjustment made food chain uptake of COPCs more realistic by estimating concentrations in food for the short-tailed shrew, coyote, and red-tailed hawk following the recommendations of Sample et al. (1998a, b). These recommendations generally consist of using log-linear models to estimate COPC concentrations in earthworms (Sample et al., 1998a) and small mammals (Sample et al., 1998b) directly from soil concentrations. Log-linear models account for the observation that bioaccumulation of chemicals generally decreases as soil concentration increases. That is, using a single uptake factor to estimate COPC concentrations in earthworms and small mammals will tend to overestimate those concentrations at higher soil concentrations. Conversely, the assumption of 100 percent transfer between trophic levels (uptake factor equal to 1.0) may not account for biomagnification. Therefore, COPC concentrations in earthworms (assumed food source for shrews) and in shrews (assumed food source for the coyote and hawk) were estimated using log-linear models or uptake factors following the recommendations of Sample et al. (1998a, b) (Table 5-19). For COPCs not addressed by Sample et al. (1998a, b), an uptake factor of 1.0 (100 percent transfer) was assumed.

Table 5-20 summarizes all HQs greater than 1.0 for the Level C assessment. All 14 inorganics remain as COPCs for plants and invertebrates after the Level C assessment, with six remaining for the vertebrate receptors in areas A-1, A-2, A-3, and A-5, the EOD Range and the drainageways. No organics remained as COPCs. The Level C assessment also reduced the number of areas and endpoint species where HQs were exceeded. All HQs for the hawk, coyote, and rabbit were reduced to below 1.0 (Table 5-18). HQs were reduced greatly for these endpoints because of their large home range compared to site land areas.

The short-tailed shrew was most often the endpoint with the highest HQ for all areas listed in Table 5-20 except bunker drains and drainageways. The exceptions were for the metals chromium, iron, mercury, and manganese, where the invertebrate receptor was most sensitive, and nickel and zinc, where the plant receptor was most sensitive.

The highest exceedances (HQ greater than 100) were for iron and mercury in Area A-3, iron in several bunker drains and DW-9, and chromium in DW-9. Except for the bunker drains and the drainageways, antimony consistently resulted in HQs exceeding 1.0 for the short-tailed shrew.

5.2.5 Comparison of EPCs with Tier 2 Level C Soil Concentrations

Soil concentrations that result in a hazard quotient of 1.0 were developed for COPCs that remained after the Level C screening process (Table 5-21). The $T_{2\text{-}c}$Ls are concentrations that are anticipated to protect ecological receptors. $T_{2\text{-}c}$Ls are useful for risk assessment and management decisions at contaminated sites because they can be used for comparison among major receptor categories (e.g., human health versus ecological) and serve to focus further risk assessment studies or remediation strategies. Values are provided for plants, invertebrates, and the short-tailed shrew (the most sensitive vertebrate). For plants and invertebrates, the $T_{2\text{-}c}$Ls are the same as the TNRCC benchmarks. For the shrew, the NOAEL-based TRVs were adjusted by the ratio of site land areas to home ranges and use of the bioaccumulation models in Sample et al. (1998a). Table 5-21 also compares the $T_{2\text{-}c}$Ls to the combined soil EPCs and background $UTL_{95,95}$ for all COPCs in each area.

Many of the $T_{2\text{-}c}$Ls presented in Table 5-21 are below the background soil $UTL_{95,95}$ established in Section 3.0. All $T_{2\text{-}c}$Ls for Areas A-1, A-2, A-3, and A-5 and the EOD Range are either below background or are associated with COPCs that are addressed in Section 6.0 because of potential human health concerns. Compounds with $T_{2\text{-}c}$Ls less than background are not of concern for ecological receptors at the Offsite WSA. The inorganics with $T_{2\text{-}c}$Ls above background include cadmium, copper lead, mercury, nickel, and zinc at the bunker drains and drainageway locations. These exceedances are limited to the $T_{2\text{-}c}$Ls generated for the plants and invertebrates. Those associated with the short-tailed shrew in these areas are below the background levels. The TNRCC soil benchmarks for plants and invertebrates that corresponded to the high HQs and low $T_{2\text{-}c}$Ls are based on studies reviewed and summarized by Efroymson et al. (1997) and Will and Suter (1995). For most metals, these reviewers expressed only low to moderate confidence in the benchmarks based on the studies they reviewed. Their applicability to specific sites such as the Offsite WSA is highly uncertain.

The total acreage of the impacted drainageways and bunker drains is approximately 0.4 acres, which is 3 percent of the total source area acreage (approximately 11 acres) and 0.01 percent of the total Offsite WSA acreage (2,555 acres). Because exceedance of $T_{2\text{-}c}$Ls is confined to this nominal acreage and the potentially impacted species are not known to be ecologically critical, the presence of the inorganic COPCs in these areas is expected to have a minimal impact on the local ecosystem.

In addition, no known rare, threatened, or endangered species or sensitive habitats are expected to be impacted by site-related contamination, based on the site survey conducted during the RFI. Animals or plants in the general vicinity, but in uncontaminated areas, would not be affected by site-related contamination because of the limited

migration potential described in Section 4.0. Most larger animals (e.g., herbivores or predators) that depend on species inhabiting the Offsite WSA would not be affected because of the small areas involved and their large home ranges.

5.3 UNCERTAINTY ANALYSIS

Uncertainties associated with each step in the Risk Evaluation process may influence the results of the Risk Evaluation. Many uncertainties are generic to the risk assessment process; others are site-specific. The major sources of uncertainties in this Risk Evaluation are summarized below for each step of the Risk Evaluation process.

5.3.1 Uncertainties Associated with Human Health Evaluation

Identification of Chemicals of Potential Concern

As shown in Tables 3-9 to 3-40, some analytical detection limits for antimony and arsenic, in soil are above or equal to the background $UTL_{95,95}$s. Similarly, some samples analyzed for PAHs and pesticides were diluted, resulting in increases in the reported detection limits. These sources of uncertainty could result in unidentified risk because although the compounds appear to be undetected in certain samples, they may actually be present in concentrations below the detection limit but above levels of concern. These compounds also had maximum detected concentrations above the background $UTL_{95,95}$s and CULs, however, and were therefore included as COPCs in the Risk Evaluation. In general, the undetected values were adjusted to one-half the detection limit and were included in the exposure point concentration calculations, as discussed in Section 5.1.4.

Human Exposure Pathway Evaluation

The most significant uncertainty associated with the exposure pathway evaluation that may influence the CULs determination lies in predicting appropriate future exposure pathways and scenarios based on current data. Inclusion of potential exposure pathways in the Risk Evaluation that do not actually occur in the future would yield lower CULs and overestimate potential risks. For example, the inclusion of the residential scenario pathways may not reflect the actual intended land use of the site. The site may be developed as commercial rather than residential property because of the historical industrial/commercial use of the site. In contrast, omitting exposure pathways from CUL calculations that may occur in the future but are not currently viewed as significant or likely to occur could increase CULs and underestimate potential risks. An example of such a pathway includes consumption of beef raised at or adjacent to the site in the future. Every effort was made, however, to include exposure pathways and land uses most likely to occur in the future.

Development of Cleanup Levels

Soil CULs associated with residential groundwater protection are the lowest CULs developed in this Risk Evaluation. Because these CULs are based upon the assumption that chemicals will leach from soil to groundwater at levels of human health concern, uncertainties associated with quantifying this pathway are particularly significant. The migration of contaminants from soil to groundwater constitutes two fate and transport

stages. The first is contaminant release from soil into soil leachate, which can be modeled using a standard equilibrium soil-water partition equation. The second stage is fate and transport of the contaminant through the subsurface and aquifer to a receptor well. Fate and transport processes include dilution due to mixing of the leachate with groundwater, chemical transformation, absorption, and biological degradation (the latter three constitute attenuation processes).

Dilution by incorporation of a default dilution factor is the only process addressed in calculation of CULs for the groundwater protection pathways in all areas except the UST areas **(this is not an issue where metal CULs were derived based on the SPLP)**. CULs for the UST areas account for dilution and contaminant release into soil leachate. Specifically, the CULs were derived by TNRCC (1998) by multiplying the target groundwater concentration (based on residential drinking water exposures) by the RRSN2 default dilution factor of 100 for all areas. CULs for the UST areas also incorporate a default dilution factor of 100, but the soil-water partition mechanism that occurs when a contaminant is released from soil to soil leachate is accounted for in the CULs. The lack of attenuation variables in the RRSN2 CUL calculations likely overestimate potential risks associated with this pathway, particularly in light of the fact that no compounds were detected above levels of concern in the Paluxy groundwater and the presence of the aquitard retards contaminant migration. **The use of a default dilution factor of 100 is also a source of uncertainty because it does not reflect chemical-specificity.**

Uncertainties associated with the use of toxicity factors to calculate the MSCs are generic to the risk assessment process. These uncertainties include:

- the quality of studies used as the basis for toxicity factors;
- potential differences in toxicity and absorption efficiency between humans and laboratory animals;
- derivation of dermal toxicity values from oral toxicity values;
- applicability of studies conducted in experimental animals dosed at high levels to human exposures at lower concentrations;
- validity of the nonthreshold assumption in the dose-response model for carcinogens (linearized multistage model);
- calculation of lifetime cancer risks on the basis of less-than-lifetime exposures; and
- potential synergistic or antagonistic interactions of chemicals.

Risk assessment methods are designed to be conservative to compensate for these uncertainties. For example, CULs are likely to be more stringent than exposure conditions warrant because EPA-derived carcinogenic slope factors (CSFs) are based on the 95 percent UCL and a nonthreshold mechanism. The use of uncertainty and modifying factors typically applied to NOAELs in deriving RfDs significantly increases the margin of safety and is likely to yield very protective CULs.

The EPA has not developed dermal toxicity factors, largely due to the lack of dose-response data on dermal exposures. Dermal contact pathways can, however, play a

significant role in total exposures. Therefore, to quantify this pathway and account for the uncertainty this creates in developing CULs based on multiple pathways, oral toxicity factors and oral absorption fractions are used to derive dermal toxicity values. This approach does not account for response differences between oral and dermal doses and increases the uncertainty associated with risk numbers generated via dermal toxicity factors.

An uncertainty associated with the use of toxicity factors that is more specific to this Risk Evaluation is the lack of toxicity criteria for some detected compounds. Specifically, no toxicity factors, and therefore no MSCs, were available for phenanthrene, benzo(g,h,i)perylene, and dibenzofuran. To provide some level of quantitative evaluation for these compounds, the MSC for pyrene was used as a substitute. Pyrene has the lowest risk-based concentration available among the noncarcinogenic PAHs.

5.3.2 Uncertainties Associated with Ecological Evaluation

Many of the uncertainties that affect human risk assessments also affect ecological risk assessments. Ecological risk assessments also includes uncertainties associated with exposure parameters used in establishing toxicological effects in wildlife. This is due, in part, because toxicological effects are based on laboratory studies in domesticated species and at exposure doses higher than most study sites.

Several biases are assumed in this and other Tier 2 ecological risk assessments. These assumptions usually overestimates the risk, particularly for metals. The bioavailability of metals is dependent on their solubility and the physical-chemical properties (i.e., pH) of the environmental media. If an ecological risk assessment indicates that contaminants are above background and/or benchmarks, it does not necessarily imply that adverse effects are occurring. To determine whether adverse effects are occurring at a particular site, tissue concentration data or toxicity tests of ambient media would be necessary. The uncertainties discussed above are unavoidable aspects of Tier 2 ecological risk assessments because they do not include detailed population models, intensive field surveys of wildlife, or bioassays.

5.4 RISK EVALUATION RESULTS SUMMARY

As presented in Section 5.1.5, the COPCs with EPCs exceeding RRSN2 human health CULs include metals (iron, mercury, and copper) and carcinogenic PAHs in soil. These exceedances occur in Area A-3, three of the eleven bunker drains, three of the five USTs, and one of the nine drainageways (see Table 5-11). In many cases, the exceedances were limited to single sample locations, where data outliers or anomalous detects were reported. The majority of area-wide EPCs were below human health CULs. Area-wide EPCs that exceeded CULs were limited to those corresponding to carcinogenic PAHs detected in the surface and subsurface soil of drainageway DW-3. The exceedances of the inorganic COPC CULs and carcinogenic PAH CULs in other areas occur at single sample locations.

Of the nine metal CUL exceedances, five of them only slightly exceed CULs (1.3 times or less). These include iron at A3-011, copper at BD-005, mercury at BD-018, and cadmium at BD-130 and BD-149. Mercury exceeds the CUL by 99 and 5 times at two sample locations, A3-006 and BD-002, respectively. Cadmium exceeds the cleanup level by 2 to 2.5 times in surface soil at two bunker drains (BD-137 and BD-138). PAH CUL exceedances in the UST areas are less than two-fold, except for the benzo(a)pyrene exceedances at UST 8500 and UST 8505, which are approximately 20 times in magnitude. PAH CUL exceedances among DW-3 samples are relatively high in many cases, particularly for the DW3-115, where concentrations were considered outliers. With two exceptions, PAH CUL exceedances in surface soil (excluding outliers) ranged from 20 to 40 times. The dibenzo(a,h)anthracene EPC, however, exceeded the CUL by 200 times because of the stringent cleanup level. The benzo(k)fluoranthene EPC for surface soil exceeded the CUL by less than two times. Exceedances in subsurface soil samples were about an order of magnitude less than those in surface soil (except for DW3-115).

The COPCs identified for the Ecological Evaluation were limited to inorganic compounds in soil. Although Section 5.2.5 presented soil concentrations protective of ecological receptors ($T_{2\text{-}c}$Ls) that were above EPCs, many of these concentrations are either below the background levels established in Section 3.0 or are associated with COPCs that are being addressed because of potential human health concerns. The ecologically protective soil concentrations above background are limited to those for plants and invertebrates potentially exposed to cadmium, copper, lead, mercury, nickel, and zinc at the bunker drains and drainageway locations. The TNRCC soil benchmarks for plants and invertebrates that corresponded to the high HQs and low $T_{2\text{-}c}$Ls in Section 5.2 are based on studies reviewed and summarized by Efroymson et al. (1997) and Will and Suter (1995). For most metals, these reviewers expressed only low to moderate confidence in the benchmarks based on the studies they reviewed. Their applicability to specific sites such as the Offsite WSA is highly uncertain.

The total acreage of the impacted drainageways and bunker drains is approximately 0.4 acres, which is 3 percent of the total source area acreage (approximately 11 acres) and 0.01 percent of the total Offsite WSA acreage (2,555 acres). Because exceedance of $T_{2\text{-}c}$Ls is confined to this nominal acreage and the potentially impacted species are not known to be ecologically critical to the region, the presence of the inorganic COPCs in these areas is expected to have a minimal impact on the local ecosystem.

Compounds detected in surface water or groundwater were either below background levels or CULs. Therefore, no human health or ecological COPCs needing further action in these media were identified in this Risk Evaluation.

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Table 5-1. Summary of Chemicals of Potential Concern (COPCs) in Soil and Sediment at the Offsite WSA Site

COPC[a]	A-1	A-2	A-3	A-4/UST-002	A-5	Drainage-ways	Trans-formers[b]	USTs	Bunker Drains	EOD	Seeps	Leach-field[b]
Metals												
Antimony	B	B	B		B	B			B	B		
Arsenic		S	S			X			X	S		
Cadmium	B		X		B	X			X	B		
Chromium	B		B			X			B			
Cobalt						S			S			
Copper	B	B	X		B	X			X	B		
Iron	B		S			X			X			
Lead	S	S	X			X			X			
Magnesium						S						
Manganese						S			S			
Mercury			S			X			S			
Molybdenum	B	B	X		B	X						
Nickel						S			X			
Selenium	B				B	X			B	B		
Silver										X		
Vanadium										S		
Zinc	B	S	X		B	X			X	B	S	
Semivolatiles												
Acenaphthene						S						
Anthracene						S						
Benz(a)anthracene				S		X		B				
Benzo(a)pyrene				S		X		B				
Benzo(b)fluoranthene				S		X		B				
Benzo(k)fluoranthene				S				B				
Benzo(g,h,i)perylene						S		B				
Butyl benzyl phthalate						S						
Chrysene						X		B				
Dibenzo(a,h)anthracene						S		B				
Dibenzofuran						S						
Indeno(1,2,3-c,d)pyrene				S		S		B				
Fluoranthene						X		B				
Fluorene						S		B				
Naphthalene						S						
Phenanthrene						X		B				
Pyrene						X		B				
Volatiles												
1,4-Dichlorobenzene			B									
cis 1,2-Dichloroethene			B			B						
Trichloroethene			B			B						
Pesticides												

Table 5-1. Summary of Chemicals of Potential Concern (COPCs) in Soil and Sediment at the Offsite WSA Site (continued)

COPC[a]	A-1	A-2	A-3	A-4/UST-002	A-5	Drainage-ways	Trans-formers[b]	USTs	Bunker Drains	EOD	Seeps	Leach-field[b]
4,4'-DDE			S			S						
4,4'-DDT			S			S						
Endosulfan sulfate						S						
β-Hexachlorocyclohexane			S			S						

[a]COPC list represents compounds with concentrations above background UTLs, as determined in Section 3.0.

[b] No COPCs identified for the leachfield or transformers.

B - COPC in subsurface soil (> 0.5 feet bgs)

S - COPC in surface soil (0-0.5 feet bgs)

X - COPC in both surface and subsurface soil

EOD - Explosive Ordnance Disposal Range

UST - Underground Storage Tank

Table 5-2. Summary of COPCs in Surface Water and Groundwater at the Offsite WSA Site

COPC[a]	Drainageways	Seeps	Paluxy Groundwater
Metals			
Aluminum			X
Copper		X	X
Iron			X
Lead			X
Magnesium	X		X
Manganese			X
Nickel		X	
Potassium			X
Sodium	X		X
Zinc			X

COPC - chemicals of potential concern

[a]COPC list represents compounds with concentrations above background UTLs, as determined in Section 3.0.

Table 5-3. Applicable RRSN2 MSCs and Promulgated Standards for the COPCs

COPC	Soil[a] (mg/kg) Residential[b]	Soil[a] (mg/kg) Industrial[b]	Soil[a] (mg/kg) Groundwater Protection[c]	Groundwater (mg/L) TNRCC MSC[c]	Groundwater (mg/L) MCL	Surface Water (mg/L) Texas SWQ[d]
Metals						
Aluminum	NC			3.70E+01	NA	
Antimony	7.20E+01	4.90E+02	6.00E-01			
Arsenic	2.00E+01	2.00E+01	5.00E+00			
Cadmium	1.40E+02	4.10E+02	5.00E-01			
Chromium	3.30E+02	1.60E+03	1.00E+01			
Cobalt	1.50E+04	1.10E+05	2.20E+02			
Copper	1.00E+04	7.40E+04	1.30E+02	1.30E+00	1.30E+00	1.30E+00
Iron	NA	NA	NA	1.10E+01[e]	NA	
Lead	5.00E+02	1.00E+03	1.50E+00	1.50E-02	1.50E-02	
Magnesium	NA	NA	NA	NA	NA	NA
Manganese	1.60E+04	8.10E+04	1.70E+02	1.70E+00	NA	
Mercury	1.10E-01	1.50E-01	2.00E-01			
Molybdenum	1.10E+03	8.10E+03	1.80E+01			
Nickel	1.90E+03	1.20E+04	1.00E+01			1.00E-01
Potassium	NC			NA	NA	
Selenium	1.30E+03	9.30E+03	5.00E+00			
Silver	4.70E+02	2.90E+03	1.80E+01			
Sodium	NC			NA	NA	NA
Vanadium	4.80E+02	3.00E+03	2.60E+01			
Zinc	5.90E+04	4.10E+05	1.10E+03	1.10E+01	NA	
PAHs (UST Sites only)						
Benzo(a)anthracene	8.77E-01	7.80E+00	3.20E+00			
Benzo(a)pyrene	8.77E-02	7.84E-01	2.20E+02			
Benzo(b)fluoranthene	8.77E-01	7.80E+00	1.30E+01			
Benzo(k)fluoranthene	8.77E+00	4.70E+01	4.70E+01			
Benzo(g,h,i)perylene	NA	NA	NA			
Chrysene	7.20E+00	7.20E+00	7.20E+00			
Dibenzo(a,h)anthracene	8.77E-02	7.84E-01	7.70E+00			
Indeno(1,2,3-c,d)pyrene	8.77E-01	7.84E+00	1.70E+01			
Fluoranthene	1.56E+02	1.56E+02	1.56E+02			
Fluorene	2.47E+02	2.47E+02	2.47E+02			
Phenanthrene	NA	NA	NA			
Pyrene	9.90E+01	9.90E+01	9.90E+01			
PAHs						
Acenaphthene	8.20E+03	5.30E+04	2.20E+02			
Anthracene	4.10E+04	2.70E+05	1.10E+03			
Benzo(a)anthracene	6.50E-01	3.40E+00	1.20E-02			
Benzo(a)pyrene	6.50E-02	3.40E-01	2.00E-02			
Benzo(b)fluoranthene	6.50E-01	3.40E+00	1.20E-02			
Benzo(k)fluoranthene	6.50E+00	3.40E+01	1.20E-01			
Benzo(g,h,i)perylene	NA	NA	NA			
Butyl benzyl phthalate	3.10E+04	2.00E+05	7.30E+02			

Table 5-3. Applicable RRSN2 MSCs and Promulgated Standards for the COPCs (continued)

COPC	Soil[a] (mg/kg) Residential[b]	Industrial[b]	Groundwater Protection[c]	Groundwater (mg/L) TNRCC MSC[e]	MCL	Surface Water (mg/L) Texas SWQ[d]
Chrysene	6.50E+01	3.40E+02	1.20E+00			
Dibenzo(a,h)anthracene	6.50E-02	3.40E-01	1.20E-03			
Dibenzofuran	NA	NA	NA			
Indeno(1,2,3-c,d)pyrene	6.50E-01	3.40E+00	1.20E-02			
Fluoranthene	5.50E+03	3.60E+04	1.50E+02			
Fluorene	5.50E+03	3.60E+04	1.50E+02			
Naphthalene	6.00E+02	9.20E+02	1.50E+02			
Phenanthrene	NA	NA	NA			
Pyrene	4.10E+03	2.70E+04	1.10E+02			
Volatiles						
1,4-Dichlorobenzene	2.70E+02	2.40E+03	7.50E+00			
cis 1,2-Dichloroethene	2.70E+03	2.00E+04	7.00E+00			
Trichloroethene	3.70E+00	6.60E+00	5.00E-01			
Pesticides						
ß-Hexachlorocyclohexane	3.20E+00	2.30E+01	4.70E-02			
4,4'-DDE	1.70E+00	1.30E+01	2.50E-02			
4,4'-DDT	1.70E+00	1.20E+01	2.50E-02			
Endosulfan sulfate	9.30E+02	6.10E+03	2.20E+01			

Boxed values are the lowest MSC/Standard listed.

COPC - chemical of potential concern

MCL - maximum contaminant level

MSC - medium-specific concentration

NA - not available

NC - not a chemical of concern in soil

RRSN2 - Risk Reduction Standard Number 2

SWQ - surface water quality standard

TNRCC MSC- Texas Natural Resource Conservation Commission Medium-Specific Concentration

[a] Source: TNRCC (1998).

[b] Values are for soil ingestion, inhalation, and dermal contact.

[c] Values are for residential scenario.

[d] Source: TNRCC Chapter 307, Texas Surface Water Quality Standards, April 30, 1997. If standard not available, RRSN2 Groundwater Concentration presented, per TNRCC (1993).

[e] Source: U.S. EPA Region 6 Media-Specific Screening Levels (EPA 1996).

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Table 5-4. Summary of SPLP Results for Human Health Chemicals of Potential Concern

	Antimony		Arsenic		Cadmium		Chromium	
Sample Location	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)
RRSN2 GWC (mg/L):	0.006		0.05		0.005		0.1	
BD-004-01	0.0075 U	0.82 U	0.007 U	5	0.0007 U	9.70	0.0065	11
BD-005-01	0.0075 U	0.82 U	0.007 U	4.4	0.0007	0.67	0.0071	16.8
BD-005-02	0.014 U	0.90 U	0.007 U	4	0.0007 U	0.88	0.0035 U	39
BD-010-01	0.0075 U	0.80 U	0.007 U	7.2	0.0007 U	3.55	0.0061	28.15
BD-012-01	0.0075 U	0.81 U	0.007 U	7.3	0.0007 U	0.071 U	0.0270	33.2
DW1-001-01	0.0075 U	1.20 U	0.0085 U	24.6	0.0007 U	0.71	0.0061	18.1
DW1-004-01	0.0075 U	0.85 U	0.007 U	9.9	0.0007 U	2.60	0.0320	185
DW4-001-01	0.0075 U	1.30	0.007 U	4.3	0.0007 U	1.40	0.0035 U	15.1
DW9-002-01[b]	0.048 U	2.50	0.007 U	10.5	0.0007 U	0.71	0.0035 U	371
EOD-009-02	0.0075 U	2.20	0.007 U	7.6	0.0007 U	0.33	0.0049 F	5.7
A3-002-20	0.01 U	1.00 U	0.007 U	6.8	0.0007 U	0.089 U	0.0040 F	28.1
A3-006-20	0.0075 U	0.98 F	0.007 U	16	0.0007 U	0.082 U	0.0067	19.5
DW1-003-20	0.0075 U	1.30 U	0.007 U	6.5	0.0007 U	0.11	0.0035 U	24.1
DW4-001-20	0.0075 U	1.00 U	0.007 U	3.3	0.0007 U	0.09 U	0.0035 U	14.6

Note: Boxed values are highest soil concentrations in which corresponding SPLP concentrations are below RRSN2 for residential groundwater. Shaded SPLP concentrations are below RRSN2 GWC.

F - Compound was positively detected below the PQL

GWC - groundwater concentration

NA - Not Analyzed

ND - Not Detected above the Method Detection Limit

RRSN2 - Risk Reduction Standard Number 2 (Source: TNRCC, 1998)

SPLP - synthetic precipitation leachate procedure

U - Compound was analyzed for, but detected below the method detection limit

[a] Value from U.S. EPA Region 6 Media-Specific Screening Levels table (EPA 1996). No RRSN2 values are available for iron.

[b] Because of differences in soil characteristics at DW9-002, the results for this sample were not used as soil cleanup level for areas other than DW9.

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Table 5-4. Summary of SPLP Results for Human Health Chemicals of Potential Concern (continued)

	Iron		Lead		Manganese		Mercury	
Sample Location	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)
RRSN2 GWC (mg/L):	11[a]		0.015		1.7		0.002	
BD-004-01	2	9,430	0.0038 F	23.10	0.026	304	NA	-
BD-005-01	1.3	8,130	0.021	49.50	0.022	246	NA	-
BD-005-02	1.2	9,310	0.0033 U	200.00	0.0075	319	NA	-
BD-010-01	0.71	45,050	0.0068	54.25	0.028	513	NA	-
BD-012-01	4	48,700	0.015	45.30	0.044	555	NA	-
DW1-001-01	3.2	8,710	0.0034 F	15.80	0.012	359	NA	-
DW1-004-01	1.2	15,700	0.0033 U	22.70	0.011	278	NA	-
DW4-001-01	0.21	7,120	0.016	71.60	0.01	661	NA	-
DW9-002-01[b]	0.26	49,100	0.0033 U	106.00	0.004 F	744	NA	-
EOD-009-02	1.9	3,740	0.0035 U	5.10	0.015	166	NA	-
A3-002-20	1.9	11,200	0.008 F	36.10	0.014	193	0.00024 U	0.051 U
A3-006-20	3.1	7,180	0.0045 F	45.60	0.014	138	0.00024 U	0.079
DW1-003-20	1.1	9,050	0.0085	33.20	0.0097	196	0.00024 U	0.064 U
DW4-001-20	0.77	7,890	0.0075	91.00	0.0088	222	0.00024 U	0.051 U

Note: Boxed values are highest soil concentrations in which corresponding SPLP concentrations are below RRSN2 for residential groundwater. Shaded SPLP concentrations are below RRSN2 GWC.

F - Compound was positively detected below the PQL

GWC - groundwater concentration

NA - Not Analyzed

ND - Not Detected above the Method Detection Limit

RRSN2 - risk reduction standard number 2

SPLP - synthetic precipitation leachate procedure

U - Compound was analyzed for, but detected below the method detection limit

[a] Value from U.S. EPA Region 6 Media-Specific Screening Levels table (EPA 1996). No RRSN2 values are available for iron.

[b] Because of differences in soil characteristics at DW9-002, the results for this sample were not used as soil cleanup level for areas other than DW9.

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Table 5-4. Summary of SPLP Results for Human Health Chemicals of Potential Concern (continued)

	Nickel		Selenium		Thallium		Vanadium	
Sample Location	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)
RRSN2 GWC (mg/L):	0.1		0.05		0.002		0.26	
BD-004-01	0.005 U	9	0.01 U	0.67 U	0.0085 U	ND	0.011	23
BD-005-01	0.005 U	7.9	0.01 U	0.66 U	0.0085 U	ND	0.0072	18.4
BD-005-02	0.005 U	6.4	0.01 U	0.89	0.0085 U	ND	0.0064	23.9
BD-010-01	0.005 U	22.95	0.01 U	0.65 U	0.0085 U	ND	0.0035	44.95
BD-012-01	0.005 U	27.5	0.01 U	0.66 U	0.0085 U	ND	0.0092	48.9
DW1-001-01	0.005 U	8.5	0.01 U	0.94 U	0.0085 U	ND	0.0077	16.8
DW1-004-01	0.005 U	10.5	0.01 U	0.69 U	0.0085 U	ND	0.005	23.6
DW4-001-01	0.005 U	10.7	0.01 U	0.75 U	0.0085 U	ND	0.0025 U	19.7
DW9-002-01[b]	0.005 U	207	0.01 U	0.75 U	0.0085 U	ND	0.0025 U	54.4
EOD-009-02	0.005 U	5	0.01 U	5	0.0085 U	4.1	0.018	19
A3-002-20	0.0098	8.4	0.01 U	0.83 U	0.0085 U	1.1 U	0.0083	22.9
A3-006-20	0.005 U	7	0.01 U	0.76 U	0.0085 U	1	0.0083	24.2
DW1-003-20	0.005 U	6.9	0.01 U	0.1 U	0.0085 U	1.3 U	0.0059	27.4
DW4-001-20	0.005 U	6.5	0.01 U	0.84 U	0.0085 U	1.1 U	0.0038	20.2

Note: Boxed values are highest soil concentrations in which corresponding SPLP concentrations are below RRSN2 for residential groundwater. Shaded SPLP concentrations are below RRSN2 GWC.

F - Compound was positively detected below the PQL

GWC - groundwater concentration

NA - Not Analyzed

ND - Not Detected above the Method Detection Limit

RRSN2 - risk reduction standard number 2

SPLP - synthetic precipitation leachate procedure

U - Compound was analyzed for, but detected below the method detection limit

[a] Value from U.S. EPA Region 6 Media-Specific Screening Levels table (EPA 1996). No RRSN2 values are available for Iron.

[b] Because of differences in soil characteristics at DW9-002, the results for this sample were not used as soil cleanup level for areas other than DW9.

Table 5-4. Summary of SPLP Results for Human Health Chemicals of Potential Concern (continued)

	Benzo(a)anthrancene		Benzo(a)pyrene		Benzo(b)fluoranthene		Chrysene	
Sample Location	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)
RRSN2 GWC (mg/L):	0.00012		0.0002		0.00012		0.012	
BD-004-01	NA	--	NA	--	NA	--	NA	--
BD-005-01	NA	--	NA	--	NA	--	NA	--
BD-005-02	NA	--	NA	--	NA	--	NA	--
BD-010-01	NA	--	NA	--	NA	--	NA	--
BD-012-01	NA	--	NA	--	NA	--	NA	--
DW1-001-01	NA	--	NA	--	NA	--	NA	--
DW1-004-01	NA	--	NA	--	NA	--	NA	--
DW4-001-01	NA	--	NA	--	NA	--	NA	--
DW9-002-01[b]	NA	--	NA	--	NA	--	NA	--
EOD-009-02	NA	--	NA	--	NA	--	NA	--
A3-002-20	0.018 U	2.1	0.018 U	2	0.033 U	2.8	0.019 U	2.3
A3-006-20	NA	--	NA	--	NA	--	NA	--
DW1-003-20	0.023 U	3.7	0.023 U	3.1	0.043 U	4.3	0.024 U	3.7
DW4-001-20	0.02 U	1.2	0.02 U	1.3	0.038 U	1.9	0.024 U	1.5

Note: Boxed values are highest soil concentrations in which corresponding SPLP concentrations are below RRSN2 for residential groundwater. Shaded SPLP concentrations are below RRSN2 GWC.

F - Compound was positively detected below the PQL

GWC - groundwater concentration

NA - Not Analyzed

ND - Not Detected above the Method Detection Limit

RRSN2 - risk reduction standard number 2

SPLP - synthetic precipitation leachate procedure

U - Compound was analyzed for, but detected below the method detection limit

[a] Value from U.S. EPA Region 6 Media-Specific Screening Levels table (EPA 1996). No RRSN2 values are available for iron.

[b] Because of differences in soil characteristics at DW9-002, the results for this sample were not used as soil cleanup level for areas other than DW9.

Table 5-4. Summary of SPLP Results for Human Health Chemicals of Potential Concern (continued)

	Dibenzo(a,h)anthracene		Indeno(1,2,3-c,d)pyrene	
Sample Location	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)	SPLP Conc. (mg/L)	Corresponding Soil (mg/kg)
RRSN2 GWC (mg/L):	0.000012		0.00012	
BD-004-01	NA	--	NA	--
BD-005-01	NA	--	NA	--
BD-005-02	NA	--	NA	--
BD-010-01	NA	--	NA	--
BD-012-01	NA	--	NA	--
DW1-001-01	NA	--	NA	--
DW1-004-01	NA	--	NA	--
DW4-001-01	NA	--	NA	--
DW9-002-01[b]	NA	--	NA	--
EOD-009-02	NA	--	NA	--
A3-002-20	0.02 U	0.4 U	0.036 U	1.7
A3-006-20	NA	--	NA	--
DW1-003-20	0.026 U	0.53 U	0.046 U	2.7
DW4-001-20	0.022 U	0.19 U	0.04 U	0.91

Note: Boxed values are highest soil concentrations in which corresponding SPLP concentrations are below RRSN2 for residential groundwater. Shaded SPLP concentrations are below RRSN2 GWC.

F - Compound was positively detected below the PQL

GWC - groundwater concentration

NA - Not Analyzed

ND - Not Detected above the Method Detection Limit

RRSN2 - risk reduction standard number 2

SPLP - synthetic precipitation leachate procedure

U - Compound was analyzed for, but detected below the method detection limit

[a] Value from U.S. EPA Region 6 Media-Specific Screening Levels table (EPA 1996). No RRSN2 values are available for iron.

[b] Because of differences in soil characteristics at DW9-002, the results for this sample were not used as soil cleanup level for areas other than DW9.

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Table 5-5. Selection of Soil Cleanup Levels for Metals at the Offsite WSA Site

Metal	SAI-Residential MSC[a] (mg/kg)	GWP-Residential MSC[a] (mg/kg)	Background $UTL_{95,95}$[b] (mg/kg)	SPLP Results[c] (mg/kg)	SPLP Results for Drainageway 9[d] (mg/kg)	Selected CUL[e] (mg/kg)
Antimony	72	0.6	4.5	NA[f]	NA[f]	4.5
Arsenic	20	5	11.8	24.6	10.5	20 (10.5)
Cadmium	140	0.5	1.2	9.7	BB	9.7
Chromium	330	10	49	185	371	185 (371)
Cobalt	15,000	220	34.8	ND	ND	220
Copper	10,000	130	19.3	ND	ND	130
Iron	NA	NA	33,008	48,700	49,100	48,700 (49,100)
Lead	500	1.5	26	200	106	200 (106)
Magnesium	NA	NA	8,312	NA[f]	NA[f]	8,312
Manganese	16,000	170	1,140	661	744	1,140
Mercury	0.11	0.2	0.051	0.079	NA	0.11
Molybdenum	1,100	18.0	9.1	ND	ND	18
Nickel	1,900	10	21.9	27.5	207	27.5 (207)
Selenium	1,300	5	1.1	ND	ND	5
Silver	470	18	0.58	ND	ND	18
Vanadium	480	26	86.9	48.9	54.4	86.9
Zinc	59,000	1,100	69.5	ND	ND	1,100

BB - below background

CUL - cleanup level

GWP - groundwater protection

MSC - medium-specific concentration

NA - not available

ND - not determined because RRSN2 value greater than background

SAI - MSC based on soil ingestion, inhalation, dermal contact

SPLP - Synthetic Precipitation Leachate Procedure.

UTL - upper tolerance limit

[a]From Table 5-3.

[b]From Section 3.0.

[c]Soil concentration associated with SPLP result that is below residential groundwater Risk Reduction Standard Number 2 (RRSN2) (Table 5-4).

[d] Soil concentration associated with DW9 leachate concentration that is below residential groundwater RRSN2. Because of soil characteristic differences at DW9 (gravel versus silty clay), cleanup levels based on SPLP results were determined separately for this area.

[e]Values in parentheses are the selected CULs for Drainageway 9.

[f]All SPLP leachate concentrations were above the residential groundwater RRSN2 or no RRSN2 was available; therefore, corresponding soil concentrations were not considered as potential cleanup levels.

Table 5-6. Final RRSN2 Cleanup Levels for The Offsite WSA

COPC	Soil (mg/kg)[a]	Groundwater (mg/L)	Surface Water (mg/L)
Metals			
Antimony	4.5		
Arsenic	20 (10.5)		
Cadmium	9.7		
Chromium	185 (371)		
Cobalt	220		
Copper	130	1.3	1.3
Iron	48,700 (49,100)	11	
Lead	200 (106)	0.015	
Magnesium	8,312		
Manganese	1,140	1.7	
Mercury	0.11		
Molybdenum	18		
Nickel	27.5 (207)		0.1
Selenium	5		
Silver	18		
Vanadium	86.9		
Zinc	1,100	11	
Semivolatiles (Non-heating oil UST Sites)			
Benz(a)anthracene	0.88		
Benzo(a)pyrene	0.088		
Benzo(b)fluoranthene	0.88		
Benzo(k)fluoranthene	8.8		
Chrysene	7.2		
Dibenzo(a,h)anthracene	0.088		
Indeno(1,2,3-c,d)pyrene	0.88		
Fluoranthene	156		
Fluorene	247		
Pyrene	99		
Semivolatiles (non-UST Sites)			
Acenphthene	220		
Anthracene	1,100		
Benz(a)anthracene	0.012		
Benzo(a)pyrene	0.02		
Benzo(b)fluoranthene	0.012		
Benzo(k)fluoranthene	0.12		
Chrysene	1.2		
Dibenzo(a,h)anthracene	0.0012		
Indeno(1,2,3-c,d)pyrene	0.012		
Butyl benzyl phthalate	730		
Fluoranthene	150		
Fluorene	150		
Naphthalene	150		
Pyrene	110		
Volatiles			
1,4-Dichlorobenzene	7.5		
cis 1,2-Dichloroethene	7		
Trichloroethene	0.5		

Table 5-6. Final RRSN2 Cleanup Levels for The Offsite WSA (continued)

COPC	Soil (mg/kg)[a]	Groundwater (mg/L)	Surface Water (mg/L)
Pesticides			
β-Hexachlorocyclohexane	0.047		
4,4'-DDE	0.025		
4,4'-DDT	0.025		
Endosulfan sulfate	22		

COPC - chemical of potential concern

NC - not a COPC in soil

RRSN2 - Risk Reduction Standard Number 2

[a] Value in parentheses is the proposed cleanup level for Drainageway 9 if based on the Synthetic Precipitation Leachate Procedure (SPLP) results.

Table 5-7. RRSN2 Soil Cleanup Level Comparison for Areas A-1 Through A-5

Area	COPC[a]	RRSN2 Human Health CUL[b] (mg/kg)	Exposure Point Concentration[c] (mg/kg) Surface Soil	Exposure Point Concentration[c] (mg/kg) Subsurface Soil
Area A-1	No COPCs (see Appendix N)			
Area A-2	No COPCs (see Appendix N)			
Area A-3	**Metals**			
	Arsenic	20	8.6	BB
	Iron	48,700	11,208[d]	BB
	Iron @ A3-011	48,700	65,200[e]	BB
	Mercury @A3-006	0.11	10.9[e]	BB
Area A-4/ UST-002	No COPCs (see Appendix N)			
Area A-5	No COPCs (see Appendix N)			

Box denotes exceedance of RRSN2 human health CUL.

COPC - chemical of potential concern

CUL - cleanup level

PAH - polycyclic aromatic hydrocarbon

RRSN2 - Risk Reduction Standard Number 2

TEQ - total toxic equivalency concentration of PAHs above CUL

[a]Includes only those COPCs with maximum area concentrations above the CULs (see Appendix N).

[b]Values from Table 5-6.

[c]EPCs compiled in Appendix O.

[d]EPC of area without outlier concentration(s).

[e]Outlier concentration.

only detected concentration was reported.

Table 5-8. RRSN2 Soil Cleanup Level Comparison for The Bunker Drains

Bunker Number (Sample Location)[a]	COPC[b]	RRSN2 Human Health CUL[c] (mg/kg)	Exposure Point Concentration[d] (mg/kg) Surface Soil	Exposure Point Concentration[d] (mg/kg) Subsurface Soil
8531	Mercury (BD-002)	0.11	0.56	ND
8535	Copper (BD-005)	130	BB	166[e]
8554	Cadmium (BD-130)	9.7	10.4	<CUL
8556	Cadmium (BD-137)	9.7	24.4	<CUL
8558	Cadmium (BD-138)	9.7	19.6	<CUL
	Mercury (BD-018)	0.11	0.14	ND
8560	Cadmium (BD-142)	9.7	9.3	<CUL

Box denotes exceedance of RRSN2 human health CUL.

BB - below background $UTL_{95,95}$

COPC - chemical of potential concern

CUL - cleanup level

ND - not detected

RRSN2 - Risk Reduction Standard Number 2

[a] No COPCs were identified for the other bunker drain samples (see Appendix N).

[b] Includes only those COPCs with maximum area concentrations above the CULs (see Appendix N).

[c] Values from Table 5-6.

[d] EPCs compiled in Appendix O.

[e] Value is an outlier concentration in the dataset (sample location shown next to COPC). All other copper concentrations at Bunker 8535 are below background $UTL_{95,95}$ and CUL.

Table 5-9. RRSN2 and PSTD Soil Cleanup Level Comparison for The UST Areas

UST Name	COPC[a]	Human Health CUL[b] (mg/kg)	Exposure Point Concentration[c] (mg/kg) Surface Soil	Exposure Point Concentration[c] (mg/kg) Subsurface Soil
UST-8500	Benz(a)anthracene	0.012	NT	1.1[d]
	Benzo(a)pyrene	0.020	NT	1.6
	Benzo(b)fluoranthene	0.012	NT	0.99[d]
	Benzo(k)fluoranthene	0.12	NT	0.59
	Dibenzo(a,h)anthracene	0.0012	NT	0.15[d]
	Indeno(1,2,3-c,d)pyrene	0.012	NT	0.78
UST-8503	No COPCs			
UST-8505	Benzo(a)pyrene	0.088	NT	1.8
UST-8507	Benzo(a)pyrene	0.020	NT	0.16
	Benzo(a)anthracene	0.012		0.046
	Benzo(b)fluoranthene	0.012		0.061
	Indeno(1,2,3-c,d)pyrene	0.012		0.042
UST-8514	No COPCs			

Box denotes exceedance of human health CUL.

COPC - chemical of potential concern

CUL - cleanup level

NT - not tested

PSTD - Petroleum Storage Tank Division

RRSN2 - Risk Reduction Standard Number 2

[a]Includes only those COPCs with maximum area concentrations above the cleanup levels (see Appendix N).

[b]Values from Table 5-6.

[c]EPCs compiled in Appendix O.

[d]Exceedance limited to sample location UST-004.

Table 5-10. RRSN2 Soil Cleanup Level Comparison for Drainageways

Drainageway[a]	COPC[b]	RRSN2 Human Health CUL[c] (mg/kg)	Exposure Point Concentration[d] (mg/kg) Surface Soil	Exposure Point Concentration[d] (mg/kg) Subsurface Soil
DW1	**Metals**			
	Arsenic	20	13.3	BB
DW3	**Metals**			
	Arsenic	20	BB	NT
	Semivolatiles			
	Benz(a)anthracene	0.012	0.5	0.11
	Benz(a)anthracene[e]	0.012	- -	2.8
	Benzo(a)pyrene	0.02	0.4	0.11
	Benzo(a)pyrene[e]	0.02	- -	2.8
	Benzo(b)fluoranthene	0.012	0.4	0.024
	Benzo(k)fluoranthene	0.120	0.14	0.013
	Chrysene	1.2	0.5	0.13
	Chrysene[e]	1.2	- -	3
	Dibenzo(a,h)anthracene	0.0012	0.24	ND
	Indeno(1,2,3-c,d)pyrene	0.012	0.29	0.085
	Indeno(1,2,3-c,d)pyrene[e]	0.012	- -	1.8
	Fluoranthene	150	1.2	ND
	Phenanthrene	110[f]	0.81	ND
DW4	**Metals**			
	Arsenic	20	BB	NT
DW9	**Metals**			
	Arsenic	10.5	10.5	NT

Box denotes exceedance of RRSN2 human health CUL.

-- - not applicable

BB - below background $UTL_{95,95}$

COPC - chemical of potential concern

CUL - cleanup level

ND - not detected

NT - not tested in subsurface soil samples

PAH - polycyclic aromatic hydrocarbons

RRSN2 - Risk Reduction Standard Number 2

[a]COPCs in samples collected from DW2 and DW5-DW8 were either below background $UTL_{95,95}$s, not detected, or below CUL.

PAHs detected in DW-4 soils are considered athropogenic background, as discussed in Section 3.0.

PAHs detected in DW-1 and DW-4 soils are considered anthropogenic background, as discussed in Section 3.0

[b]Includes only those COPCs with maximum area concentrations above the CULs (see Appendix N).

[c]Values from Table 5-6.

[d]EPCs compiled in Appendix O.

[e]Subsurface soil outlier at DW3-115.

[f]RRSN2 concentration for pyrene used in the absence of a chemical - specific value.

Table 5-11. Magnitude of Soil Cleanup Level Exceedances

Area	COPC	EPC/CUL Ratio	
		Surface Soil	Subsurface Soil
Area A-3	Iron @ A3-011	1.3	BB
	Mercury @ A3-006	99	BB
Bunker Drains			
BD 8531	Mercury (BD-002)	5	ND
BD 8535	Copper (BD-005)	BB	1.3
BD 8552	Cadmium (BD-149)	1.04	<CUL
BD 8554	Cadmium (BD-130)	1.1	<CUL
BD 8556	Cadmium (BD-137)	2.5	<CUL
BD 8558	Cadmium (BD-138)	2	<CUL
	Mercury (BD-018)	1.3	ND
USTs			
UST-8500	Benz(a)anthracene	NT	91.7
	Benzo(a)pyrene	NT	80
	Benzo(b)fluoranthene	NT	82
	Benzo(k)fluoranthene	NT	5
	Dibenzo(a,h)anthracene	NT	125
	Indeno(1,2,3-c,d)pyrene	NT	65
UST-8505	Benzo(a)pyrene	NT	20
UST-8507	Benzo(a)pyrene	NT	8
	Benzo(a)anthracene	NT	3.8
	Benzo(b)fluoranthene	NT	5
	Indeno(1,2,3-c,d)pyrene	NT	3.5
Drainageways			
DW3	Benz(a)anthracene	42	9
	Benz(a)anthracene[a]	--	233
	Benzo(a)pyrene	20	6
	Benzo(a)pyrene[a]	--	233
	Benzo(b)fluoranthene	33	2
	Benzo(k)fluoranthene	1.2	<CUL
	Chrysene	--	2
	Dibenzo(a,h)anthracene	200	ND
	Indeno(1,2,3-c,d)pyrene	24	7
	Indeno(1,2,3-c,d)pyrene[a]	--	150

Note: Table includes those areas and COPCs with CUL exceedances from tables 5-7 to 5-10.

COPC - chemical of potential concern

BB - below background

CUL - cleanup level

EPC - exposure point concentration

ND - not detected

NT - not tested

[a]Subsurface soil outlier at DW3-115.

Table 5-12. Threatened, Endangered, and State-Ranked Species Potentially Occurring in the Vicinity of the Offsite WSA

Common Name	Scientific Name	Status	
		Federal	State
Whooping crane	*Grus americana*	E	T
Bald eagle	*Haliaeetus leucophalus*	T	E
Interior least tern	*Sterna antillarum*	E	E

Federal and state Status

E - Species in danger of extinction throughout all or a significant portion of its range.

T - Species population or habitat threatened throughout all or a significant portion of its range.

Table 5-13. Summary of Analytes With Maximum Soil Concentrations Exceeding Ecological Soil Screening Benchmarks

Area	Analyte	Maximum Concentration in Soils (mg/kg)	Plant HQ[a]	Invert. HQ[a]	Cotton-tail Rabbit HQ[b]	Short-tailed Shrew HQ[b]	Red-tailed Hawk HQ[b]	Coyote HQ[b]
Area A-1	Inorganics							
	Antimony	2	--	--	1.75	8.06	--	9.02
	Chromium	31.6	31.60	79	--	2.63	3.06	2.94
	Lead	42.8	--	--	--	1.46	3.67	1.63
	Molybdenum	8.3	4.15	--	4.31	15.96	--	18
	Selenium	2	2.00	--	--	2.73	--	3.05
	Zinc	64.3	1.29	--	--	--	--	--
Area A-2	Inorganics							
	Antimony	2.4	--	--	2.10	9.68	--	11
	Arsenic	8.3	--	--	1.96	33.20	--	37
	Lead	27.3	--	--	--	--	2.34	--
	Molybdenum	8.7	4.35	--	4.52	16.73	--	19
	Zinc	71.8	1.44	--	--	--	--	--
Area A-3	Inorganics							
	Antimony	1.8	--	--	2	7	--	8
	Arsenic	22.9	2.29	--	5.41	92	--	102
	Cadmium	6.3	1.58	2.19	--	1.78	--	2
	Chromium	43.8	43.80	110	--	3.65	4.24	4
	Copper	112	1.12	2.24	--	2.01	--	2
	Iron	65200	--	326	--	--	--	--
	Lead	153	3.06	--	--	5.22	13	5.84
	Mercury	10.9	36.33	109	2.07	2.29	2.34	2.56
	Molybdenum	9.9	4.95	--	5.14	19	--	21
	Zinc	129	2.58	1.29	--	--	--	--
Area A-5	Inorganics							
	Antimony	2.5	--	--	2.18	10	--	11
	Molybdenum	7.3	3.65	--	3.79	14	--	16
	Selenium	1.2	1.20	--	--	1.64	--	1.83
	Zinc	55.7	1.11	--	--	--	--	--

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Table 5-13. Summary of Analytes With Maximum Soil Concentrations Exceeding Ecological Soil Screening Benchmarks (continued)

Area	Analyte	Maximum Concentration in Soils (mg/kg)	Plant HQ[a]	Invert. HQ[a]	Cotton-tail Rabbit HQ[b]	Short-tailed Shrew HQ[b]	Red-tailed Hawk HQ[b]	Coyote HQ[b]
Explosive Ordnance	Inorganics							
	Antimony	2.2	--	--	1.92	8.87	--	9.93
	Arsenic	10.6	1.06	--	2.50	42	--	47
	Selenium	5	5.00	--	--	6.82	--	7.63
	Vanadium	69.6	35	3.48	2.45	97	--	10.1
	Zinc	66.4	1.33	--	--	--	--	--
Bunker Drains								
8531	Inorganics							
	Cadmium	9	2.30	--	1.43	2.55	--	2.75
	Lead	47.4	--	--	--	1.62	4.06	1.81
	Mercury	1.2	4.00	12.00	--	--	--	--
8533	Inorganics							
	Arsenic	12	1.20	--	2.83	48.00	--	54
	Cadmium	9.7	2.40	--	1.54	2.75	--	2.96
	Chromium	15.4	15.40	39	--	1.28	1.49	1.43
	Iron	24500	122	--	--	--	--	--
	Lead	99.8	2.00	--	--	3.41	8.55	3.81
	Zinc	355	7.10	3.60	--	--	2.37	--
8535	Inorganics							
	Cadmium	9.6	2.40	--	1.52	2.72	--	2.93
	Chromium	39	39	98	--	3.25	3.78	3.63
	Copper	166	1.70	3.30	1.23	2.98	--	3.33
	Lead	200	4.00	--	--	6.83	17	7.63
	Zinc	145	2.90	1.50	--	--	--	--
8537	Inorganics							
	Cadmium	7.8	2.00	--	1.24	2.21	--	2.38
	Chromium	26.2	26	66	--	2.18	2.54	2.44
	Copper	91.4	--	1.80	--	1.64	--	1.83
	Lead	65.9	1.30	--	--	2.25	5.65	2.61

Table 5-13. Summary of Analytes With Maximum Soil Concentrations Exceeding Ecological Soil Screening Benchmarks (continued)

Area	Analyte	Maximum Concentration in Soils (mg/kg)	Plant HQ[a]	Invert. HQ[a]	Cotton-tail Rabbit HQ[b]	Short-tailed Shrew HQ[b]	Red-tailed Hawk HQ[b]	Coyote HQ[b]
	Zinc	347	6.90	3.50	--	--	2.32	--
8539	Inorganics							
	Arsenic	7.2	--	--	1.70	29	--	32
	Cadmium	8.6	2.20	--	1.37	2.34	--	2.62
	Iron	45050	--	225	--	--	--	--
	Lead	54.25	1.10	--	--	1.85	4.65	2.07
	Manganese	513	--	5.13	--	1.59	--	1.78
	Zinc	154	3.08	1.54	--	--	--	--
8541	Inorganics							
	Cadmium	9.6	2.40	--	1.52	2.72	--	2.93
	Chromium	34.8	35	87	--	2.90	3.37	3.24
	Iron	48700	--	243	--	--	--	--
	Lead	71.2	1.40	--	--	2.43	6.10	2.72
	Selenium	1.2	1.20	--	--	1.64	--	1.83
	Zinc	250	5.00	2.50	--	--	1.67	--
8552	Inorganics							
	Cadmium	4.5	1.10	--	--	1.27	--	1.37
	Chromium	18.7	19	47	--	1.56	1.81	1.74
	Lead	69.4	1.40	--	--	2.37	5.95	2.65
	Zinc	142	2.80	1.40	--	--	--	--
8560	Inorganics							
	Cadmium	10.8	2.70	--	1.72	3.06	--	3.03
	Lead	80	1.60	--	--	2.73	6.86	3.05
	Zinc	201	4.00	2.00	--	--	1.34	--
8558	Inorganics							
	Antimony	2	--	--	1.75	8.06	--	9.02
	Cadmium	26.3	6.00	1.30	4.18	7.44	1.76	8.03
	Lead	68.3	1.40	--	--	2.33	5.85	2.61
	Mercury	0.14	--	1.40	--	--	--	--
	Zinc	192	3.80	1.90	--	--	1.28	--

Table 5-13. Summary of Analytes With Maximum Soil Concentrations Exceeding Ecological Soil Screening Benchmarks (continued)

Area	Analyte	Maximum Concentration in Soils (mg/kg)	Plant HQ[a]	Invert. HQ[a]	Cotton-tail Rabbit HQ[b]	Short-tailed Shrew HQ[b]	Red-tailed Hawk HQ[b]	Coyote HQ[b]
8556	Inorganics							
	Cadmium	51.4	12.90	2.60	8.16	14.55	3.43	15.68
	Chromium	28.4	28	7.1	--	2.36	2.75	2.64
	Iron	37500	--	187	--	--	--	--
	Lead	63.5	1.30	--	--	2.17	5.44	2.42
	Zinc	187	3.70	1.90	--	--	1.25	--
8554	Inorganics							
	Lead	79.5	1.60	--	--	2.71	6.81	3.03
	Zinc	285	5.70	2.90	--	--	1.90	--
	Cadmium	23.7	5.90	1.20	3.76	6.71	1.58	7.23
	Copper	68.2	--	1.40	--	1.22	--	1.37
USTs	No COPCs							
Area A-4	No COPCs		--	--	--	--	--	--
Transformers	No COPCs		--	--	--	--	--	--
Drainageways								
DW1	Inorganics							
	Antimony	1.3	--	--	1.13	5.24	--	5.87
	Arsenic	24.6	2.46	--	5.81	98	--	110
	Cadmium	4.9	1.22	--	--	1.39	--	1.50
	Chromium	185	185.00	462	--	15	17.91	17
	Copper	60.1	--	1.20	--	1.08	--	1.21
	Iron	26000	130.00	2	--	--	--	--
	Lead	97.2	1.32	6.61	--	3.32	--	3.71
	Mercury	0.12	--	1.20	--	--	--	--
	Molybdenum	14.7	7.35	--	7.63	28	--	32
	Selenium	1.7	1.70	--	--	2.32	--	2.59
	Zinc	287	5.70	2.90	--	--	1.92	--

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Table 5-13. Summary of Analytes With Maximum Soil Concentrations Exceeding Ecological Soil Screening Benchmarks (continued)

Area	Analyte	Maximum Concentration in Soils (mg/kg)	Plant HQ[a]	Invert. HQ[a]	Cotton-tail Rabbit HQ[b]	Short-tailed Shrew HQ[b]	Red-tailed Hawk HQ[b]	Coyote HQ[b]
DW3	**Inorganics**							
	Selenium	1	--	--	--	1.36	--	1.53
	Zinc	169	3.40	1.70	--	1.13	--	--
	Semivolatiles							
	Acenaphthene	24	1.20	--	--	--	--	--
	Benzo(a)pyrene	55	--	--	27.40	27.80	--	31.00
DW4	**Inorganics**							
	Lead	71.6	1.43	--	--	2.44	--	2.73
	Manganese	661	1.32	6.60	--	2.05	--	2.29
	Selenium	1.6	1.60	--	--	2.18	--	2.44
	Zinc	80.2	1.60	--	--	--	--	--
DW9	**Inorganics**							
	Arsenic	10.5	--	--	2.48	42	--	47
	Chromium	371	371.00	927	--	31	36	35
	Copper	64.6	--	1.30	--	1.16	--	1.30
	Iron	49100	--	245	--	--	--	--
	Lead	106	2.10	--	--	3.62	--	4.04
	Manganese	744	1.50	7.40	--	2.31	--	2.58
	Molybdenum	15.3	7.70	--	7.94	29	--	33
	Nickel	207	6.90	2.30	--	1.41	--	1.58
	Zinc	82.5	1.70	--	--	--	--	--

-- concentration or benchmark not available or HQ not exceeding 1 (see Appendices R and S)

[a] Screening Benchmarks (McBee et al., 1996)

[b] Sample et al. (1996a)

HQ Hazard Quotient = Maximum concentration / Benchmark

[ ] - boxed values are the maximum values amongst the various endpoint species or groups

Table 5-14. Level C TNRCC Soil Screening Assessment for Areas A-1, A-2, A-3, A-5, and EOD Soils

Area	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
Area A-1	**Inorganics**				
	Chromium	8.6	1	plant	8.6
		8.6	0.40	invertebrate	21.5
	Molybdenum	1.0	2	plant	0.50
	Selenium	2.0	1	plant	2.00
	Zinc	25.0	50	plant	0.50
Area A-2	**Inorganics**				
	Molybdenum	2.2	2	plant	1.1
	Zinc	46.0	50	plant	0.92
Area A-3	**Inorganics**				
	Arsenic	5.1	10	plant	0.51
	Cadmium[c]	0.76	4	plant	0.19
		0.76	20	invertebrate	0.75
	Chromium	15.0	1.00	plant	15
		15.0	0.40	invertebrate	37.5
	Copper	10.6	100	plant	0.11
		10.6	50	invertebrate	0.21
	Iron	9598.0	200	invertebrate	47.99
	Iron @ A3-011	65200.0	200	invertebrate	326
	Lead	16.0	50	plant	0.32
	Mercury @ A3-006	10.9	0.30	plant	36.33
		10.9	0.10	invertebrate	109
	Molybdenum	1.7	2.00	plant	1
	Zinc	39.6	50	plant	0.79
		39.6	100	invertebrate	0.40
Area A-5	**Inorganics**				
	Molybdenum	2.1	2	plant	1.05
	Selenium	1.2	1	plant	1.20

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Table 5-14. Level C TNRCC Soil Screening Assessment for Areas A-1, A-2, A-3, A-5, and EOD Soils (continued)

Area	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
	Zinc	26.6	50	plant	0.53
Explosive Ordinance	**Inorganics**				
	Arsenic	5.5	10	plant	0.55
	Selenium	5.0	1	plant	5
	Vanadium	27.7	2	plant	13.85
		27.7	20	invertebrate	1.39
	Zinc	29.5	50	plant	0.59

EPC - exposure point concentration

HQ - Hazard Quotient = EPC / Benchmark

Box denotes HQs greater than 1.0.

[a] Includes surface and subsurface soils. See Section 5.1.4 and Appendix O.

[b] Screening Benchmarks (McBee et al., 1996; Sample 1996a)

[c] Efroymson et al. (1997)

Table 5-15. Level C TNRCC Soil Screening Assessment for Bunker Drains

Bunker Number	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
8531	Inorganics				
	Cadmium[c]	7.5	4	plant	2
	Mercury	0.56	0.10	invertebrate	6
8533	Inorganics				
	Arsenic	9.9	10	plant	0.99
	Cadmium[c]	5.9	4	plant	1.48
	Chromium	14.6	1	plant	14.6
		14.6	0.40	invertebrate	36.5
	Iron	19,342	200	invertabrate	96.71
	Lead	17.5	50	plant	0.35
	Lead @ BD-003	99.8	50	plant	2.00
	Zinc	92	50	plant	1.84
		92	100	invertebrate	0.92
8535	Inorganics				
	Cadmium	4.1	4	plant	1.0
	Chromium	26.9	1	plant	26.9
		26.9	0.40	invertebrate	67.25
	Copper	10.3	100	plant	0.10
		10.3	50	invertebrate	0.21
	Copper @ BD-005	166	100	plant	1.66
		166	50	invertebrate	3.32
	Lead	47	50	plant	0.94
	Zinc	76	50	plant	1.52
		76.2	100	invertebrate	0.76
8537	Inorganics				
	Cadmium	5.2	4	plant	1.30
	Chromium	25.4	1	plant	25.4
		25.4	0.40	invertebrate	63.5
	Copper	91.4	50	invertebrate	1.83

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Table 5-15. Level C TNRCC Soil Screening Assessment for Bunker Drains (continued)

Bunker Number	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
	Lead	37.0	50	plant	0.74
	Zinc	110	50	plant	2.20
		110	100	plant	1.10
8539	Inorganics				
	Cadmium[c]	8.6	4	plant	2.2
	Iron	45,050	200	Invertebrate	225.25
	Lead	38.0	50	plant	0.76
	Manganese	513	500	plant	1.03
		513	100	Invertebrate	5.13
	Zinc	113	50	plant	2.26
		113	100	invertebrate	1.13
8541	Inorganics				
	Chromium	34.8	1	plant	34.8
		34.8	0.40	invertebrate	87
	Cadmium	9.6	4.00	plant	2
	Zinc	125	50	plant	3
	Iron	48,700	200	Invertebrate	243.5
	Lead	49.4	50	plant	0.99
	Selenium	1.2	1	plant	1.20
8552	Inorganics				
	Chromium	18.7	1	plant	18.70
		18.7	0.40	invertebrate	46.75
	Lead	49.0	50	plant	0.98
	Zinc	87	50	plant	1.74
		87	100	invertebrate	0.87
	Cadmium[c]	2.6	4	plant	0.7
8560	Inorganics				
	Lead	40	50	plant	0.8

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Table 5-15. Level C TNRCC Soil Screening Assessment for Bunker Drains (continued)

Bunker Number	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
	Zinc	109	50	plant	2.18
		109.0	100	invertebrate	1.09
	Cadmium	7.5	4	plant	1.88
8558	Inorganics				
	Cadmium	6.5	4	plant	1.63
	Lead	39.7	50	plant	0.79
	Mercury	0.14	0.10	invertebrate	1.4
	Zinc	70.60	50	plant	1.41
		70.60	100	invertebrate	0.71
8556	Inorganics				
	Chromium	28.4	1	plant	28.4
		28.4	0.40	invertebrate	71
	Iron	37,500	200	invertebrate	187.5
	Zinc	101	50	plant	2.02
		101	100	invertebrate	1.01
	Cadmium	12.9	4	plant	3.23
	Lead	43.7	50	plant	0.87
8554	Inorganics				
	Lead	34.6	50	plant	0.69
	Zinc	161	50	plant	3.2
		161	100	invertebrate	1.61
	Cadmium	4.7	4	plant	1.2
	Copper	31.2	50	invertebrate	0.62

EPC - exposure point concentration

HQ Hazard Quotient = EPC / Benchmark

Box denotes HQs greater than 1.0.

[a] Includes surface and subsurface soils. See Section 5.1.4 and Appendix O.

[b] Screening Benchmarks (McBee et al., 1996; Sample 1996a)

[c] Efroymson et al. (1997)

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Table 5-16. Level C TNRCC Soil Screening Assessment for Drainageways

Drainageway	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
DW 1	**Inorganics**				
	Arsenic	7.9	10	plant	0.79
	Cadmium[c]	0.84	4	plant	0.21
	Chromium	13.3	1	plant	13.3
		13.3	0.40	invertebrate	33.3
	Copper	10.6	50	invertebrate	0.212
	Iron	10,908	200	invertebrate	54.5
	Lead	16.4	50	plant	0.328
	Mercury	0.12	0.10	invertebrate	1.2
	Molybdenum	2.9	2	plant	1.45
	Selenium (DW1-007)	1.7	1	plant	1.7
	Zinc	46.3	50	plant	0.926
		46.3	100	invertebrate	0.463
DW 2	**No COPCs**				
DW 3	**Inorganics**				
	Selenium	1	1	plant	1.0
	Zinc	169	50	plant	3.38
		169	100	invertebrate	1.69
	Semivolatiles				
	Acenaphthene	2.2	20	plant	0.11
DW 4	**Inorganics**				
	Lead	71.6	50	plant	1.432
	Manganese	661	500	plant	1.322
		661	100	invertebrate	6.61
	Selenium	1.6	1	plant	1.6
	Zinc	80.2	50	plant	1.604
DW 5	**No COPCs**				

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Table 5-16. Level C TNRCC Soil Screening Assessment for Drainageways (continued)

Drainageway	COPC	Combined Soil EPC (mg/kg)[a]	Soil Screening Benchmarks (mg/kg)[b]	Organism	HQ
DW 6	No COPCs				
DW 7	No COPCs				
DW 8	No COPCs				
DW 9	Inorganics				
	Arsenic	10.5	10	plant	1.05
	Chromium	371	1	plant	371.0
		371	0.40	invertebrate	927.5
	Copper	64.6	50	invertebrate	1.292
	Iron	49,100	200	invertebrate	245.5
	Lead	106	50	plant	2.12
	Manganese	744	500	plant	1.488
		744	100	invertebrate	7.44
	Molybdenum	15.3	2	plant	7.65
	Nickel	207	30	plant	6.9
		207	90	invertebrate	2.3
	Zinc	82.5	50	plant	1.65

EPC - exposure point concentration

HQ - Hazard Quotient = EPC / Benchmark

Box denotes HQs greater than 1.0.

[a] Includes surface and subsurface soils. See Section 5.1.4 and Appendix O.

[b] Screening Benchmarks (McBee et al., 1996; Sample et al., 1996a)

[c] Efroymson et al. (1997)

Table 5-17. Ratio of Site Land Areas to Animal Home Ranges[c]

Area Description	Land Area (acres)[d]	Cottontail Rabbit[a] Home Range (acres)	Short-tailed Shrew[a] Home Range (acres)	Red-tailed Hawk[a] Home Range (acres)	Coyote[b] Home Range (acres)
		7.7	0.96	1660	50,265
A-1	3.59	4.7E-01	1.0E+00	2.2E-03	7.1E-05
A-2	0.71	9.2E-02	7.4E-01	4.3E-04	1.4E-05
A-3	1.1	1.4E-01	1.0E+00	6.6E-04	2.2E-05
A-5	1.09	1.4E-01	1.0E+00	6.6E-04	2.2E-05
EOD	3.04	3.9E-01	1.0E+00	1.8E-03	6.0E-05
Bunker Drains (each)	0.00009	1.2E-05	9.4E-05	5.4E-08	1.8E-09
Drainageways (each)	0.09	1.2E-02	9.4E-02	5.4E-05	1.8E-06

[a] Mean of values reported in EPA (1993), converted from hectares to acres.

[b] Based on estimates in Burt and Grossenheider (1976) of a hunting route of about 10 miles (and assuming a circular hunting territory of 10 miles diameter)

[c] If the ratio is greater than 1.0, value set equal to 1.0, i.e., the animal is assumed to spend 100% of its time in the area.

[d] Values based on field measurements.

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Table 5-18. Level C Screening Assessment for Wildlife

Area	Analyte	EPC Combined Soil Conc. (mg/kg) (unless noted)	Cottontail Rabbit Food: plants				Short-tailed Shrew Food: Earthworms				Red-tailed Hawk Food: Shrews				Coyote Food: Shrews			
			Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]
Area A-1	Inorganics																	
	Antimony	0.68	0.150	0.252	0.59	0.28	0.680	0.248	2.74	2.74	0.680	NA[e]	NA	NA	0.680	0.222	3.06	<0.01
	Chromium	8.8	Not a COPC[d]				27.193	12.01	2.26	2.26	1.126	10.33	0.11	<0.01	1.126	10.749	0.10	<0.01
	Lead	7.6	Not a COPC[d]				4.132	29.3	0.14	0.14	4.347	11.67	0.37	<0.01	4.347	26.217	0.17	<0.01
	Molybdenum	0.99	0.267	0.52	0.51	0.24	0.990	0.52	1.90	1.90	Not a COPC[d]				0.990	0.461	2.15	<0.01
	Selenium	2.0	Not a COPC[d]				1.542	0.733	2.10	2.10	Not a COPC[d]				0.857	0.655	1.31	<0.01
Area A-2	Inorganics																	
	Antimony	1.1	0.242	0.252	0.96	0.09	1.100	0.248	4.44	3.28	1.100	NA	NA	NA	1.100	0.222	4.95	<0.01
	Arsenic	4.9	0.294	0.254	1.16	0.11	2.563	0.25	10	7.58	Not a COPC[d]				0.029	0.223	0.13	<0.01
	Lead	15.1	Not a COPC[d]				Not a COPC[d]				6.072	11.67	0.52	<0.01	6.072	26.217	0.23	<0.01
	Molybdenum	2.2	0.594	0.52	1.14	0.11	2.200	0.52	4.23	3.13	Not a COPC[d]				2.200	0.461	4.77	<0.01
Area A-3	Inorganics																	
	Antimony	0.74	0.163	0.252	0.65	0.09	0.740	0.248	2.98	2.98	0.740	NA[e]	NA	NA	0.740	0.222	3.33	<0.01
	Arsenic	5.1	0.311	0.254	1.22	0.17	2.667	0.25	11	11	Not a COPC[d]				0.030	0.223	0.13	<0.01
	Cadmium	0.76	0.433	3.589	0.12	0.02	6.658	3.533	1.88	1.88	Not a COPC[d]				1.734	3.277	0.53	<0.01
	Chromium	15	Not a COPC[d]				47.430	12.01	3.95	3.95	1.694	10.33	0.16	<0.01	1.694	10.749	0.16	<0.01
	Copper	10.6	Not a COPC[d]				9.957	55.7	0.18	0.18	Not a COPC[d]				12.493	49.85	0.25	<0.01
	Lead	16	Not a COPC[d]				7.534	29.3	0.26	0.26	6.246	11.67	0.54	<0.01	6.246	26.217	0.24	<0.01
	Mercury @ A3-006	10.9	10.028	4.84	2.07	0.30	2.418	4.76	0.51	0.51	0.592	4.65	0.13	<0.01	0.592	4.261	0.14	<0.01
	Molybdenum	1.7	0.459	0.52	0.88	0.13	1.700	0.52	3.27	3.27	1.700	NA	NA	NA	1.700	0.461	3.69	<0.01
	Semivolatiles																	
	Benzo(a)pyrene	0.21	0.214	2.01	0.11	0.02	0.210	1.98	0.11	0.11	0.210	NA	NA	NA	0.210	1.77	0.12	<0.01
Area A-4	No COPCs																	
Area A-5	Inorganics																	
	Antimony	0.92	0.202	0.252	0.80	0.11	0.920	0.248	3.71	3.71	0.920	NA	NA	NA	0.920	0.222	4.14	<0.01
	Molybdenum	2.1	0.587	0.52	1.09	0.15	2.100	0.52	4.04	4.04	Not a COPC[d]				2.100	0.461	4.56	<0.01
	Selenium	1.2	Not a COPC[d]				1.060	0.733	1.45	1.45	Not a COPC[d]				0.707	0.655	1.08	<0.01
Explosive Ordnance	Inorganics																	
	Antimony	2.2	0.484	0.252	1.92	0.75	2.200	0.248	8.87	8.87	2.200	NA	NA	NA	2.200	0.222	9.91	<0.[illegible]
	Arsenic	5.5	0.330	0.254	1.30	0.51	2.877	0.25	12	12	Not a COPC[d]				0.032	0.223	0.14	<0.01
	Selenium	5	Not a COPC[d]				3.018	0.733	4.12	4.12	Not a COPC[d]				1.209	0.655	1.85	<0.01
	Vanadium	27.7	0.706	0.725	0.97	0.38	27.700	0.714	39	39	Not a COPC[d]				27.700	0.688	40	<0.01
USTs[f]	Semivolatiles																	
	Benzo(a)pyrene (max)	1.8	Not a COPC[d]				Not a COPC[d]				1.800	NA	NA	NA	1.800	1.77	1.02	<0.01
Transformers	No COPCs																	
8531	Inorganics																	
	Lead	37.5	Not a COPC[d]				15.014	29.3	0.51	<0.01	9.468	11.67	0.81	<0.01	9.468	26.217	0.36	<0.01
	Cadmium	7.5	4.650	3.589	1.30	<0.01	41.093	3.533	12	<0.01	Not a COPC[d]				15.752	3.277	4.81	<0.01
8533	Inorganics																	
	Arsenic	9.9	0.594	0.254	2.34	<0.01	5.176	0.25	21	<0.01	Not a COPC[d]				0.051	0.223	0.23	<0.01
	Cadmium	5.9	3.659	3.589	1.02	<0.01	33.957	3.533	9.61	<0.01	Not a COPC[d]				12.500	3.277	3.81	<0.01
	Chromium	14.6	Not a COPC[d]				46.165	12.01	3.84	<0.01	1.661	10.33	0.16	<0.01	1.661	10.749	0.15	<0.01
	Lead	17.5	Not a COPC[d]				6.099	29.3	0.28	<0.01	6.524	11.67	0.56	<0.01	6.524	26.217	0.25	<0.01
	Lead @ BD-003	99.8	Not a COPC[d]				33.008	29.3	1.13	<0.01	15.229	11.67	1.30	<0.01	15.229	26.217	0.58	<0.01
	Zinc	92.2	Not a COPC[d]				Not a COPC[d]				122.140	149.8	0.82	<0.01	Not a COPC[d]			
8535	Inorganics																	
	Cadmium	4.1	0.082	3.589	0.02	<0.01	25.425	3.533	7	<0.01	Not a COPC[d]				8.801	3.277	2.69	<0.01
	Chromium	26.9	Not a COPC[d]				85.056	12.01	7.08	<0.01	2.601	10.33	0.25	<0.01	2.601	10.749	0.24	<0.01

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Table 5-18. Level C Screening Assessment for Wildlife (continued)

Area	Analyte	EPC Combined Soil Conc. (mg/kg) (unless noted)	Cottontail Rabbit Food: plants				Short-tailed Shrew Food: Earthworms				Red-tailed Hawk Food: Shrews				Coyote Food: Shrews			
			Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]
	Copper	10.3	4.326	56.6	0.08	<0.01	9.882	55.7	0.18	<0.01	Not a COPC[d]				12.429	49.85	0.25	<0.01
	Copper @ SD-005	166	69.720	56.6	1.23	<0.01	20.585	55.7	0.37	<0.01	Not a COPC[d]				20.403	49.85	0.41	<0.01
	Lead	47.1	Not a COPC[d]				18.007	29.3	0.61	<0.01	10.565	11.67	0.91	<0.01	10.565	26.217	0.40	<0.01
8537	Inorganics																	
	Cadmium	5.2	0.104	3.589	0.03	<0.01	30.713	3.533	9	<0.01	Not a COPC[d]				11.067	3.277	3.38	<0.01
	Chromium	25.4	Not a COPC[d]				80.315	12.01	6.69	<0.01	2.494	10.33	0.24	<0.01	2.494	10.749	0.23	<0.01
	Copper	91.4	Not a COPC[d]				17.585	55.7	0.32	<0.01	Not a COPC[d]				18.343	49.85	0.37	<0.01
	Lead	37	Not a COPC[d]				14.820	29.3	0.51	<0.01	9.394	11.67	0.80	<0.01	9.394	26.217	0.35	<0.01
	Zinc	110	Not a COPC[d]				Not a COPC[d]				123.742	149.8	0.83	<0.01	Not a COPC[d]			
8539	Inorganics																	
	Arsenic	7.2	0.432	0.254	1.70	<0.01	3.786	0.25	15	<0.01	Not a COPC[d]				0.040	0.223	0.18	<0.01
	Cadmium	8.6	5.332	3.589	1.49	<0.01	45.817	3.533	12.97	<0.01	Not a COPC[d]				17.979	3.277	5.48	<0.01
	Lead	36.1	Not a COPC[d]				15.175	29.3	0.52	<0.01	9.529	11.67	0.82	<0.01	9.529	26.217	0.36	<0.01
	Manganese	513	Not a COPC[d]				65.038	322	0.20	<0.01	Not a COPC[d]				513.000	288.387	1.78	<0.01
8541	Inorganics																	
	Chromium	34.8	Not a COPC[d]				110.038	12.01	9.16	<0.01	3.142	10.33	0.30	<0.01	3.142	10.749	0.29	<0.01
	Cadmium	9.6	0.624	3.589	0.17	<0.01	4.989	3.533	1.41	<0.01	Not a COPC[d]				4.870	3.277	1.49	<0.01
	Zinc	125	Not a COPC[d]				Not a COPC[d]				124.915	149.8	0.83	<0.01	Not a COPC[d]			
	Lead	49.4	Not a COPC[d]				16.714	29.3	0.64	<0.01	10.813	11.67	0.93	<0.01	10.813	26.217	0.41	<0.01
	Selenium	1.2	Not a COPC[d]				1.060	0.733	1.45	<0.01	Not a COPC[d]				0.707	0.655	1.08	<0.01
8552	Inorganics																	
	Chromium	18.7	Not a COPC[d]				59.129	12.01	4.92	<0.01	1.992	10.33	0.19	<0.01	1.992	10.749	0.19	<0.01
	Lead	48.9	Not a COPC[d]				18.561	29.3	0.63	<0.01	10.760	11.67	0.92	<0.01	10.760	26.217	0.41	<0.01
	Cadmium	2.6	Not a COPC[d]				17.701	3.533	5.01	<0.01	Not a COPC[d]				5.674	3.277	1.73	<0.01
8560	Inorganics																	
	Lead	40	Not a COPC[d]				15.783	29.3	0.54	<0.01	9.757	11.67	0.84	<0.01	9.757	26.217	0.37	<0.01
	Zinc	109	Not a COPC[d]				Not a COPC[d]				123.658	149.8	0.83	<0.01	Not a COPC[d]			
	Cadmium	7.5	4.650	3.589	1.30	<0.01	41.093	3.533	11.63	<0.01	Not a COPC[d]				15.752	3.277	4.81	<0.01
8556	Inorganics																	
	Antimony	1.5	0.330	0.252	1.31	<0.01	1.500	0.248	6.05	<0.01	1.500	NA	NA	NA	1.500	0.222	6.75	<0.01
	Lead	39.7	Not a COPC[d]				15.687	29.3	0.54	<0.01	9.722	11.67	0.83	<0.01	9.722	26.217	0.37	<0.01
	Zinc	70.6	Not a COPC[d]				Not a COPC[d]				119.757	149.8	0.80	<0.01	Not a COPC[d]			
	Cadmium	6.5	0.130	3.589	0.04	<0.01	36.675	3.533	10.38	<0.01	4.028	14.98	0.27	<0.01	13.723	3.277	4.19	<0.01
8558	Inorganics																	
	Cadmium	12.9	7.998	3.589	2.23	<0.01	63.244	3.533	17.90	<0.01	5.624	14.98	0.38	<0.01	26.567	3.277	8.11	<0.01
	Chromium	26.4	Not a COPC[d]				89.801	12.01	7.48	<0.01	2.707	10.33	0.26	<0.01	2.707	10.749	0.25	<0.01
	Lead	43.7	Not a COPC[d]				16.951	29.3	0.58	<0.01	10.187	11.67	0.87	<0.01	10.187	26.217	0.39	<0.01
	Zinc	101	Not a COPC[d]				Not a COPC[d]				122.965	149.8	0.82	<0.01	Not a COPC[d]			
8554	Inorganics																	
	Cadmium	4.7	0.094	3.589	0.03	<0.01	28.341	3.533	8.02	<0.01	3.440	14.98	0.23	<0.01	10.040	3.277	3.06	<0.01
	Lead	34.5	Not a COPC[d]				14.040	29.3	0.48	<0.01	9.092	11.67	0.78	<0.01	9.092	26.217	0.35	<0.01
	Zinc	161	Not a COPC[d]				Not a COPC[d]				127.270	149.8	0.85	<0.01	Not a COPC[d]			
	Copper	31.2	Not a COPC[d]				13.240	55.7	0.24	<0.01	Not a COPC[d]				15.144	49.85	0.30	<0.01
Drainageways																		
DW1	Inorganics																	
	Antimony	0.62	0.136	0.252	0.54	<0.01	0.620	0.2[illegible]	2.50	0.23	0.620	NA	NA	NA	0.620	0.222	2.7[illegible]	<0.01

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Table 5-18. Level C Screening Assessment for Wildlife (continued)

Area	Analyte	EPC Combined Soil Conc. (mg/kg) (unless noted)	Cottontail Rabbit Food: plants				Short-tailed Shrew Food: Earthworms				Red-tailed Hawk Food: Shrews				Coyote Food: Shrews			
			Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]	Chemical conc. in food (mg/kg)[a]	NOAEL-based Food Benchmark (mg/kg)[b]	HQ[c]	HQ Adjusted for Home Range[e]
	Arsenic	7.90	0.474	0.254	1.87	0.02	4.132	0.25	17	1.55	Not a COPC[d]				0.043	0.223	0.19	<0.01
	Cadmium	0.84	Not a COPC[d]				7.209	3.533	2.04	0.19	Not a COPC[d]				1.910	3.277	0.58	<0.01
	Chromium	13.30	Not a COPC[d]				42.055	12.01	3.50	0.33	1.551	10.33	0.15	<0.01	1.551	10.749	0.14	<0.01
	Copper	10.50	Not a COPC[d]				9.957	55.7	0.18	0.02	Not a COPC[d]				12.493	49.85	0.25	<0.01
	Lead	16.40	Not a COPC[d]				7.686	29.3	0.26	0.02	6.321	NA	NA	NA	6.321	26.217	0.24	<0.01
	Molybdenum	2.9	0.783	0.520	1.51	0.02	2.900	0.52	5.66	0.52	Not a COPC[d]				2.900	0.461	6.29	<0.01
	Selenium	1.7	Not a COPC[d]				1.369	0.733	1.87	0.16	Not a COPC[d]				0.806	0.655	1.23	<0.01
	Zinc	46.3	Not a COPC[d]				Not a COPC[d]				116.086	149.8	0.77	<0.01	Not a COPC[d]			
	No COPCs																	
DW3	Inorganics																	
	Selenium	1.0	Not a COPC[d]				0.928	0.733	1.27	0.12	Not a COPC[d]				0.660	0.655	1.01	<0.01
	Zinc	169.0	Not a COPC[d]				Not a COPC[d]				127.726	149.8	0.85	<0.01	Not a COPC[d]			
	Semivolatiles																	
	Acenaphthene	2.2	0.044	0.520	0.08	<0.01	2.200	0.52	4.23	0.40	Not a COPC[d]				2.200	0.461	4.77	<0.01
	Benzo(a)pyrene	0.16	0.003	0.520	0.006	<0.01	0.160	0.52	0.30769	0.03	Not a COPCd				0.160	0.461	0.34707	<0.01
DW4	Inorganics																	
	Lead	71.60	Not a COPC[d]				25.249	29.3	0.86	0.08	12.955	NA	NA	NA	12.955	26.217	0.49	<0.01
	Manganese	661	Not a COPC[d]				77.311	322	0.24	0.02	Not a COPC[d]				661.000	288.387	2.29	<0.01
	Selenium	1.6	Not a COPC[d]				1.309	0.733	1.79	0.17	Not a COPC[d]				0.788	0.655	1.20	<0.01
DW5	No COPCs																	
DW6	No COPCs																	
DW7	No COPCs																	
DW8	No COPCs																	
DW9	Inorganics																	
	Arsenic	10.50	0.630	0.254	2.48	0.03	5.492	0.25	22	2.06	Not a COPC[d]				0.054	0.223	0.24	<0.01
	Chromium	371	Not a COPC[d]				1173.102	12.01	98	9.16	17.639	10.33	1.73	<0.01	17.639	10.749	1.66	<0.01
	Copper	64.60	Not a COPC[d]				16.045	55.7	0.29	0.03	Not a COPC[d]				17.243	49.85	0.35	<0.01
	Lead	106	Not a COPC[d]				34.653	29.3	1.18	0.11	15.682	NA	NA	NA	15.682	26.217	0.60	<0.01
	Manganese	744.00	Not a COPC[d]				63.807	322	0.20	0.02	Not a COPC[d]				744.000	288.387	2.58	<0.01
	Molybdenum	15.3	Not a COPC[d]				15.300	0.52	29	2.76	Not a COPC[d]				15.300	0.461	33	<0.01
	Nickel	207.0	Not a COPC[d]				979.110	145.52	6.68	0.63	Not a COPC[d]				9.373	131.085	0.07	<0.01

[a] Adjusted based on bioaccumulation models, where available (see models in Table 5-19).

For rabbbit, concentration in plants = $C_V = C_S \times B_V$

Where: C_V = concentration in vegetative portions

C_S = concentration in soil

B_V = Soil to plant transfer coefficient from Figure 2.1, Baes et al. (1984)

[b] Toxicological benchmarks from Appendix D, Sample et al. (1996a)

[c] HQ Hazard Quotient = Food concentration/Benchmark

[d] Not a COPC at Level C because the HQ for the Level A/B assessment was less than 1.0

[e] HQ multiplied by the ratio of contaminated area to home range of the animal (see ratios in Table 5-17). Boxed values, HQ>1.0.

[f] Land area assumed to be 0.1 acre for for calculating adjusted HQ

Table 5-19. Uptake Models for Bioaccumulation in Earthworms and Shrews

Chemical	Accumulation in Earthworms[a]	Accumulation in Shrews[b]
Antimony	1	1
Arsenic	0.523	ln(shrew)=-4.8471+0.8188(ln[soil])
Cadmium	ln(earthworm)=2.114+0.795(ln[soil])	ln(shrew)=0.8150+0.9638(ln[soil])
Chromium	3.162	ln(shrew)=-1.4599+0.7338(ln[soil])
Copper	ln(earthworm)=1.675+0.264(ln[soil])	ln(shrew)=2.1042+0.1783(ln[soil])
Mercury	ln(earthworm)=0.0781+0.3369(ln[soil])	0.0543
Manganese	ln(earthworm)=-0.0809+0.682(ln[soil])	c
Molybdenum	1	1
Nickel	4.73	ln(shrew)=-0.2462+0.4658(ln[soil])
Lead	ln(earthworm)=-0.218+0.807(ln[soil])	ln(shrew)=0.4819+0.4869(ln[soil])
Selenium	ln(earthworm)=-0.075+0.733(ln[soil])	ln(shrew)=-0.4158+0.3764(ln[soil])
Vanadium	1	1
Zinc	ln(earthworm)=4.449+0.328(ln[soil])	ln(shrew)=4.4713+0.0738(ln[soil])
Semivolatiles		
Benzo(a)pyrene	1	1

[a] Following recommendations of Sample et al. (1998a), Table 18

[b] Following recommendations of Sample et al. (1998b), Table 9

c No model provided in Sample et al. (1998b); assume 100% transfer

Table 5-20. Summary of Analytes With Hazard Quotients Exceeding 1.0 under TNRCC Ecological Risk Assessment Tier 2-C

Area	COPC	Plant HQ	Invert. HQ	Cottontail Rabbit HQ	Short-tailed Shrew HQ	Red-tailed Hawk HQ	Coyote HQ
Area A-1	Inorganics						
	Antimony	--	--	--	2.7	--	--
	Chromium	8.6	22	--	2.3	--	--
	Molybdenum	--	--	--	1.9	--	--
	Selenium	2.0	--	--	2.10	--	--
Area A-2	Inorganics						
	Antimony	--	--	--	3.3	--	--
	Arsenic	--	--	--	7.6	--	--
	Molybdenum	1.1	--	--	3.1	--	--
Area A-3	Inorganics						
	Antimony	--	--	--	3.0	--	--
	Arsenic	--	--	--	11	--	--
	Cadmium	--	--	--	1.9		
	Chromium	15	38	--	3.9	--	--
	Iron	--	48	--	--	--	--
	Iron @ A3-011	--	326	--	--	--	--
	Mercury @A3-005	36	109	--	--	--	--
	Molybdenum	--	--	--	3.3	--	--
Area A-5	Inorganics						
	Antimony	--	--	--	3.7	--	--
	Molybdenum	1.1	--	--	4.0	--	--
	Selenium	--	--	--	1.5	--	--
Explosive Ordnance	Inorganics						
	Antimony	--	--	--	8.9	--	--
	Arsenic	--	--	--	12	--	--
	Selenium	5	--	--	4.1	--	--
	Vanadium	14	1.4	--	39	--	--
Bunker Drains							
8531	Inorganics						
	Cadmium	2.0	--	--	--	--	--
	Mercury	--	6.0	--	--	--	--
8533	Inorganics						
	Cadmium	1.5	--	--	--	--	--
	Chromium	15	37	--	--	--	--
	Iron	--	97	--	--	--	--
	Lead @ BD-003	2	--	--	--	--	--
	Zinc	1.8	--	--	--	--	--
8535	Inorganics						
	Copper @BD-005	1.7	3.3	--	--	--	--
	Chromium	27	67	--	--	--	--
	Zinc	1.5	--	--	--	--	--
8537	Inorganics						
	Cadmium	1.3	--	--	--	--	--
	Chromium	25	64	--	--	--	--
	Copper	1.8	--	--	--	--	--
	Lead	1.1	--	--	--	--	--

Table 5-20. Summary of Analytes With Hazard Quotients Exceeding 1.0 under TNRCC Ecological Risk Assessment Tier 2-C (continued)

Area	COPC	Plant HQ	Invert. HQ	Cottontail Rabbit HQ	Short-tailed Shrew HQ	Red-tailed Hawk HQ	Coyote HQ
	Zinc	4.6	2.3	--	--	--	--
8539	Inorganics						
	Cadmium	2.2	--	--	--	--	--
	Iron	--	225	--	--	--	--
	Manganese	--	5.1	--	--	--	--
	Zinc	2.3	1.1	--	--	--	--
8541	Inorganics						
	Chromium	35	87	--	--	--	--
	Cadmium	2.0	--	--	--	--	--
	Iron	--	244	--	--	--	--
	Selenium	1.2	--	--	--	--	--
	Zinc	3.0	--	--	--	--	--
8552	Inorganics						
	Chromium	19	47	--	--	--	--
	Zinc	1.7	--	--	--	--	--
8554	Inorganics						
	Zinc	3.2	1.6	--	--	--	--
	Cadmium	1.2	--	--	--	--	--
8556	Inorganics						
	Chromium	28	71	--	--	--	--
	Cadmium	3	--	--	--	--	--
	Iron	--	188	--	--	--	--
	Zinc	2.0	--	--	--	--	--
8558	Inorganics						
	Cadmium	1.6	--	--	--	--	--
	Mercury	--	1.4	--	--	--	--
	Zinc	1.4	--	--	--	--	--
8560	Inorganics						
	Cadmium	1.9	--	--	--	--	--
	Zinc	2.2	1.1	--	--	--	--
Drainageways							
DW 1	Inorganics						
	Arsenic	--	--	--	1.6	--	--
	Chromium	13	33	--	--	--	--
	Iron	--	55	--	--	--	--
	Mercury	--	1.2	--	--	--	--
	Molybdenum	1.5	--	--	--	--	--
	Selenium (DW1-007)	1.7	--	--	--	--	--
DW 3	Inorganics						
	Zinc	3.4	1.7	--	--	--	--
DW 4	Inorganics						
	Lead	1.4	--	--	--	--	--
	Manganese	1.3	6.6	--	--	--	--
	Selenium	1.6	--	--	--	--	--

Table 5-20. Summary of Analytes With Hazard Quotients Exceeding 1.0 under TNRCC Ecological Risk Assessment Tier 2-C (continued)

Area	COPC	Plant HQ	Invert. HQ	Cottontail Rabbit HQ	Short-tailed Shrew HQ	Red-tailed Hawk HQ	Coyote HQ
	Zinc	1.6	--	--	--	--	--
DW 9	Inorganics						
	Arsenic	1.1	--	--	2.1	--	--
	Chromium	37.1	928	--	9.2	--	--
	Copper	--	1.3	--	--	--	--
	Iron	--	246	--	--	--	--
	Lead	2.1	--	--	--	--	--
	Manganese	1.5	7.4	--	--	--	--
	Molybdenum	7.7	--	--	2.8	--	--
	Nickel	6.9	2.3	--	--	--	--
	Zinc	1.7	--	--	--	--	--

Box denotes the highest HQ.

-- concentration or benchmark not available or HQ not exceeding 1.

Table 5-21. Soil Concentrations Resulting in a Hazard Quotient of 1.0 under Ecological Tier 2-C Levels ($T_{2\text{-}c}$Ls)

Area	COPC[a]	EPC (mg/kg)[a]	$T_{2\text{-}c}$Ls for Plants (mg/kg)	$T_{2\text{-}c}$Ls for Invertebrates (mg/kg)	$T_{2\text{-}c}$Ls for Short-tailed Shrew (mg/kg)	Background Soil $UTL_{95,95}$[b] (mg/kg)
Area A-1	Inorganics					
	Antimony	0.68	--	--	0.2	4.5
	Chromium	8.6	1	0.4	3.8	49
	Molybdenum	0.99	--	--	0.5	9.1
	Selenium	2.0	1	--	0.7	1.1
Area A-2	Inorganics					
	Antimony	1.1	--	--	0.3	4.5
	Arsenic	1.1	--	--	0.6	11.8
	Molybdenum	2.2	2	--	0.7	9.1
Area A-3	Inorganics					
	Antimony	0.74	--	--	0.2	4.5
	Arsenic	5.1	--	--	0.5	11.8
	Cadmium	0.76	--	--	0.3	1.2
	Chromium	15	1	0.4	3.8	49
	Iron @ A3-011	65200	--	200	--	33,008
	Mercury @A3-006	10.9	0.3	0.1	--	0.051
	Molybdenum	1.7	--	--	0.5	9.1
Area A-5	Inorganics					
	Antimony	0.92	--	--	0.2	4.5
	Molybdenum	2.1	2	--	0.5	9.1
	Selenium	1.2	--	--	0.7	1.1
Explosive Ordnance	Inorganics					
	Antimony	2.2	--	--	0.2	4.5
	Arsenic	5.5	--	--	0.5	11.8
	Selenium	5	1	--	0.7	1.1
	Vanadium	27.7	2	20	0.7	86.9
Bunker Drains						
8531	Inorganics					
	Cadmium	7.5	4	--	--	1.2
	Mercury	0.56	--	0.1	--	0.051
8533	Inorganics					
	Cadmium	5.9	4	--	--	1.2
	Chromium	14.6	1	0.4	--	49
	Iron	19342	--	200	--	33,008
	Lead @ BD-003	99.8	50	--	--	26
	Zinc	92	50	--	--	69.5
8535	Inorganics					
	Chromium	26.9	1	0.4	--	49
	Copper @ BD-005	166	100	50	--	19.3
	Zinc	76	50	--	--	69.5
8537	Inorganics					
	Chromium	25.4	1	0.4	--	49

Table 5-21. Soil Concentrations Resulting in a Hazard Quotient of 1.0 under Ecological Tier 2-C Levels ($T_{2\text{-}c}$Ls) (continued)

Area	COPC[a]	EPC (mg/kg)[a]	$T_{2\text{-}c}$Ls for Plants (mg/kg)	$T_{2\text{-}c}$Ls for Invertebrates (mg/kg)	$T_{2\text{-}c}$Ls for Short-tailed Shrew (mg/kg)	Background Soil $UTL_{95,95}$[b] (mg/kg)
	Copper	91.4	--	50	--	19.3
	Zinc	110	50	100	--	69.5
8539	Inorganics					
	Cadmium	8.6	4	--	--	1.2
	Iron	45050	--	200	--	33,008
	Manganese	513	500	100	--	1,140
	Zinc	113	50	100	--	69.5
8541	Inorganics					
	Chromium	34.8	1	0.4	--	49
	Zinc	125	50	100	--	69.5
	Iron	48700	--	200	--	33,008
	Cadmium	9.6	4	--	--	1.2
	Selenium	1.2	1	--	--	1.1
8552	Inorganics					
	Chromium	18.7	1	0.4	--	49
	Zinc	87	50	--	--	69.5
8554	Inorganics					
	Zinc	161	50	100	--	69.5
	Cadmium	4.7	4	--	--	1.2
8556	Inorganics					
	Chromium	28.4	1	0.4	--	49
	Iron	37500	--	200	--	33,008
	Zinc	101	50	--	--	69.5
	Cadmium	12.9	4	--	--	1.2
8558	Inorganics					
	Cadmium	6.5	4	--	--	1.2
	Mercury	0.14	--	0.1	--	0.051
	Zinc	70.6	50	--	--	69.5
8560	Inorganics					
	Zinc	109	50	100	--	69.5
	Cadmium	7.5	4	--	--	1.2
Drainageways						
DW 1	Inorganics					
	Arsenic	7.9	--	--	5.1	11.8
	Chromium	13.3	1	0.4	--	49
	Iron	10908	--	200	--	33008
	Mercury	0.12	--	0.1	--	0.051
	Molybdenum	2.9	2	--	--	9.1
	Selenium (DW1-007)	1.7	1	--	--	1.1
DW 3	Inorganics					
	Zinc	169	50	100	--	69.5

Table 5-21. Soil Concentrations Resulting in a Hazard Quotient of 1.0 under Ecological Tier 2-C Levels ($T_{2\text{-}C}$Ls) (continued)

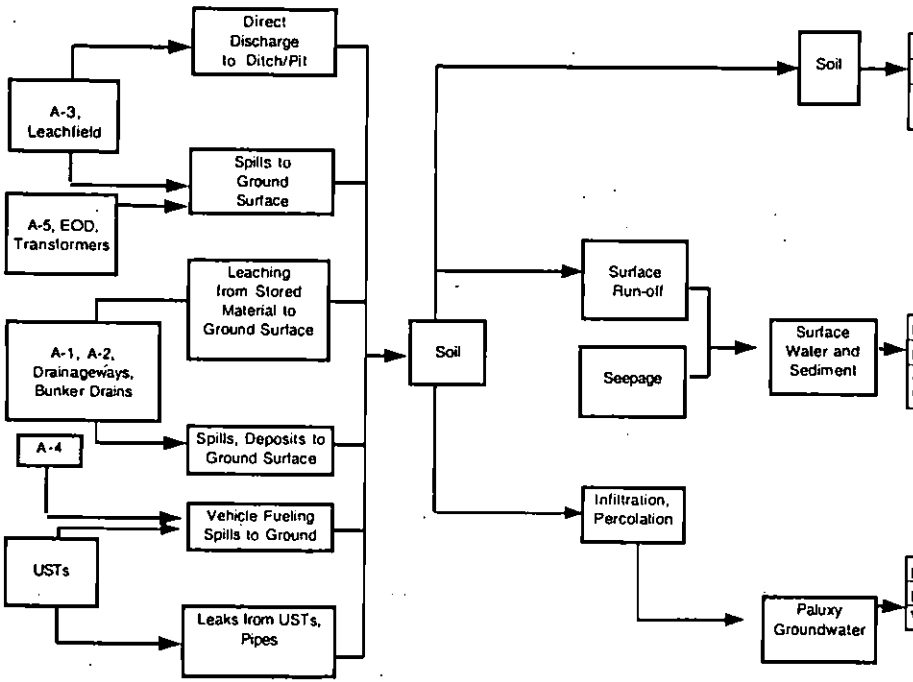
Area	COPC[a]	EPC (mg/kg)[a]	$T_{2\text{-}C}$Ls for Plants (mg/kg)	$T_{2\text{-}C}$Ls for Invertebrates (mg/kg)	$T_{2\text{-}C}$Ls for Short-tailed Shrew (mg/kg)	Background Soil $UTL_{95,95}$[b] (mg/kg)
DW 4	Inorganics					
	Lead	71.6	50	--	--	26
	Manganese	661	500	100	--	1,140
	Selenium	1.6	1	--	--	1.1
	Zinc	80.2	50	--	--	69.5
DW 9	Inorganics					
	Arsenic	10.5	10	--	5.1	11.8
	Chromium	37.1	1	0.4	41	49
	Copper	64.6	--	50	--	19.3
	Iron	49100	--	200	--	33,008
	Lead	106	50	--	--	26
	Manganese	744	500	100	--	1,140
	Molybdenum	15.3	2	--	5.5	9.1
	Nickel	207	30	90	--	21.9
	Zinc	82.5	50	--	--	69.5

[ ] - boxed values indicate the $T_{2\text{-}C}$Ls that are above the background UTLs.

-- HQ not exceeding 1.0 or data to calculate values not available

[a]EPCs summarized in Appendix O.

[b]From Section 3.0.



POTENTIAL RECEPTORS

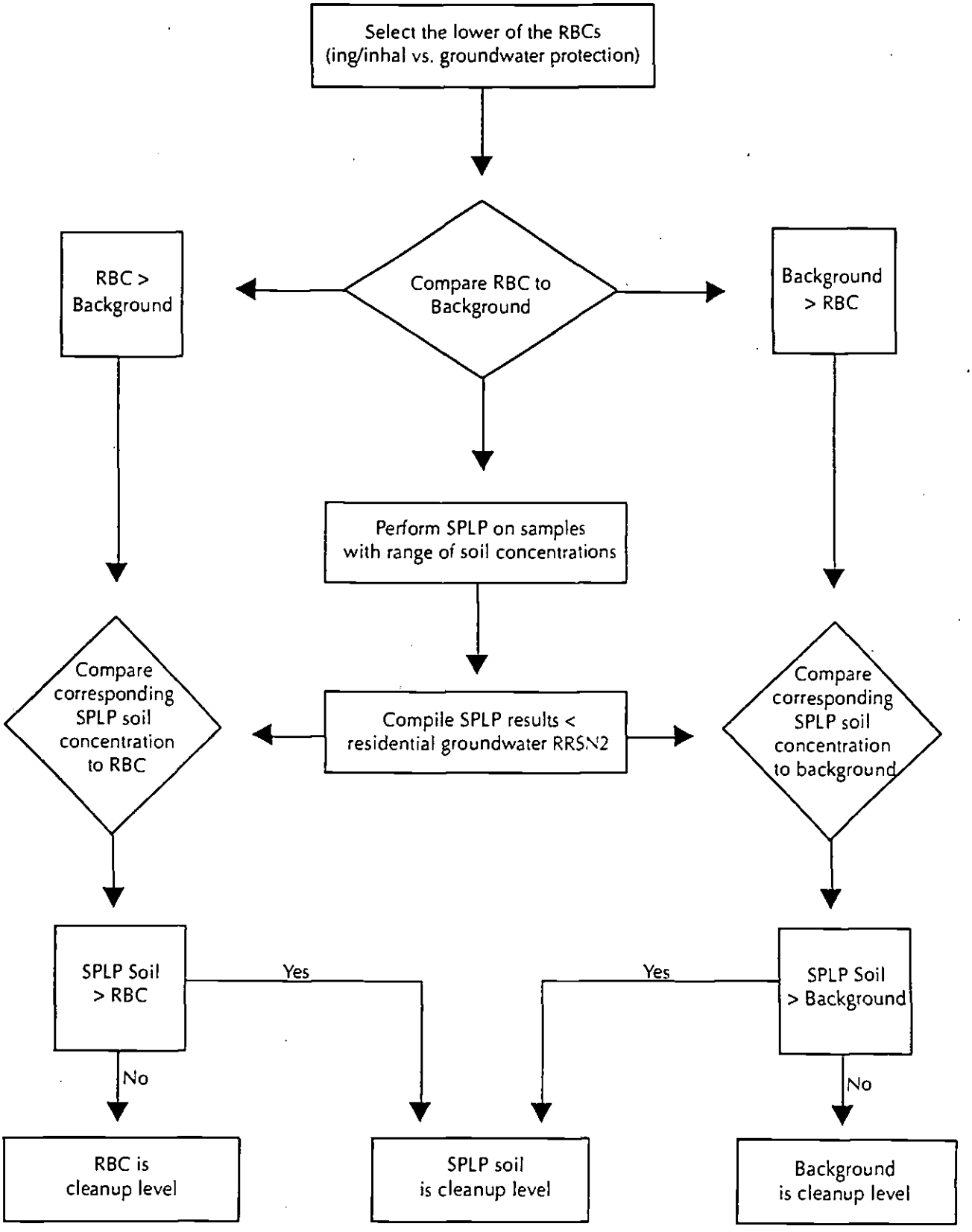
EXPOSURE ROUTE	HUMAN: Current Area Residents	HUMAN: Future Residents/Workers	HUMAN: Future Commercial/ Industrial Workers	HUMAN: Future Construction Workers	HUMAN: Current Trespassers/ Site Visitors	BIOTA: Aquatic	BIOTA: Terrestrial
Soil							
Ingestion	•	•	•	•	•		•
Dermal Contact	•	•	•	•	•		•
Paticulate/Volatile Inhalation	•	•	•	•	•		•
Surface Water and Sediment							
Ingestion	•	•	•	•	•	•	•
Dermal Contact	•	•	•	•	•	•	•
Aquatic Biota Consumption	•	•			•	•	•
Paluxy Groundwater							
Ingestion	•	•	•				
Dermal Contact	•	•	•				
Volatile Inhalation	•	•					

The Environmental Company, Inc.

Figure 5-1 -- Human Health and Ecological Conceptual Exposure Model

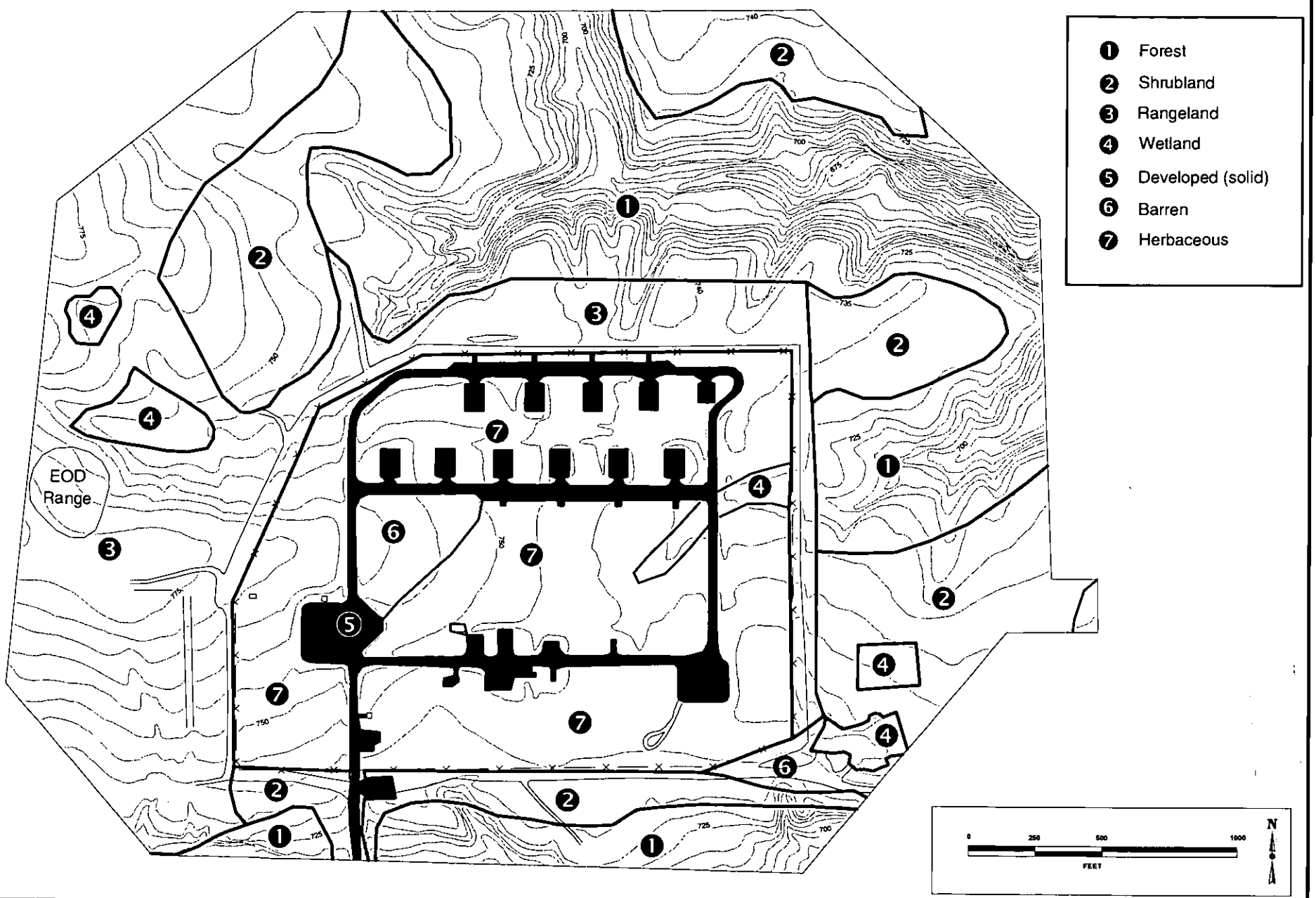
Date: April 1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No.: P-3109

Figure 5-2. Decision Logic for Selecting Proposed Cleanup Level



Legend

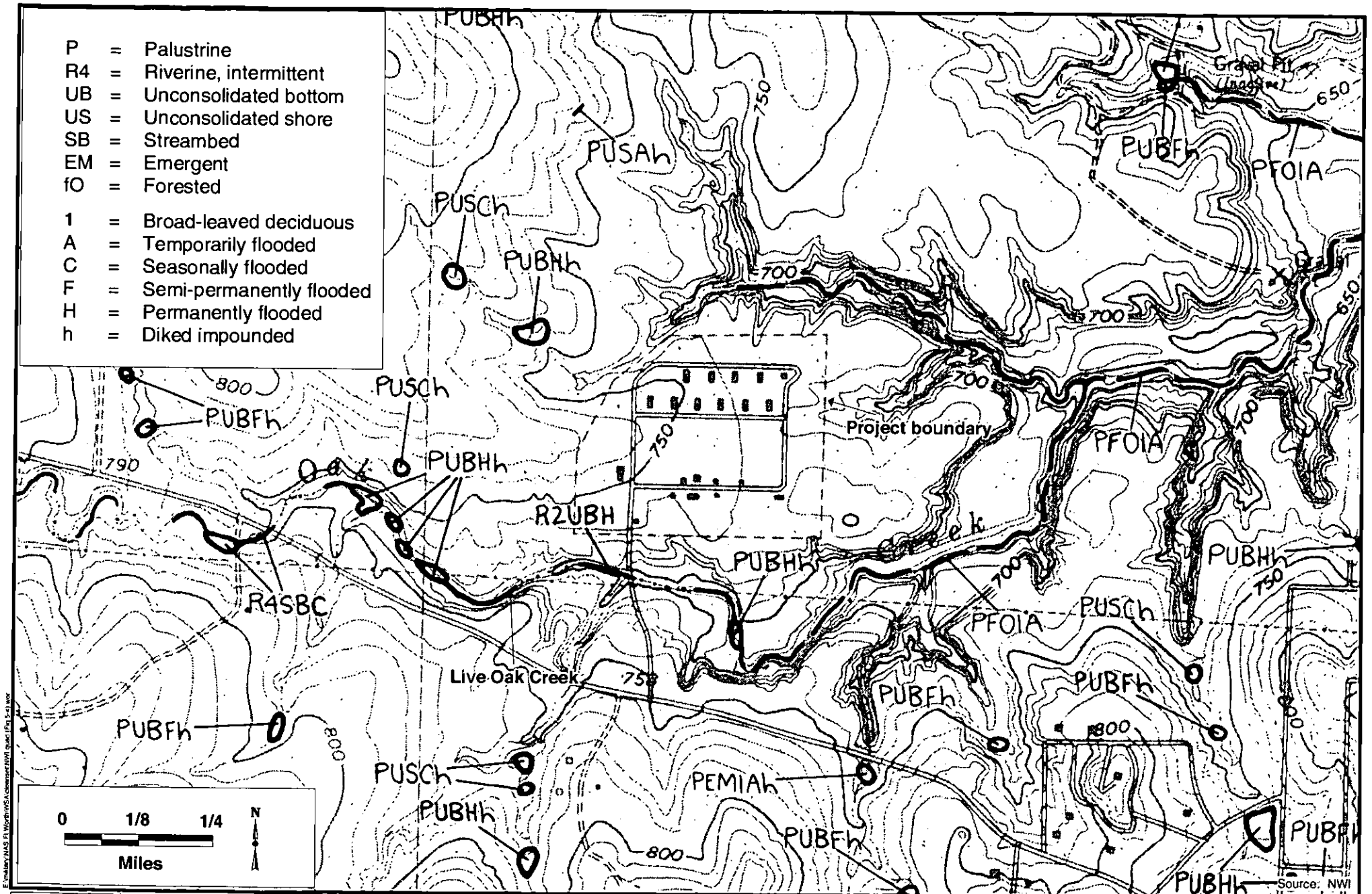
RBC Risk-based concentration
RRSN2 Risk Reduction Standard Number 2
SPLP Synthetic precipitation leachate procedure



The Environmental Company, Inc.

Figure 5-3 -- Vegetation Cover Types at the Offsite WSA

Creation Date: 12/01/1997
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109



The Environmental Company, Inc.

Figure 5-4 -- National Wetlands Inventory for the Offsite WSA

Creation Date: 11/01/1997
Rev. Date: 07/16/1999
Project Manager: B. Duffner
Prepared By: W. Mitchell
Project No: P-3109

198 450

TAB

6

6.0 CONCLUSIONS

Conclusions of the investigations conducted as part of the Offsite WSA RFI are presented below. These conclusions are presented for both the environmental media investigations (soil, sediment, surface water, and groundwater) and the facility surveys (asbestos, lead-based paint, and surface contamination).

6.1 ENVIRONMENTAL MEDIA INVESTIGATIONS

Nine separate potential source areas were investigated during the RFI. These source areas included:

- Areas A-1 and A-2 - outdoor materiel storage and maintenance areas;
- Area A-3 - unpaved perimeter of the Waste Accumulation Area (SWMU 59) and Bldg. 8503
- Area A-5 - disturbed surface area southwest of the Control Fence
- EOD Range;
- bunker floor drain areas;
- removed UST locations;
- Area A-4 - vehicle fueling area;
- areas beneath electrical transformers; and
- leach field.

In addition to these potential source areas, samples were collected to directly characterize three potential contaminant migration pathways. To accomplish this task, samples were collected from:

- drainageways;
- seeps; and
- Paluxy Aquifer groundwater.

The following sections summarize the investigation results for these source areas and environmental media. These results are summarized with respect to requirements for closure as identified in TAC 335 Subchapter S, *Risk Reduction Standards*. Based on these standards, the conclusions are provided in two steps as described below.

- Section 6.1.1 provides assessment of whether contaminant concentrations at each area (or location) are above or below background or, if applicable, whether the contaminant exceedance over background is attributable to an unpermitted discharge. Areas with contamination below background or areas where the contamination is not attributable to an unpermitted discharge are identified as meeting RRSN1 closure requirements.
- Section 6.1.2 includes assessment of the closure requirements for those areas (or locations) where unpermitted discharges have resulted in contaminant concentrations above background. The assessment involves the determination of the applicable requirements of RRSN2 (i.e., Deed Certifications for areas with contamination less than the RRSN2 CULs or removal actions for areas with contamination greater than the RRSN2 CULs).

6.1.1 Summary of Results With Respect to RRSN1

As discussed in Section 2.0, a total of 464 soil, sediment, surface water, groundwater, and quality control samples were collected during the initial characterization effort. Thirty of these samples were collected to establish site-specific background conditions. An additional 200 soil samples were collected as part of a supplemental characterization effort to verify anomalous detections and further delineate the extent of contamination.

As part of the initial data assessment under the TNRCC Risk Reduction Standards, site sample results were compared to background levels as determined using the Tolerance Interval method (EPA, 1989c, 1992a). Background $UTL_{95,95}$ was not established for organic compounds. Background was assumed to be undetected.

To assess whether exceedances over background were attributable to an unpermitted site discharge, a number of factors were considered. These included:

- contamination introduced during sample collection, shipment, or analysis:
- contamination attributable to anthroprogenic sources (i.e., contamination from the operation of vehicles that is transported to the investigation areas via stormwater runoff); and
- the relative frequency, magnitude, and distribution of exceedances over background in combination with the potential for a contaminant source.

Contamination introduced during sample collection, shipment, or analysis was assessed through the collection and analysis of a series of field and laboratory blanks. Contaminants identified in these blank samples included bis(2-ethylhexyl)phthalate, methylene chloride, chloroform, tetrachloroethene, and toluene. As a result, unless otherwise noted, these contaminants are not considered to be attributable to the site. The assessment of these non-site-related contaminants are discussed on an area basis in Sections 3.2, 3.3, 3.4, 3.5, and 5.1.1.

Contamination attributable to anthroprogenic sources included surficial and ubiquitous low-concentration PAHs (acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene) identified adjacent to existing paved surfaces or on unpaved surfaces apparently used by vehicles. To confirm this possibility, several additional samples, as described in Section 3.0, were analyzed for SVOCs to confirm and delineate the extent of PAHs. The results from this investigation show that PAH concentrations decrease to below the reporting limit as samples are collected progressively further from the roadways and pavement. The results also demonstrate that PAHs are limited to surface soil located within 15 feet of roadways and parking areas. Samples collected 30 feet from the edge of the pavement had no detectable levels of PAHs. In support of this conclusion, PAH analytical results were compared to anthropogenic background levels of PAHs reported in the literature. As shown in Section 3.0, PAH concentrations detected at A-1, A-3, and the drainageways (except DW-3) are generally comparable to those documented for rural and agricultural soils. PAH concentrations that are more consistent with those reported for urban soils were detected in locations adjacent to expected high vehicle-use areas (e.g., parking, loading/unloading). Furthermore, literature sources indicate that the principal sources of PAHs along roadways are due to vehicular exhausts and surface runoff of emissions and

that the majority of PAH deposition occurs within 15 feet of roadways (ATSDR, 1995 and USDI, 1987).

Finally, consideration was given to the relative frequency, magnitude, and distribution of contaminant concentrations that exceed background. In a number of cases, an analyte was reported at concentrations slightly greater than (i.e., less than 3 times) background. In many cases, no apparent source for the exceedance could be documented. Random exceedances of this nature were attributed to natural variability in background conditions that were not represented in the background level determination or normal site use. For example, as discussed in Section 5.1.1, low-level antimony concentrations were detected above background. However, the frequency and magnitude of the exceedance was low and the analyte distribution in soil revealed no evidence of a source-related pattern. Exceedances of this nature were not attributed to an unpermitted discharge from the site.

Based on these considerations, an assessment of each investigation area with respect to background and the potential presence of a related unpermitted site discharge is presented below.

Area A-1

Ten inorganic analytes, methylene chloride, bis(2-ethylhexyl)phthalate and PAHs were detected at concentrations above background in 84 soil samples.

Although cadmium and antimony most often exceeded the background $UTL_{95,95}$, the difference between the maximum reported value and the background $UTL_{95,95}$ was not great. The maximum reported cadmium and antimony values of 1.4 mg/kg and 2.0 mg/kg were less than three times their respective background $UTL_{95,95}$ values. As indicated in Figure 3-1, the distribution of these analytes reveals no evidence of a source-related pattern. Nickel was initially identified at a concentration of 24 times background, but supplemental sampling failed to verify any exceedance over background.

Methylene chloride and bis(2-ethylhexyl)phthalate are assumed to be field sampling-or laboratory-related contaminants and not attributable to the site.

PAHs were detected at one location, A1-019. These contaminants are discussed in detail in Sections 3.2.1 and 5.1.1. Area A-1 PAHs were demonstrated to be attributable to vehicle-related pollutants transported to the investigation areas via roadway runoff.

This assessment indicates that there are no Area A-1 contaminants present at concentrations greater than background that are attributable to an unpermitted site discharge. Therefore, Area A-1 currently meets the closure requirements of RRSN1.

Area A-2

Six inorganic analytes were detected at concentrations above background in the 19 area soil samples. All inorganic concentration exceedances were less than twice background. As indicated in Figure 3-4, the distribution of these analytes reveals no evidence of a source-related pattern. Toluene was the only organic compound detected and was attributed to laboratory contamination.

This assessment indicates that there are no Area A-2 contaminants present at concentrations greater than background that are attributable to an unpermitted site discharge. Therefore, Area A-2 currently meets the closure requirements of RRSN1.

Area A-3 (SWMU 59 and Building 8503) and Drainageway DW-1

Area A-3 and drainageway DW-1 are discussed together due to their close proximity and relationship between the contaminants identified. A total of 131 samples were collected from Area A-3 and drainageway DW-1.

Five of the 10 inorganics were detected at concentrations above background in Area A-3 in at least 25 percent of the surface samples. The most common inorganic analytes with elevated concentrations in surface samples were arsenic, cadmium, copper, lead, and zinc. Cadmium and lead were reported at concentrations over five times background. Mercury was detected in one sample at over 200 times background. The presence of mercury above background was verified at this location, however at a lower concentration. Area A-3 locations with inorganic exceedances were generally within 5 to 10 feet of the concrete pad (see Figure 3-5). The inorganic exceedances in Area A-3 were generally matched by those in DW-1. Cadmium and arsenic were most often detected at elevated concentrations (see Figure 3-26). The maximum cadmium and arsenic values are approximately four and three times greater than their respective background $UTL_{95,95}$ values. In Area A-3 and Draingeway DW-1, contamination was generally limited to the surficial soils (0 to 6 inches). Beyond the perimeter of DW-1, the topography immediately rises approximately 5 feet. Two soil samples were collected within this outer perimeter. There were no inorganic analytes detected above background in these outer perimeter samples (see Figure 3-5). The concentrations, frequency of detection, and distribution indicate that the inorganic contamination at Area A-3 and DW-1 exceeds background and is attributable to an unpermitted site discharge.

PAH compounds (acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene) were detected in both Area A-3 and drainageway DW-1. The concentrations and distribution of these contaminants are discussed in detail in Sections 3.2.3, 3.3.1, and 5.1.1. Area A-3 and DW-1 PAHs were demonstrated to be attributable to vehicle-related pollutants transported to the investigation areas via roadway runoff.

Four VOCs (excluding those attributable to field and/or laboratory contamination) were detected in Area A-3 and DW-1 upper subsurface and lower subsurface samples. TCE was present at the greatest concentration (0.0560 mg/kg) in sample A3-009-03. As shown in Figure 3-5, VOCs were located adjacent to the Waste Accumulation Area. The results indicate that VOC contamination has migrated under the concrete pad to a limited extent.

The results of this investigation therefore indicate that the perimeter of the concrete pad in association with SWMU 59 contain inorganic and VOC contaminants that exceed background and are attributable to an unpermitted discharge from the site. The area containing inorganic analytes with concentrations greater than background extends approximately 25 feet out from the perimeter of the concrete pad. The depth of the contamination generally extends from the surface to a depth of 0.5 feet bgs. The area containing VOC with concentrations greater than background is limited to the southwest

corner of the concrete pad and extends approximately 25 feet out from the perimeter of the concrete pad. In addition the VOC-contaminated area extends down DW-1 approximately 60 feet from the southwest corner of the concrete pad to sample location DW1-008. The depth of VOC contamination extends from 0.5 feet bgs to bedrock (approximately 10 feet bgs)

Area A-5

A total of 11 soil samples were collected from Area A-5. Contaminants of concern included inorganics, VOCs, SVOCs, pesticides/PCBs, and explosive compounds.

Six inorganic analytes were detected in Area A-5 samples at concentrations greater than the background $UTL_{95,95}$. These included antimony, cadmium, copper, molybdenum, selenium, and zinc. As shown in Table 3-17, only subsurface soil samples contained analytes with concentrations greater than the background $UTL_{95,95}$. Cadmium was most frequently detected at elevated concentrations. All exceedances were less than 2.4 times greater than background. As indicated in Figure 3-9, the distribution of these analytes reveals no evidence of a source-related pattern.

With the exception of methylene chloride, no organic compounds were detected in Area A-5 soil samples.

This assessment indicates that there are no Area A-5 contaminants present at concentrations greater than background that are attributable to an unpermitted site discharge. Therefore, Area A-5 currently meets the closure requirements of RRSN1.

EOD Range

A total of 50 soil samples were collected from the EOD Range and were analyzed for inorganics and explosive compounds.

Nine inorganics were detected in 15 samples at concentrations greater than the background $UTL_{95,95}$. The maximum concentration of seven of the nine analytes was less than 1.5 times background. The maximum concentration of selenium and silver was less than 4.5 times background. Thallium was initially detected in only one subsurface sample at a concentration of 4.1 mg/kg, four times background. Verification samples failed to confirm the presence of this analyte above background. As indicated in Figure 3-10, the distribution of these analytes reveals no evidence of a source-related pattern.

Explosives were detected in one of the 31 soil samples collected during the initial characterization effort. Verification samples failed to confirm the presence of this analyte.

This assessment indicates that there are no Area A-5 contaminants present at concentrations greater than background that are attributable to an unpermitted site discharge. Therefore, EOD Range currently meets the closure requirements of RRSN1.

Bunker Drain Areas

A total of 113 soil samples were collected from bunker drain investigation area. Samples were analyzed for inorganics and explosives.

A total of 13 analytes were present at concentrations greater than the background $UTL_{95,95}$ (see Figure 3-13). Four inorganic analytes, cadmium, copper, lead, and zinc, were reported at concentrations elevated above the background $UTL_{95,95}$ in more than 50 percent of the surface samples (see Table 3-21). Cadmium and lead concentrations were the highest relative to the background $UTL_{95,95}$. Cadmium and lead were detected at more than eight times and 11 times background, respectively. The highest concentration of copper was more than 100 times the background level.

A series of supplemental samples were collected to verify initial inorganic results and determine the extent of contamination with respect to background. The supplemental samples extended out from the floor drain, the suspected point source for the contamination. Supplemental sample results for mercury, copper, cadmium, lead, and zinc are shown in Figures 3-14, 3-15, 3-16, 3-17, and 3-18, respectively. The supplemental sample results for mercury, copper, lead, and zinc indicated that the inorganic contamination above background was generally limited to the surface samples collected immediately adjacent to the bunker drain (within 2 feet of the wall). Concentrations from samples collected 15 feet from the wall typically decreased to below background. Cadmium concentrations remained high in all supplemental samples however, indicating that the entire area in front of all bunker drains contain cadmium at concentrations above background. The extent of this contamination is defined by the road surrounding the bunkers (see Figure 3-28). Results from Areas A-1 and A-2 and Drainageways DW-2, DW-5, and DW-7 confirm that this contamination does not extend beyond the roadways.

Explosive compounds were not detected in any of the surface or subsurface bunker drain samples.

The results of this investigation indicate that the inorganic contamination in front of all bunker drains exceeds background and is attributable to an unpermitted site discharge. The extent of this exceedance is defined by the roadways in front of each bunker. No contaminants were detected in the area between the two rows of bunkers (see Figure 3-28). The contamination above background is therefore assumed to extend no further than the extent of the bunker buildings themselves.

Electrical Transformers

A total of 31 samples were collected from 16 transformer sample locations (see Figure 3-21). All transformer investigation samples were analyzed for pesticides/PCBs. No PCBs were detected in any of the samples. One sample contained 0.0110 mg/kg of 4,4-DDE. The DDE is not considered to be associated with an unpermitted discharge.

This assessment indicates that there are no electrical transformer related contaminants present at concentrations greater than background that are attributable to an unpermitted site discharge. Therefore, electrical transformer areas currently meet the closure requirements of RRSN1.

Leach Field

Eight samples were collected from four locations in and downgradient from the leach field (see Figure 3-25). Cadmium was detected in a shallow subsurface sample located directly downgradient from the leach field at a concentration greater than background. 2-methylnapthalene and naphthalene were detected inside the leach field wall at the bedrock floor and in two lower subsurface samples directly downgradient from the leach field at concentrations greater than background. Contamination was not present in one sample located 25 feet downgradient from the leach field.

The results of this investigation indicate cadmium, 2-methylnapthalene, and naphthalene contamination exceeds background and is attributable to an unpermitted site discharge. This contamination is assumed to extend from within the leach field itself to 13 feet downgradient from the leach field.

Removed UST Locations

As indicated in Section 2.2.1.6, the removed USTs contained different products. USTs associated with Bldgs. 8503, 8500, and 8507 contained fuel oil. Contamination associated with a release from these removed tanks is therefore considered under TAC 335 Subchapter S, *Risk Reduction Standards*. USTs associated with Bldgs. 8514 and 8505 contained diesel. Contamination associated with a release from these removed tanks is therefore considered under TAC 334, PSTD Regulations.

SVOCs were detected in soils associated with USTs previously located near Bldgs. 8503, 8500, and 8507 (see Figure 3-19). Contamination at removed USTs near Bldg. 8503 was limited to one surface soil sample located 15 feet from the concrete pad surrounding Bldg. 8503. The sample was positioned to characterize a potential release from the connecting pipe. Contaminants identified included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene. These PAHs were identified at concentrations of 0.012, 0.042, and 0.013 mg/kg, respectively. These levels are below those determined to be associated with vehicle related pollutants transported to the investigation areas via runoff. Therefore, the area associated with the removed UST near Bldg. 8503 currently meet the closure requirements of RRSN1.

PAH contamination at a removed UST near Bldg. 8500 was reported in surface and subsurface soil samples positioned to characterize the removed tank and connecting pipe. The results of this investigation indicate the PAH contamination exceeds background and is attributable to an unpermitted site discharge. This contamination is assumed to be limited to the immediate vicinity of the tank. The exact extent will be determined during a subsequent removal action (see Section 6.1.2).

PAH contamination at a removed UST near Bldg. 8507 was reported in subsurface soil samples positioned to characterize both the removed tank. The tank was located directly adjacent to the building wall, therefore no pipe related samples were collected. The results of this investigation indicate the PAH contamination exceeds background and is attributable to an unpermitted site discharge. This contamination is assumed to be limited to the immediate vicinity of the tank. The exact extent will be determined during a subsequent removal action (see Section 6.1.2).

Removed USTs near Bldg. 8514 is assessed with respect to TAC 334 PSTD regulations. This removed tank had not been registered with TNRCC. Contamination at removed USTs near Bldg. 8514 was limited to one surface soil sample located five feet from a dirt service road used by vehicles (see Figure 3-19). The lower subsurface sample did not contain PAHs. Contaminants identified in the surface soil sample was limited to benzo(a)pyrene at a concentration of 0.014 mg/kg, respectively. These levels are within the range of those determined to be associated with vehicle-related pollutants transported to the investigation areas via runoff. Therefore, it is assumed that no release had occurred from the removed UST near Bldg. 8514. No further action will be required for this area in association with the TAC 334 regulations.

Removed UST near Bldg. 8505 is assessed with respect to TAC 334 PSTD regulations. This removed tank had previously been registered with TNRCC as No. 91568. PAH contamination at removed UST near Bldg. 8505 was reported in surface and subsurface soil samples positioned to characterize both the removed tank and the connecting pipes. The results of this investigation indicate the PAH contamination exceeds background and is attributable to an unpermitted site discharge. This contamination is assumed to be limited to the immediate vicinity of the tank. The exact extent will be determined during a subsequent removal action (see Section 6.1.2).

Area A-4

Area A-4 is a former service road and diesel fueling station. Contamination associated with a potential release to this area is therefore considered under TAC 334, *PSTD regulations*. A total of nine surface and subsurface soil samples were collected. The samples contained total recoverable petroleum hydrocarbons (TRPHs), toluene and PAHs. TRPHs ranged from 26.1 to 227 µg/g (see Figure 3-20). The TRPHs are used only for characterization purposes and not incorporated into regulatory management decisions under TAC 334. Toluene was reported at less than 0.03 mg/kg and, as discussed above, is not considered attributable to the site at those levels. PAHs detected included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene at maximum concentrations of 0.028 mg/kg, 0.038 mg/kg, 0.043 mg/kg, 0.024 mg/kg, and 0.090 mg/kg, respectively. The samples were collected directly on the dirt service road. These levels are within the range of those determined to be associated with vehicle-related pollutants transported to the investigation areas via runoff. Therefore, it is assumed that no release had occurred to this area. In addition, they are below PSTD CULs. No further action will be required for this area in association with the TAC 334 regulations.

Drainageways DW-2

Three sediment samples were collected from within DW-2 (see Figure 3-28). No inorganics were reported at concentrations greater than background. Methylene chloride and toluene were the only organic analytes detected. Both are considered to be associated with field and/or laboratory contamination.

The investigation results therefore indicate that there are no DW-2 contaminants present at concentrations greater than background that are attributable to the site. DW-2 therefore currently meets the closure requirements of RRSN1.

Drainageways DW-3

As described in Section 3.3.4, the prominent feature in the area is a ditch that forms at a pipe connected to Bldg. 8505 floor drains (see Figure 3-29). At its origin, the ditch is approximately 0.5 feet deep and four feet wide. The ditch transitions into a 10-foot-wide swale in the vicinity of sample location DW3-118. Downgradient, the ditch opens and becomes unconfined between DW3-133 and DW3-003. Also investigated were upland areas extending as much as 80 feet to the north and south of the ditch. The soil horizon in the area is limited by bedrock located 1 to 3 feet bgs.

Indications of vehicle traffic are evident on both the north and south sides of the ditch. Vehicle tracks were noted during the field investigation and are represented by eroded areas visible on the aerial photograph of the site taken while the site was active (see Figure 1-3). The two historic sources of potential contamination were therefore present at the site; the pipe connected to Bldg. 8505 floor drains and vehicles.

A total of 63 surface and subsurface soil samples were collected from DW-3. Twenty-eight samples were collected within the ditch itself. The remaining samples were collected from the adjacent upland. Samples were analyzed for inorganics, SVOCs, VOCs, Pesticides/PCBs, and explosives. There were no pesticides/PCBs or explosives detected. Toluene was the only VOC and is considered to be associated with field and/or laboratory contamination.

Detected analytes above background in surface samples included mercury and zinc in the samples closest to the pipe (DW3-001) and magnesium and selenium at the downgradient DW3-002 location. Zinc was detected at 2.4 times background. The remaining exceedances were less than 1.2 times background.

Sixteen PAHs were found in both surface and subsurface soil samples at DW-3. The sample with the greatest concentration of PAHs was outside of the ditch (DW3-103), however supplemental samples (location DW3-106) failed to verify the high concentrations. Excluding the unverified PAH concentration at DW3-103, the DW-3 PAH concentrations are similar to those found in areas considered to be impacted by vehicle-related pollutants. As an example, benzo(a)anthracene (a common contaminant in areas impacted by vehicle pollutants) was reported at a maximum concentration of 2.8 in samples collected within the ditch and 6.1 in samples collected outside of the ditch. The maximum benzo(a)anthracene concentration in Area A-3 is 4.8 mg/kg. Area A-3 PAHs are considered to be attributable to vehicle-related pollutants. Within the ditch, however, the distribution of PAH concentration suggest a relation to a point source discharge, in that concentrations decrease with distance from the pipe. A notable decrease in ditch PAH concentrations is evident between locations DW3-117 and DW3-128 (see Figure 3-29). As shown in Table 6-1, PAH concentrations decrease significantly between DW3-118 and DW3-127.

Based on the results of this investigation, it is therefore assumed that zinc and PAH concentrations within the DW-3 ditch extending from the pipe discharge to the midpoint between DW3-118 and DW3-127 exceed background and are attributable to an unpermitted discharge. Although the PAHs in soils located beyond the top of ditch bank and within the ditch downgradient from DW3-127 exceed background, they are considered attributable to vehicles that historically utilized that area.

Drainageways DW-4

Drainageway DW-4 is located directly adjacent to a roadway. Nine sediment samples were collected from within DW-4 (see Figures 3-28 and 3-30). Five inorganics were reported at concentrations greater than background. The lead concentration was the highest relative to the background $UTL_{95,95}$. Sample DW4-001-01 contained lead at a concentration of 71.6 mg/kg, approximately 2.7 times the background. The remaining analytes were less than 1.7 times background.

The sample collected at the head of the drainageway near Bldg. 8514 (DW4-001-01) contained 13 SVOCs. Verifications samples demonstrated that the PAH contamination was localized to within 5 to 10 feet of the roadway and is therefore most likely associated with vehicle-related pollutants.

Toluene was the only organic compound detected and is attributed to field and/or laboratory contamination.

The investigation results therefore indicate that there are no DW-4 contaminants present at concentrations greater than background that are attributable to the site. DW-4 therefore currently meets the closure requirements of RRSN1.

Drainageways DW-5

Five sediment and one surface water samples were collected from within DW-5 (see Figure 3-28). No inorganics were reported at concentrations greater than background. Methylene chloride and toluene were the only organic analytes detected. Both are considered to be associated with field and/or laboratory contamination.

The investigation results therefore indicate that there are no DW-5 contaminants present at concentrations greater than background that are attributable to the site. DW-5 therefore currently meets the closure requirements of RRSN1.

Drainageways DW-6

Two sediment samples were collected from the top of each DW-6 ravine (see Figure 3-28). No inorganics were reported at concentrations greater than background. Toluene was the only organic analyte detected. The compound is considered to be associated with field and/or laboratory contamination.

The investigation results therefore indicate that there are no DW-6 contaminants present at concentrations greater than background that are attributable to the site. DW-6 therefore currently meets the closure requirements of RRSN1.

Drainageways DW-7

Two sediment samples were collected from within DW-7 (see Figure 3-28). No inorganics were reported at concentrations greater than background. Methylene chloride and toluene were the only organic analytes detected. Both are considered to be associated with field and/or laboratory contamination.

The investigation results therefore indicate that there are no DW-7 contaminants present at concentrations greater than background that are attributable the site. DW-7 therefore currently meets the closure requirements of RRSN1.

Drainageways DW-8

Two sediment samples were collected from within DW-8 (see Figure 3-28). Magnesium was the only inorganic reported at a concentration greater than background. The analyte was detected at a concentration 1.1 times greater than background. Given the low magnitude of the exceedances and the fact that a source of magnesium contamination was not found, the exceedance is not considered attributable to the site.

The investigation results therefore indicate that there are no DW-8 contaminants present at concentrations greater than background that are attributable the site. DW-8 therefore currently meets the closure requirements of RRSN1.

Drainageways DW-9

Two sediment samples and one surface water sample were collected from within DW-9 (see Figure 3-28). No analytes were detected above the background $UTL_{95,95}$ in the sample collected directly downgradient from the EOD range (DW9-001-01). The sample collected further downgradient contained a number of inorganic analytes at concentrations above the background $UTL_{95,95}$. The downgradient sample was collected within an area previously investigated and remediated. It is concluded that the increased concentrations are attributable to residuals remaining from the soil and debris removal.

The investigation results therefore indicate that the only analytes present at concentrations greater than background in DW-9 are associated with previously remediated area that has been closed by TNRCC. DW-9 therefore currently meets the closure requirements of RRSN1.

Seep Locations

Four sediment and 10 surface water samples were collected from four seep locations. One inorganic analyte was detected at a concentration greater that background at one seep location. Zinc was detected at a concentration 1.3 times background. Copper and nickel were reported in one surface water sample at concentrations 1.9 and 1.3 times background respectively. Given the low magnitude of the exceedances and the fact that a source of zinc, copper, and nickel contamination was not found, the exceedances are not considered attributable to the site.

The investigation results therefore indicate that there are no seep contaminants present at concentrations greater than background that are attributable the site. All seep areas therefore currently meet the closure requirements of RRSN1.

Groundwater

Groundwater samples were collected from three Paluxy Formation wells at the site (see Figure 3-31). These wells included two of the previously existing on-site water supply wells and one upgradient monitoring well (WJEPX925) installed during a previous investigation. There were no SVOCs, VOCs, pesticide/PCBs, or explosive compounds

detected in the on-site wells. Twelve inorganic analytes were detected; seven were at concentrations above those reported for the background sample. Iron, magnesium, manganese, and potassium were no more than twice the background. Sodium, copper, and zinc were approximately three, four, and seven times the background, respectively. As previously discussed, these exceedances are attributed to the on-site well steel casing material or natural variability in groundwater quality.

The investigation results therefore indicate that there are no groundwater contaminants present at concentrations greater than background that are attributable to the site. The site groundwater thus currently meet the closure requirements of RRSN1.

6.1.2 Summary of Results With Respect to RRSN2

This section provides an assessment of the closure requirements for those areas (or locations) where unpermitted discharges have resulted in contaminant concentrations above background. The assessment involves the determination of the applicable requirements to meet RRSN2 (i.e., Deed Certifications for areas with contamination less than the RRSN2 CULs or removal actions for areas with contamination greater than the RRSN2 CULs). The areas (or locations) where contamination exists above background, as described in Section 6.1.1, are.

- Area A-3 (SWMU 59 and Building 8503) and Drainageway DW-1;
- bunker drain areas;
- removed UST locations;
- Drainageway DW-3; and
- leach field.

To determine the applicable closure requirements for the areas identified, an assessment of whether the contamination present exceeded respective CULs was performed individually for each area. The assessment was performed, as described in Section 5, *Risk Evaluation*, using a two-step process.

- CULs are compared to the maximum detected contaminant concentrations. When the maximum detected concentration did not exceed the CUL, it was concluded that the respective contaminant did not exceed the CUL and therefore, the RRSN2 requirements could be met with a Deed Certification. For those contaminants where the maximum detected concentration exceeded the CUL, a second evaluation step was conducted.
- Exposure point concentration and/or single location outlier concentrations were identified for the respective contaminants as described in the Risk Evaluation. The exposure point concentration (or single location concentration) was then compared to the respective CUL. For exposure point concentrations that did not exceed the CUL, it was concluded that the RRSN2 requirements could be met with a Deed Certification. For exposure point concentrations that did exceed the CUL, it was concluded that additional removal actions would be necessary to meet the RRSN2 cleanup requirements. In this latter case, the amount of soil removed will be determined in the field though confirmation sampling and comparison of the sampling results with the CULs.

A summary of the closure requirements for each of the areas identified above are provided below.

Area A-3 (SWMU 59 and Building 8503) and Drainageway DW-1

As indicated in Section 6.1.1, inorganic and VOC contamination exceeds background and are most likely is attributable to an unpermitted discharge from the site.

Analysis of analyte concentrations greater than background was performed in Section 5.1. Two analytes were found to exceed both background and the RRSN2 CULs. These included:

- mercury in the vicinity of sample location A3-006 (see Figure 3-6) and
- iron at sample location A3-011.

Limited amounts of iron-based materials were seen on the site during the investigation. Therefore, the iron exceedance is not considered representative of actual site contamination. The VOC contaminants were determined to be present at concentrations less than the RRSN2 CULs.

The majority of the area of concern contains contaminants with concentrations less than the CULs and can therefore be closed under RRSN2 with the appropriate deed notice. However, removal of mercury contaminated soil in the vicinity of A3-006 must first be performed.

Bunker Drain Areas

As indicated in Section 6.1.1, inorganic and VOC contamination exceeds background and are most likely is attributable to an unpermitted discharge from the site.

Analysis of analyte concentrations greater than background was performed in Section 5.1. Three analytes at six locations were found to exceed both background and the RRSN2 CULs. These included

- mercury at sample location BD-002 and BD-018
- copper at sample location BD-005 and
- cadmium at sample locations BD-130, BD-137, and BD-138.

The majority of the bunker drain area of concern contains contaminants with concentrations less than the CULs, and can therefore be closed under RRSN2 with the appropriate deed notice. However, removal of mercury, copper, and cadmium contaminated soil at those locations identified above must first be performed.

Removed UST Locations

As indicated in Section 6.1.1, PAH contamination exceeds background at removed USTs located near Bldgs. 8500, 8507 and 8505 and most likely is attributable to an unpermitted discharge from the site. The contamination from removed USTs associated with 8500 and 8507 is regulated under TAC 335.

Analysis of analyte concentrations greater than background was performed in Section 5.1. Four analytes at removed USTs located near Bldgs. 8500 and 8507 were found to exceed both background and the RRSN2 CULs. These included

- benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h,)anthracene at the removed USTs located near Bldg. 8500; and
- benzo(a)pyrene at the removed USTs located near Bldg. 8507.

Removal of PAH-contaminated soil at the removed UST locations associated with Bldgs. 8500 and 8507 will therefore be necessary in order to close areas under RRSN2.

As indicated in Section 6.1.1, removal of PAH-contaminated soil at the removed UST locations associated with Bldg. 8505 will be necessary in order to close areas under PSTD regulations.

Drainageways DW-3

As indicated in Section 6.1.1, PAH contamination in the ditch exceeds background and most likely is attributable to an unpermitted discharge from the site.

Analysis of analyte concentrations greater than background was performed in Section 5.1. This analysis was performed on EPC developed for the entire area of concern. Seven analytes were found to exceed both background and the RRSN2 CULs.

Removal of PAH-contaminated soil within DW-3 ditch will therefore be necessary in order to close areas under RRSN2. As described in Section 6.1.1, the ditch area requiring removal extends from the pipe discharge to the midpoint between DW3-118 and DW3-127. The width of the required removal area generally extends from the top of the south bank to the top of the north bank.

Leach Field

As indicated in Section 6.1.1, inorganic and SVOC contamination exceeds background and most likely is attributable to an unpermitted discharge from the site.

Analysis of analyte concentrations greater than background was performed in Section 5.1. No analytes were found to exceed the RRSN2 CULs.

The leach field area can therefore be closed under RRSN2 with the appropriate Deed Certifications. It should be noted, however, that TNRCC closure requirement also specify that tanks wall be removed. The downgradient concrete wall of the leach field should therefore be excavated. The debris can remain on-site.

6.1.3 Ecological Evaluation Conclusions

The COPCs identified for the Ecological Evaluation were limited to inorganic compounds in soil and sediment. Although Section 5.2.5 presented soil concentrations protective of ecological receptors ($T_{2\text{-}c}$Ls) that were above EPCs, many of these concentrations are either below the background levels established in Section 3.0 or are associated with COPCs that are being addressed because of potential human health concerns. The $T_{2\text{-}c}$Ls above background are limited to those for plants and invertebrates potentially exposed to

cadmium, copper, lead, mercury, nickel, and zinc at the bunker drains and drainageway locations. The TNRCC soil benchmarks for plants and invertebrates that corresponded to the high HQs and low $T_{2\text{-}c}$Ls in Section 5.2 are based on studies reviewed and summarized by Efroymson et al. (1997) and Will and Suter (1995). For most metals, these reviewers expressed only low to moderate confidence in the benchmarks based on the studies they reviewed. Their applicability to specific sites such as the Offsite WSA is highly uncertain.

The total acreage of the impacted drainageways and bunker drains is approximately 0.4 acres, which is 3 percent of the total source area acreage (approximately 11 acres) and 0.01 percent of the total Offsite WSA acreage (2,555 acres). Because exceedances of $T_{2\text{-}c}$Ls are confined to this nominal acreage and the potentially impacted species are not known to be ecologically critical to the region, the presence of the inorganic COPCs in these areas is expected to have a minimal impact on the local ecosystem. Therefore, no further action is recommended to address compounds in soil/sediment with HQs greater than 1 or $T_{2\text{-}c}$Ls greater than site EPCs, other than those being addressed by the human health evaluation.

Compounds detected in drainageway and seep surface water, groundwater, and seep sediment were either below background levels or CULs. Therefore, no human health or ecological COPCs needing further action in these media were identified in the Risk Evaluation.

6.1.4 Recommendations for Site Closure

As discussed in the previous sections, results of the field investigation and risk evaluation conducted for the Offsite WSA demonstrate that site areas can be closed under RRSN1 and RRSN2. Table 6-2 summarizes regulatory basis for closure and the actions necessary to achieve closure for each area (location) included in this evaluation.

Documentation of closure requirements, including removal actions, and demonstration of RRSN1 or RRSN2 attainment will be provided in a site closure report. The closure report will be completed following completion of all closure activities at the Offsite WSA.

6.2 FACILITY SURVEYS CONCLUSIONS

Conclusions from the facility surveys portion of the RFI are presented below. ACM, LBP, and limited surface contamination was identified in the survey. There was no indication that the ACM, LBP or limited surface contamination was contributing to environmental media contamination. The survey information is therefore only provided to facilitate the potential transfer of property at a later date. Additionally, the information may be used to ensure proper management of waste and dust that will result when the buildings are demolished.

6.2.1 Asbestos Survey Conclusions

As detailed in Section 3.6.1, a visual asbestos survey was performed in all but one of the Offsite WSA buildings. During the asbestos survey, 99 suspect ACM samples were collected, thirty-two of which tested positive in eight of the 23 buildings surveyed. One additional building was believed to contain asbestos based on a visual determination. None

of the ceiling tiles at the Offsite WSA tested positive for asbestos. Additionally, no asbestos was found in any of the Offsite WSA storage igloos (i.e., bunkers). Pipe insulation varied from building to building. Generally, the performed TSI and the aircell TSI were found to be positive, while the fitting TSI was negative. Nine-inch by nine-inch floor tiles were all positive while the 12-inch by 12-inch floor tiles varied. Asbestos containing roofing materials also varied. On the smaller buildings the roofing felt contains asbestos, while on the larger buildings, only the sealant around the vents contains asbestos.

It must be noted that visual comparison of similar material is not adequate to determine the presence of asbestos. When tested, materials that appeared to be identical in different buildings were found to be positive in one building and negative in the next building. Table 3-43 and Appendix G summarize all the materials sampled and list their respective laboratory results to determine whether material in a specific building contains asbestos.

6.2.2 LBP Survey Conclusions

The LBP survey was conducted at 24 Offsite WSA facilities. Ninety-five paint samples were collected. Forty-two samples were found to be LBP in 19 of the 24 facilities surveyed.

In general, the majority of metal exterior building components such as handrails, doors, door frames, and window frames are coated with LBP. Most interior steel support beams are also coated with LBP. It was rare to find LBP on other interior components, with the exception of the floor molding in Bldg. 8507. Some interior wall paint in Bldg. 8514 was found to be positive. The tan exterior wall paint, which is typical of most Offsite WSA buildings, was found to be positive only on Bldgs. 8500 and 8505. Finally, yellow safety paint that was used on ramps and stairs was also determined to be LBP.

Table 3-44 and Appendix G summarize all the materials sampled and list their respective laboratory results to determine whether building-specific paint is LBP.

The results of the LBP survey provided varying results for similar colors of paint on similar components on different building surfaces. A good example of this is the metal doors on the storage igloos. All of the storage igloos have the same color dark pink paint on their exterior doors. Only some of the doors were determined to have LBP. It is surmised that the doors that tested positive for lead have a layer of LBP beneath the top coat. The results from the survey also show that levels of lead vary from paint to paint and from component to component. This is also due to different layers and combinations of paint on a facility component. Paint chip sampling can only determine whether a sample is or is not LBP. Sampling techniques and laboratory procedures do not differentiate which layer of paint is LBP. Further repainting, repair, or demolition procedures do not deal with each distinct layer of paint. Therefore, where the paint was determined to be LBP, all layers of paint are considered LBP for the purposes of discussion in this report.

6.2.3 Facility Surface Contamination Survey Conclusions

A facility surface contamination survey was conducted at 13 Offsite WSA buildings as part of this RFI to determine the extent of contamination from dust and particles

associated with ordnance on the surfaces of various Offsite WSA buildings. Contamination was found on the walls and floors in 12 of the 13 buildings. Bldg. 8512 (SWMU 59) was the only building in which no surface residue contamination was detected. Table 3-46 and Appendix G further summarize the results from the facility wipe sampling effort.

Both the walls and the floors were determined to have inorganic contaminants above background levels in eight of the 12 contaminated buildings. The remaining four buildings only have contamination present on their floors. Generally, the floors seemed to have higher levels of contamination and more types of analytes detected on them. Contamination on the floors seemed to be as a result of the previous room/building use and the fact that inorganic materials settle better onto a floors than on walls and ceilings.

Higher levels of inorganic contamination were detected on the floors of the paint booth and HVAC/mechanical room in Bldg. 8503. Also, noticeably higher levels of contamination were observed on the floor in the work bays of Bldg. 8514, the Conventional Munitions Shop. Generally, the walls of the weapons storage bunkers had minimal amounts of contaminants above background levels. The floors in munitions bunker Bldg. 8531 and Bldg. 8535 had noticeably higher amounts of contamination on their floors than other bunkers.

Low levels of ordnance residue contamination were detected on the floors of the paint booth in Bldg. 8503 and in the HVAC/mechanical room in Bldg. 8514.

As stated earlier, no remedial action is necessary to address the low-levels of surface contamination detected during this survey. This is due to two factors: (1) the 90-day storage shed (SWMU 59) does not contain contaminant levels above background and therefore does not require decontamination as part of the RCRA closure and (2) the surface contamination at other locations surveyed do not pose a threat to the environment.

Table 6-1. Selected PAH Results From DW-3 Ditch Surface Samples

	DW3-117	DW3-118	DW3-127	DW3-128
Benzo(a)anthracene	1.6	1.2	0.64	0.0066 U
Benzo(a)pyrene	1.8	1.3	0.017	0.13
Benzo(b)fluoranthene	1.7	1.2	0.061	0.13

Note: units are in mg/kg.

Table 6-2. Summary of Areas of Concern, Basis for Closure, and Actions Required

Area/Location	Basis for Closure	Actions Required Prior to Closure
Area A-1	RRSN1	No Action Required
Area A-2	RRSN1	No Action Required
Area A-3 (SWMU 59 and Building 8503) and Drainageway DW-1	RRSN2	Soil Removal/Deed Certification
Area A-4	No Action per PSTD Requirements	No Action Required
Area A-5	RRSN1	No Action Required
EOD Range	RRSN1	No Action Required
Bunker Drains	RRSN2	Soil Removal/Deed Certification
Electrical Transformer Areas	RRSN1	No Action Required
Leach Field		Dismantle Downgradient Wall/Deed Certification
Removed UST at Bldg. 8500	RRSN2	Soil Removal/Deed Certification
Removed UST at Bldg. 8503	RRSN1	No Action Required
Removed UST at Bldg. 8505	No Action per PSTD Requirements	No Action Required
Removed UST at Bldg. 8507	RRSN2	Soil Removal/Deed Certification
Removed UST at Bldg. 8514	PSTD Closure Requirements	No Action Required
Drainageway DW-3	RRSN2	Soil Removal/Deed Certification
Drainageways DW-2, DW-4, DW-5, DW-6, DW-7, DW-8, and DW-9	RRSN1	No Action Required
Seep Locations	RRSN1	No Action Required
Groundwater	RRSN1	No Action Required

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7.0 REFERENCES

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498 478

TAB

A

498 479

APPENDIX A

PHOTO DOCUMENTATION

The Environmental Company, Inc.

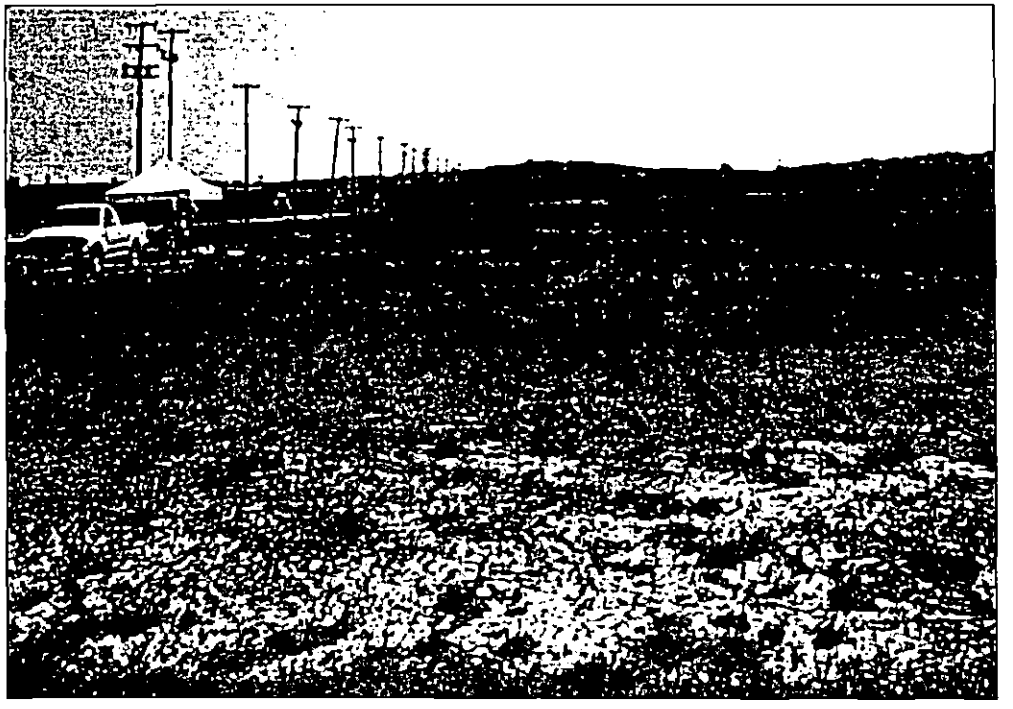
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: A1

Photo Number: A1-a

View: East view

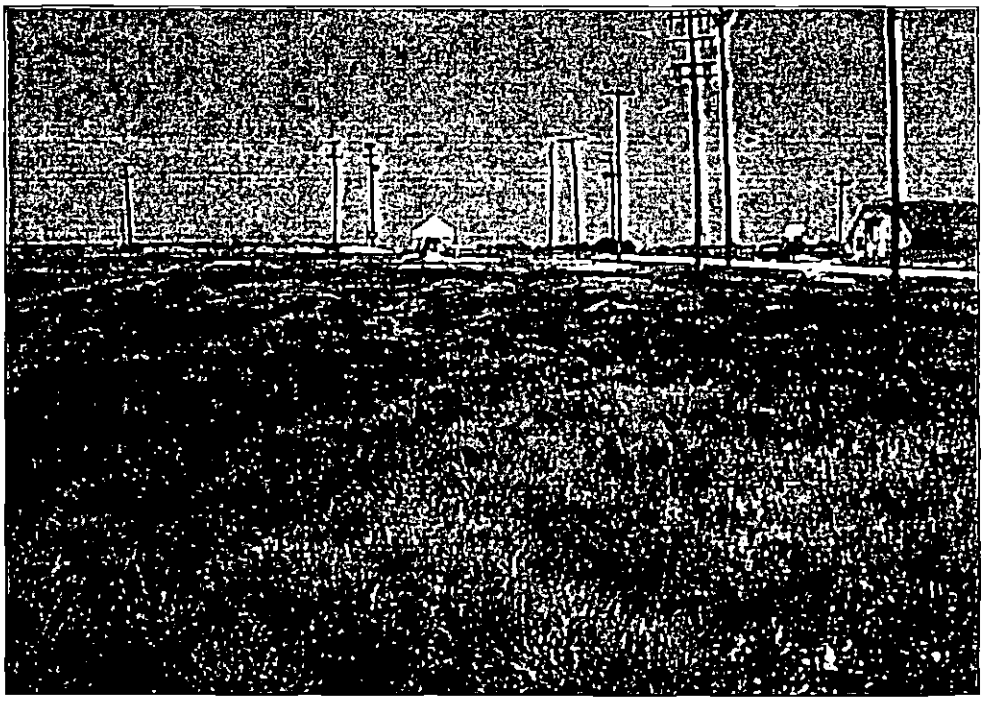
Comments: Overview of A1. Note pole-mounted transformers near road.

Site: A1

Photo Number: A1-b

View: West view

Comments: Overview of A1. Note pole-mounted transformers near road.



The Environmental Company, Inc.

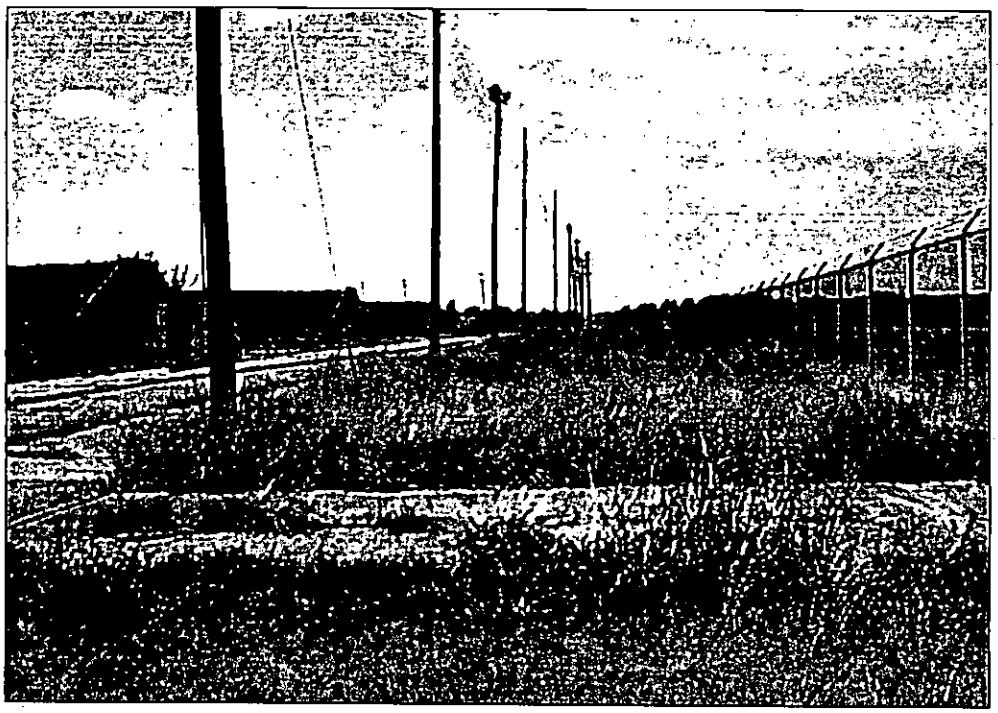
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: A2

Photo Number: A2-a

View: West view

Comments: Overview of A2 at northern end of WSA.

The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: A3

Photo Number: A3-a

View: West view

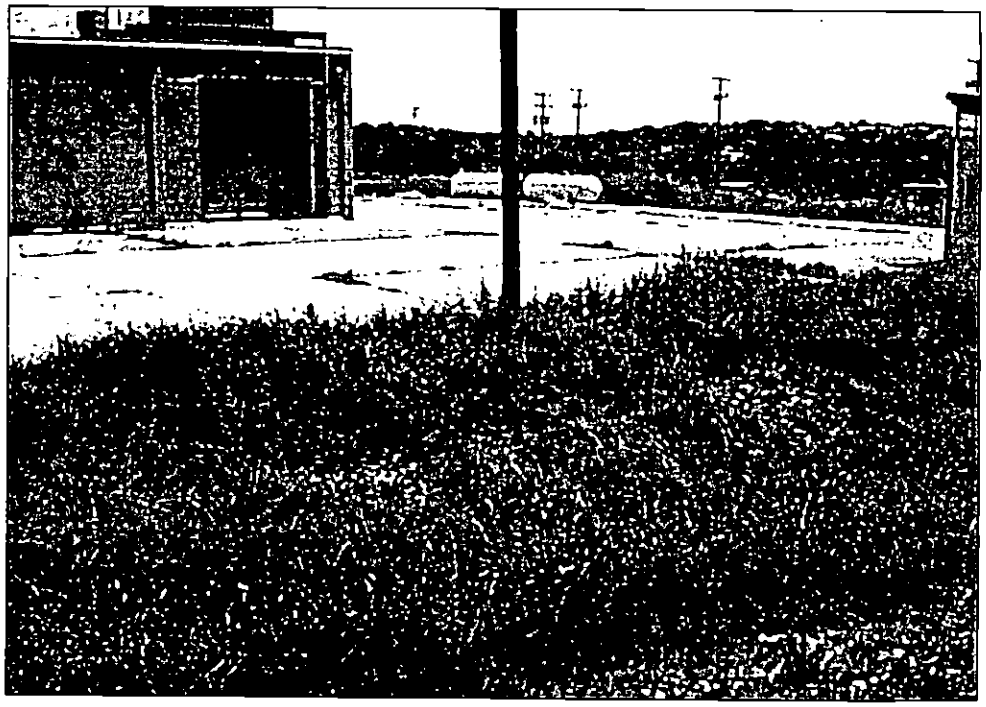
Comments: View of A3 on northern side of Building 8503. Note rack of transformers (sample location TRF-005) near right side of photograph.

Site: A3

Photo Number: A3-b

View: Southeast view

Comments: View of A3 on western side of Building 8503.



198 483

The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: A3

Photo Number: A3-c

View: East view

Comments: View of A3 on southern side of Building 8503.

498 484

The Environmental Company, Inc.

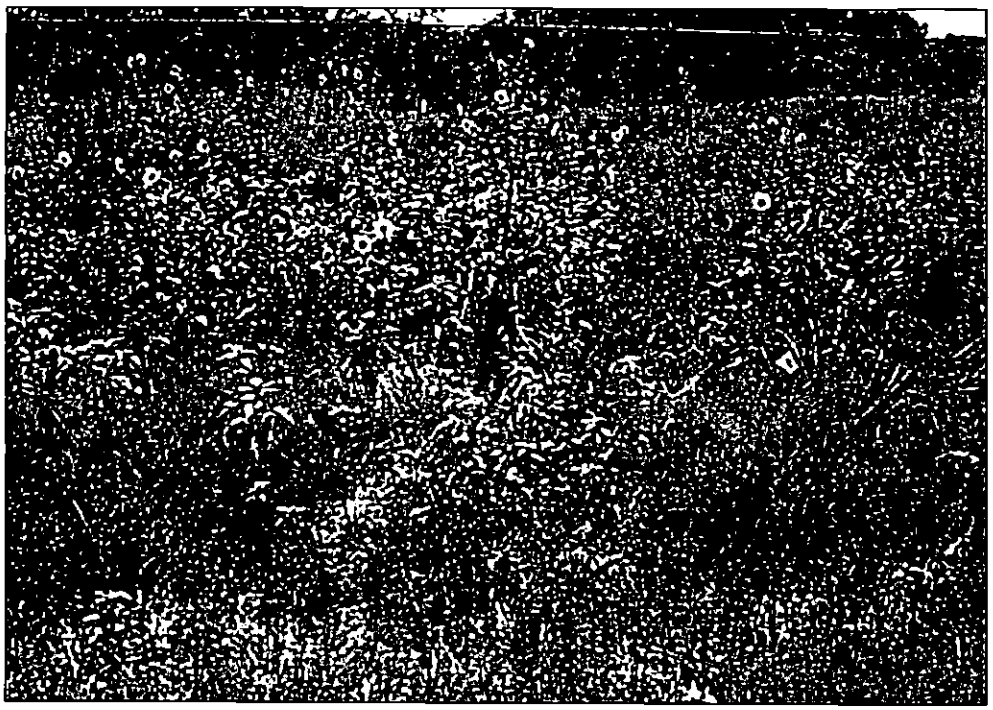
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: A4

Photo Number: A4-a

View: South view

Comments: View of A4 southwest of Building 8514.

The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: A5

Photo Number: A5-a

View: East view

Comments: Overview of A5.

Site: A5

Photo Number: A5-b

View: Northwest view

Comments: Overview of A5.

198 486

The Environmental Company, Inc.

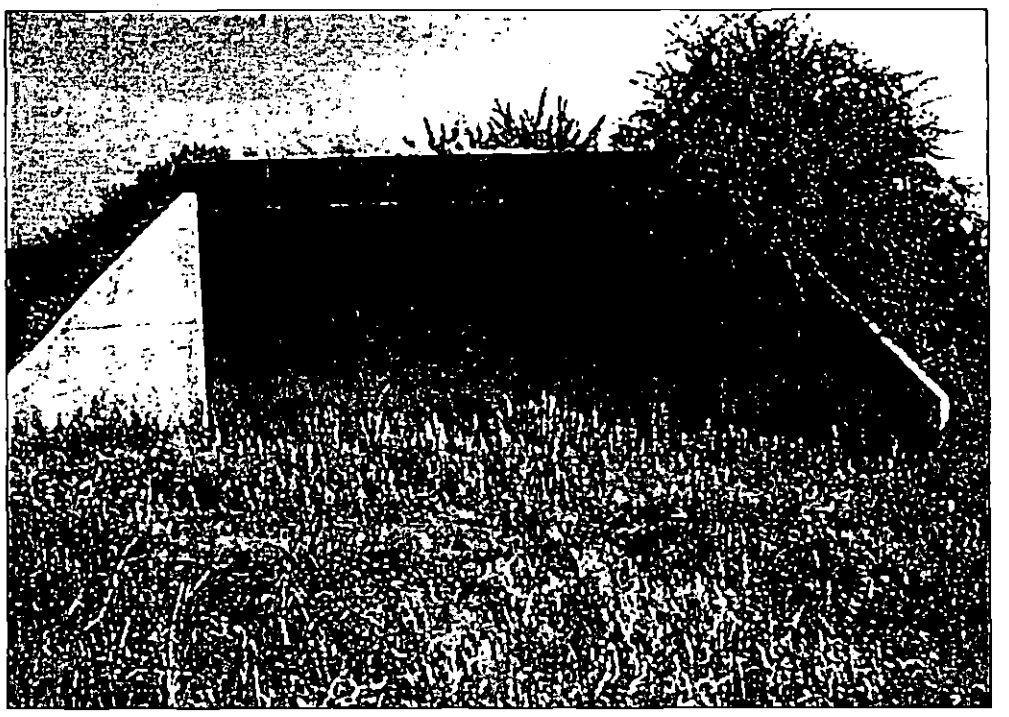
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: EOD Range

Photo Number: EOD-a

View: North view

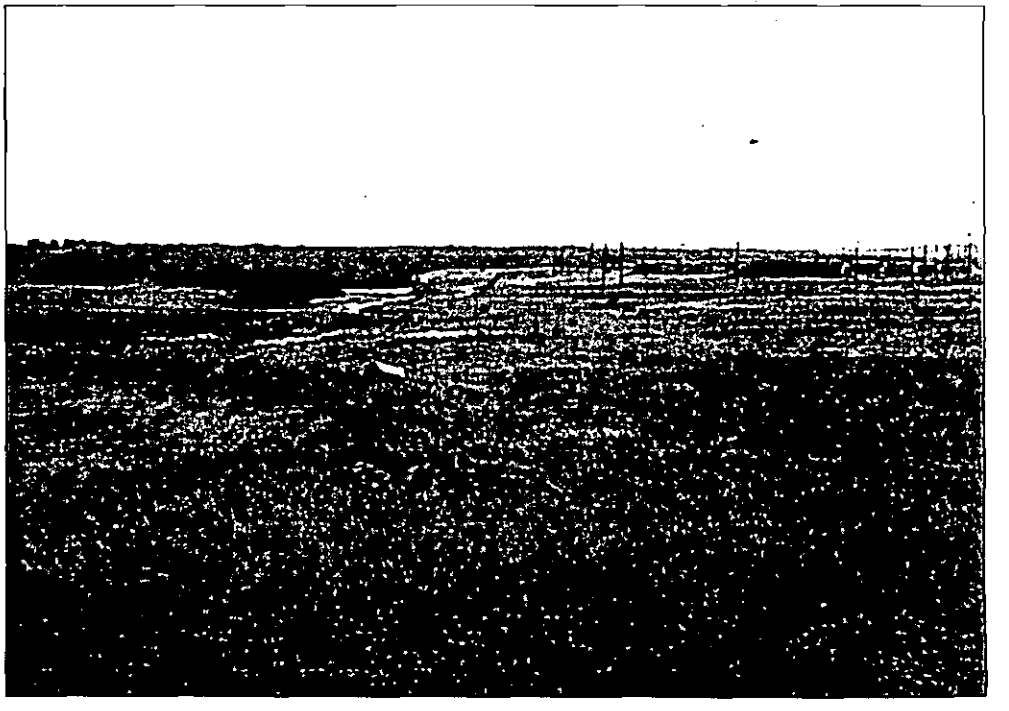
Comments: Bunker on EOD Range.

Site: EOD Range

Photo Number: EOD-b

View: Northeast view

Comments: Overview of EOD Range from top of bunker.



The Environmental Company, Inc.

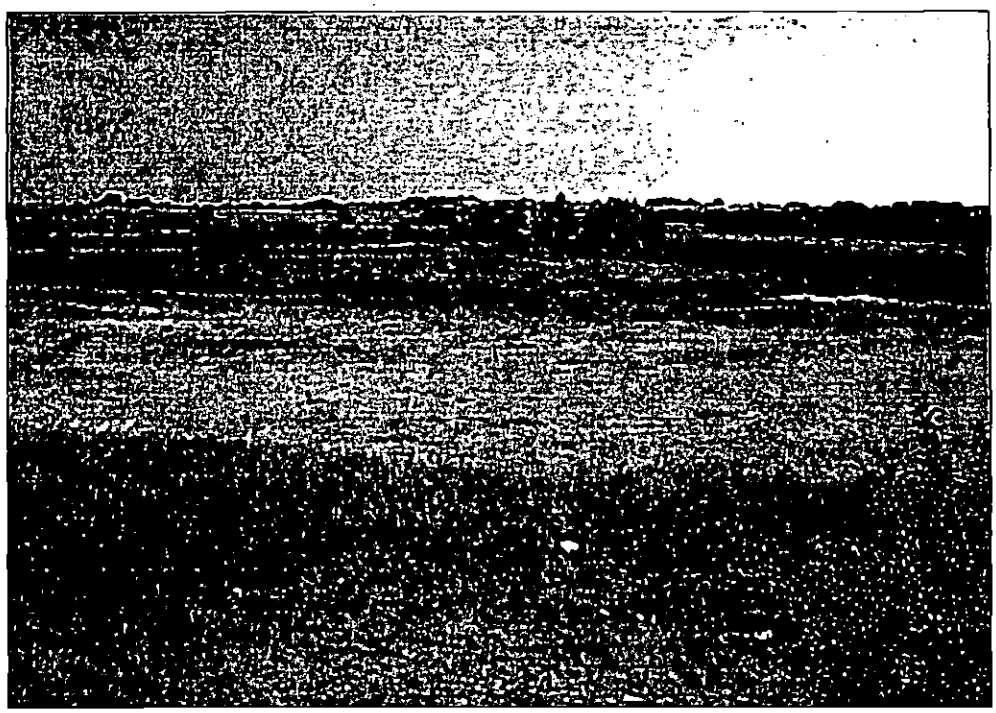
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: EOD Range

Photo Number: EOD-c

View: North view

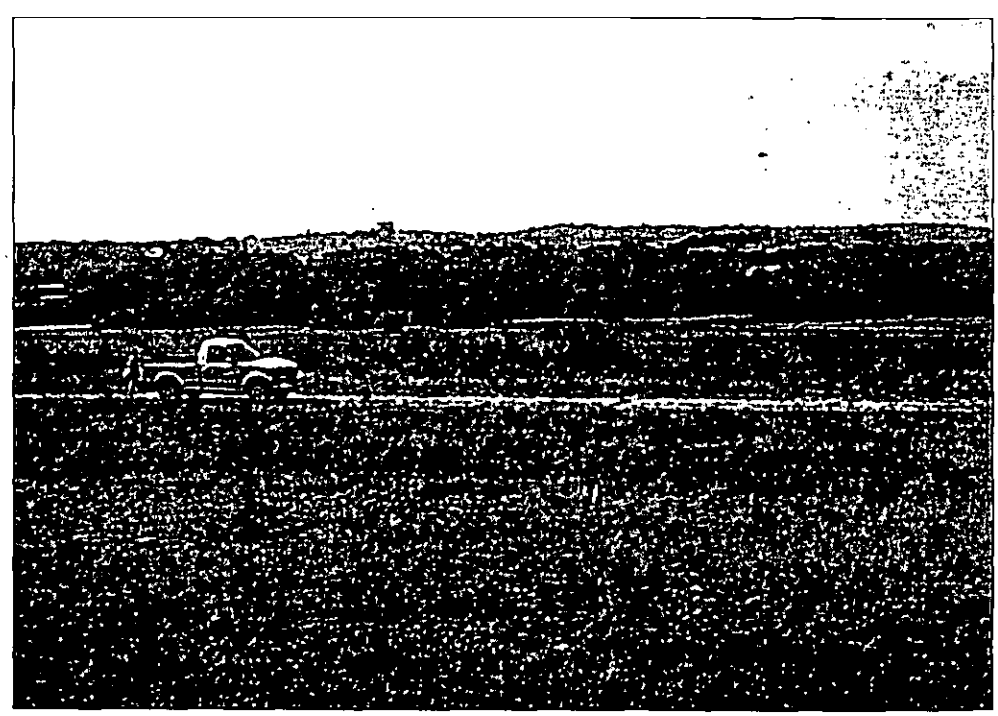
Comments: Overview of EOD Range from top of bunker.

Site: EOD Range

Photo Number: EOD-d

View: South view

Comments: Overview of EOD Range from top of bunker.



The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Bunker 8531

Photo Number: BD-a

View: N/A

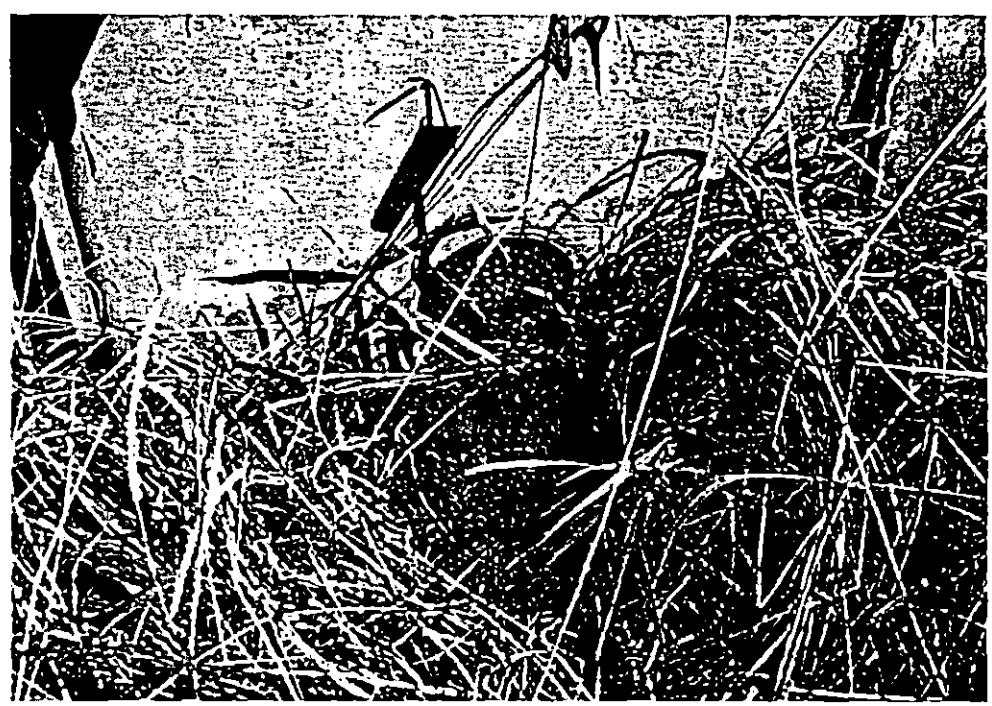
Comments: Bunker drain on Bunker 8531.

Site: Bunker 8533

Photo Number: BD-b

View: N/A

Comments: Bunker drain on Bunker 8533.



The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Removed UST Location

Photo Number: UST-a

View: East view

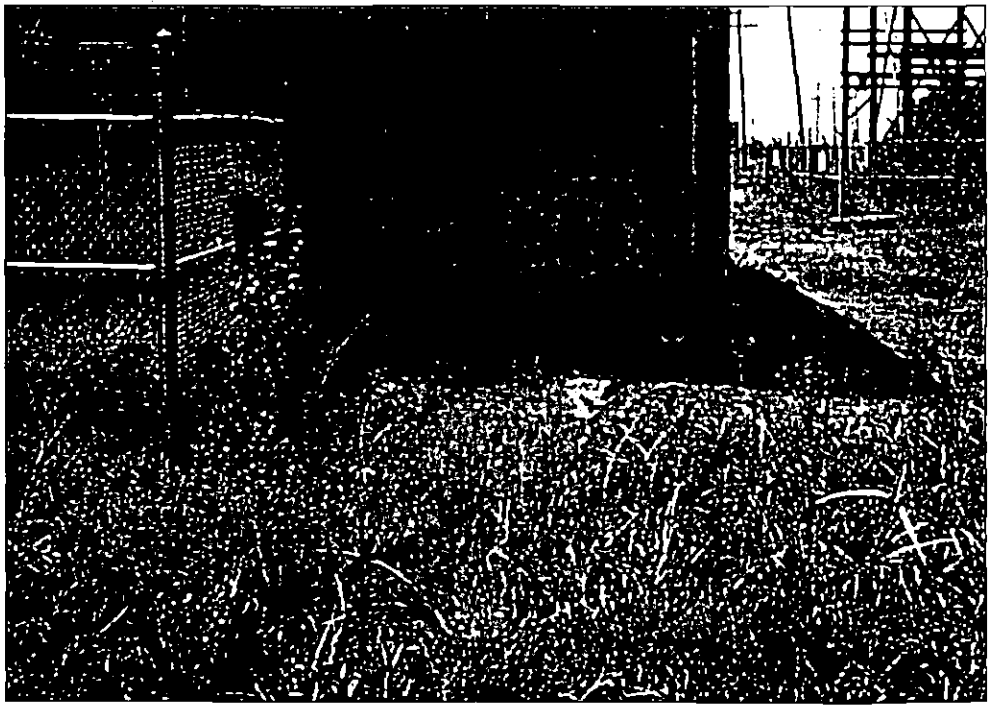
Comments: Former UST location on northern side of Building 8500.

Site: Removed UST Location

Photo Number: UST-b

View: West view

Comments: Former UST location on eastern side of Building 8505.



198 490

The Environmental Company, Inc.

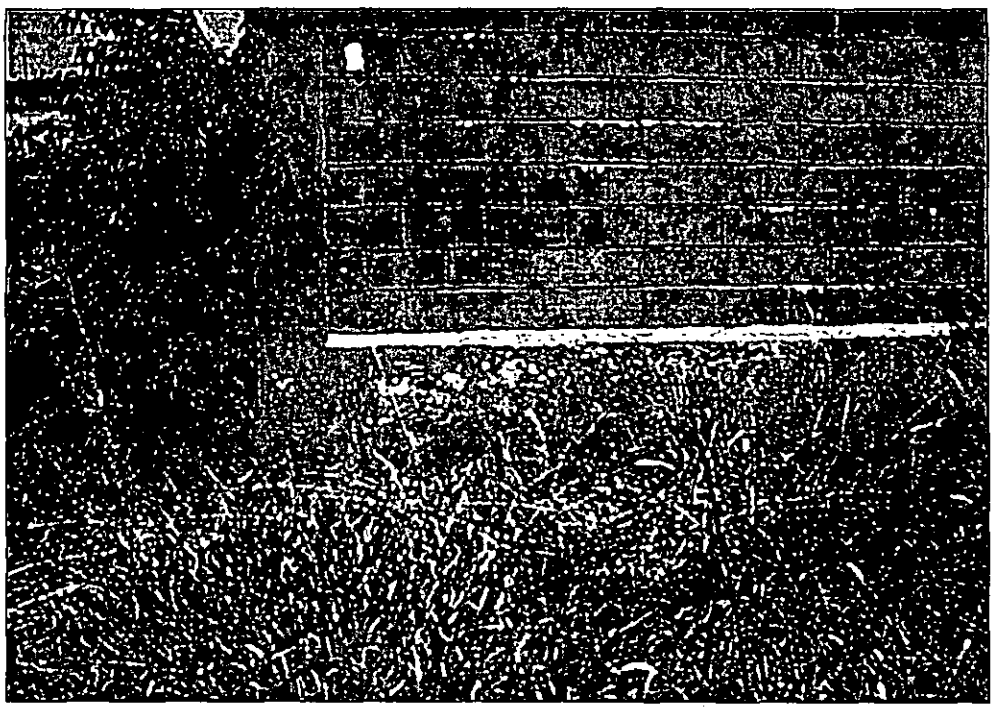
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

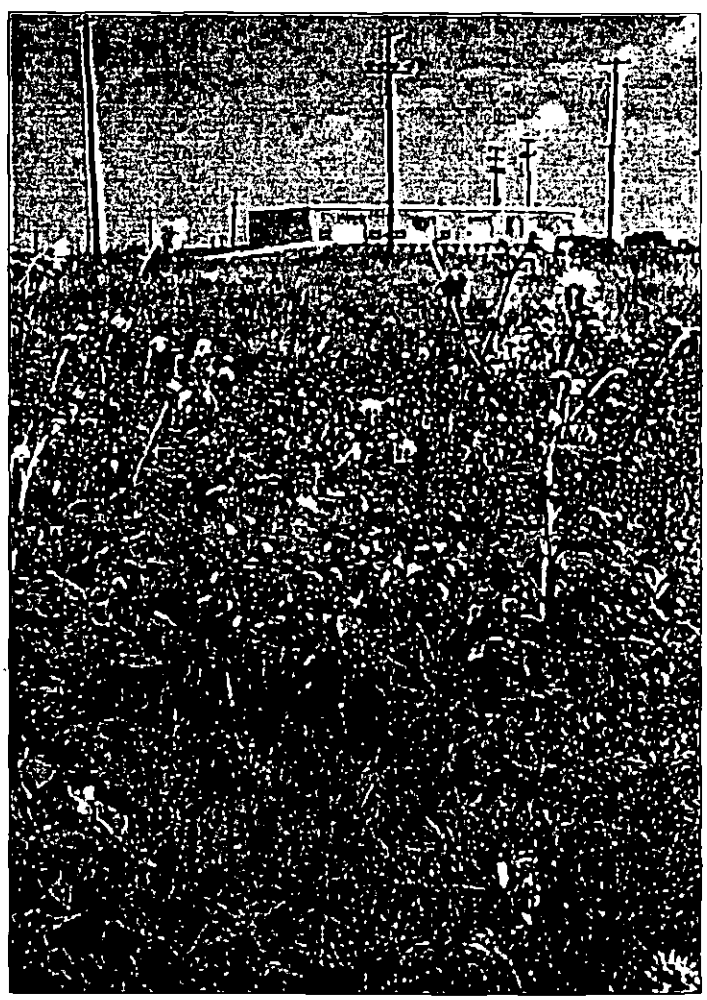


Site: Removed UST Location

Photo Number: UST-c

View: East view

Comments: Former UST location on western side of Building 8507.



Site: Removed UST Location

Photo Number: UST-d

View: Northeast view

Comments: Former UST location southwest of Building 8514.

The Environmental Company, Inc.

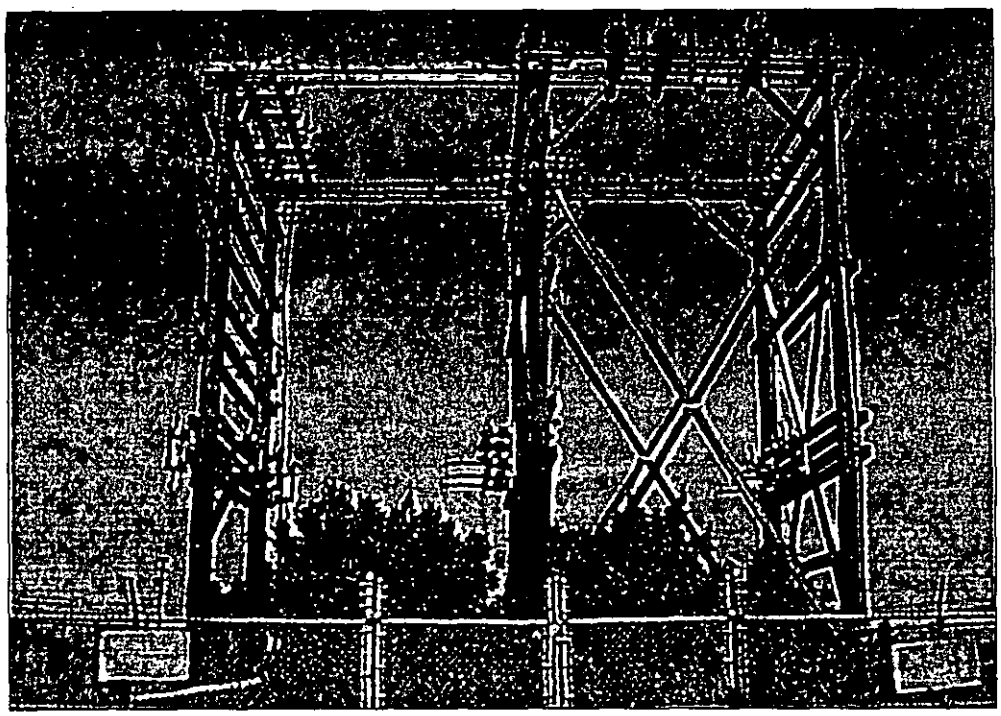
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Power Generating Substation

Photo Number: TRF-a

View: North view

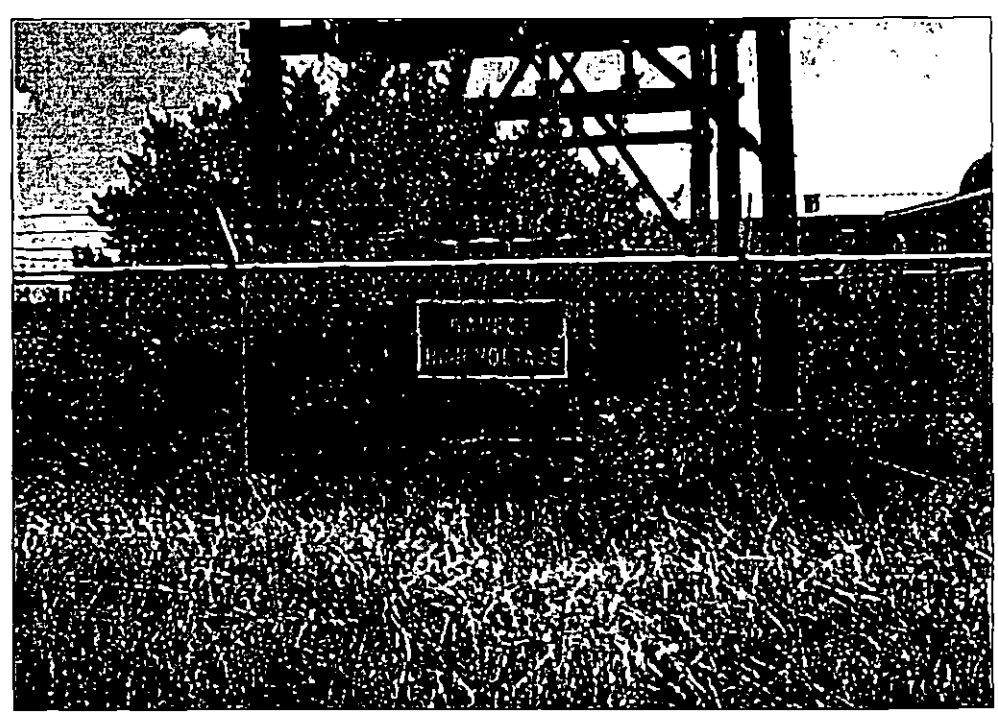
Comments: Power generating substaion west of Building 8505, with racks of transformers.

Site: Power Generating Substation

Photo Number: TRF-b

View: North view

Comments: Power generating substaion west of Building 8505.



The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Transformer

Photo Number: TRF-c

View: East view

Comments: Pole-mounted transformer east of Building 8514.

The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Drainageway 1

Photo Number: DW1-a

View: North view

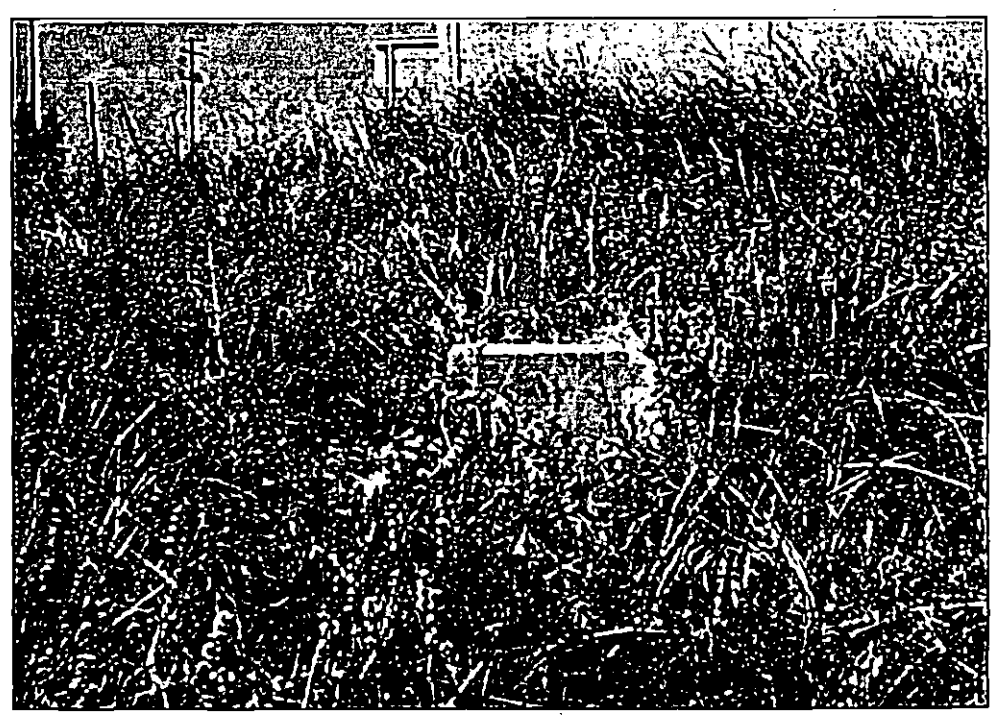
Comments: View of DW1 west of Building 8503.

Site: Drainageway 1

Photo Number: DW1-b

View: Northwest view

Comments: Drain in DW1 south of Building 8503, site DW1-009.



The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Drainageway 1

Photo Number: DW1-c

View: North view

Comments: Overview of DW1 looking north.

The Environmental Company, Inc.

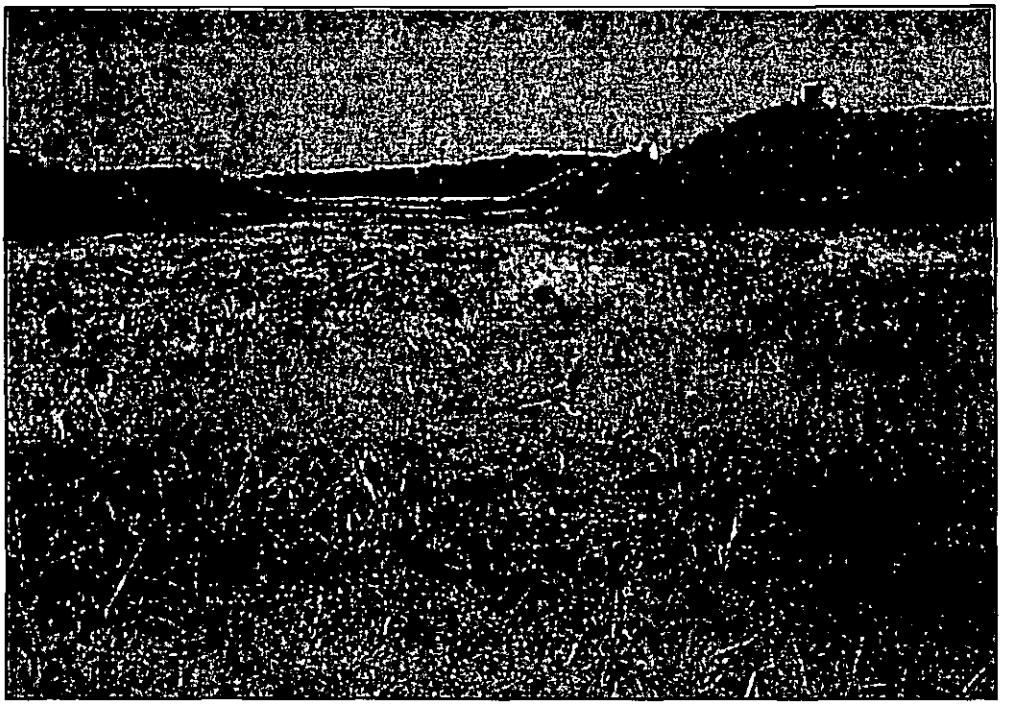
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 2

Photo Number: DW2-a

View: East view

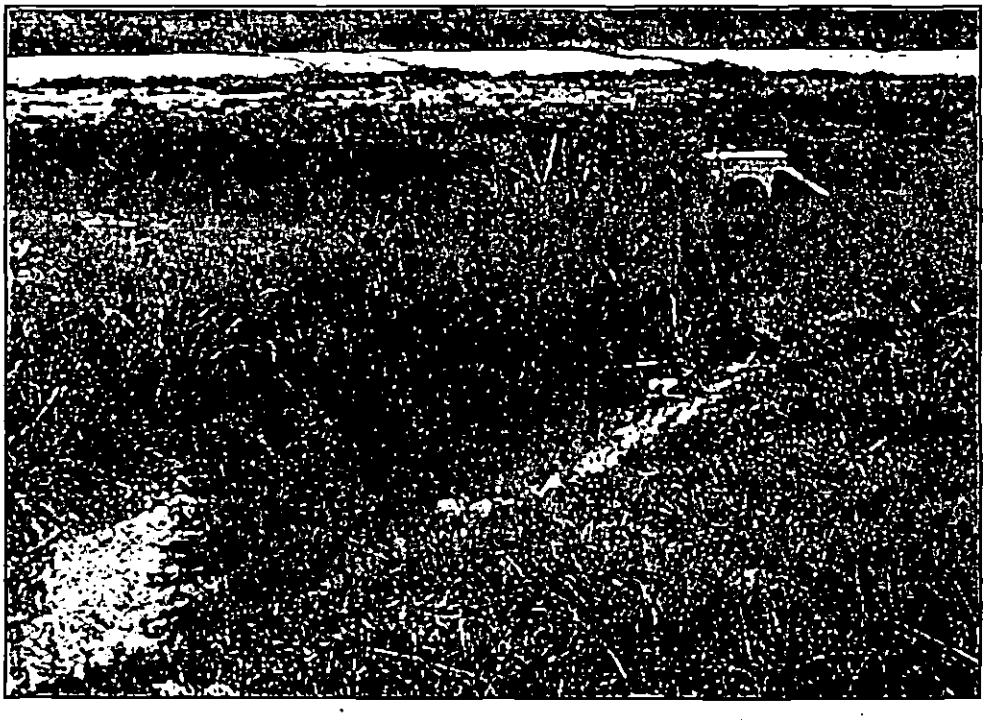
Comments: Overview of DW2 between bunkers.

Site: Drainageway 2

Photo Number: DW2-b

View: Southeast view

Comments: Overview of DW2 and drain leading to DW5.



The Environmental Company, Inc.

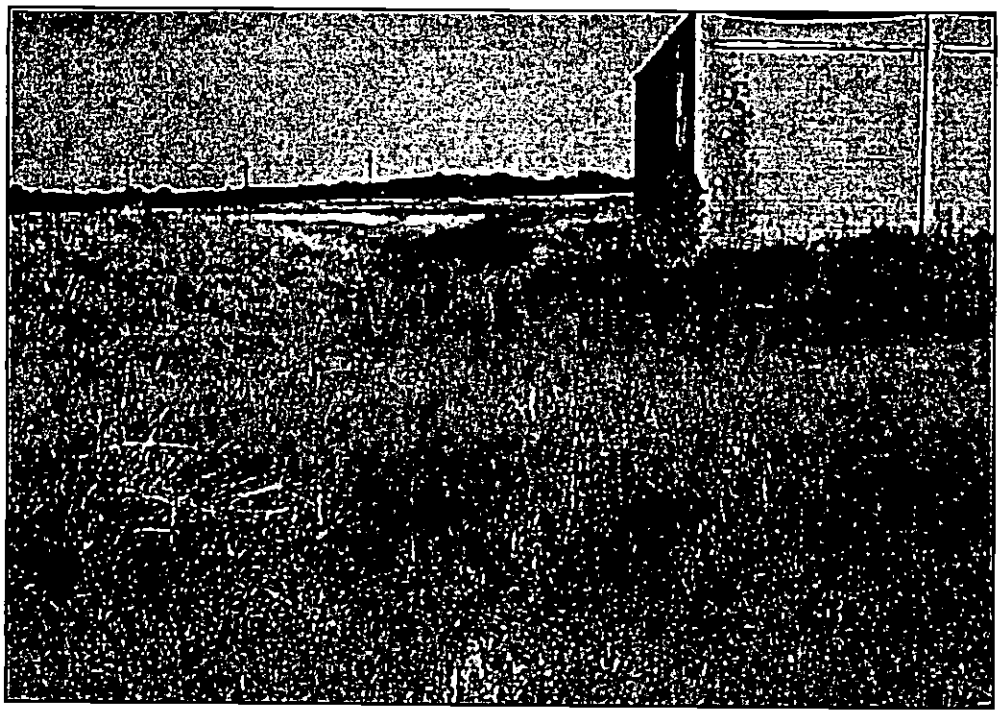
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 3

Photo Number: DW3-a

View: East view

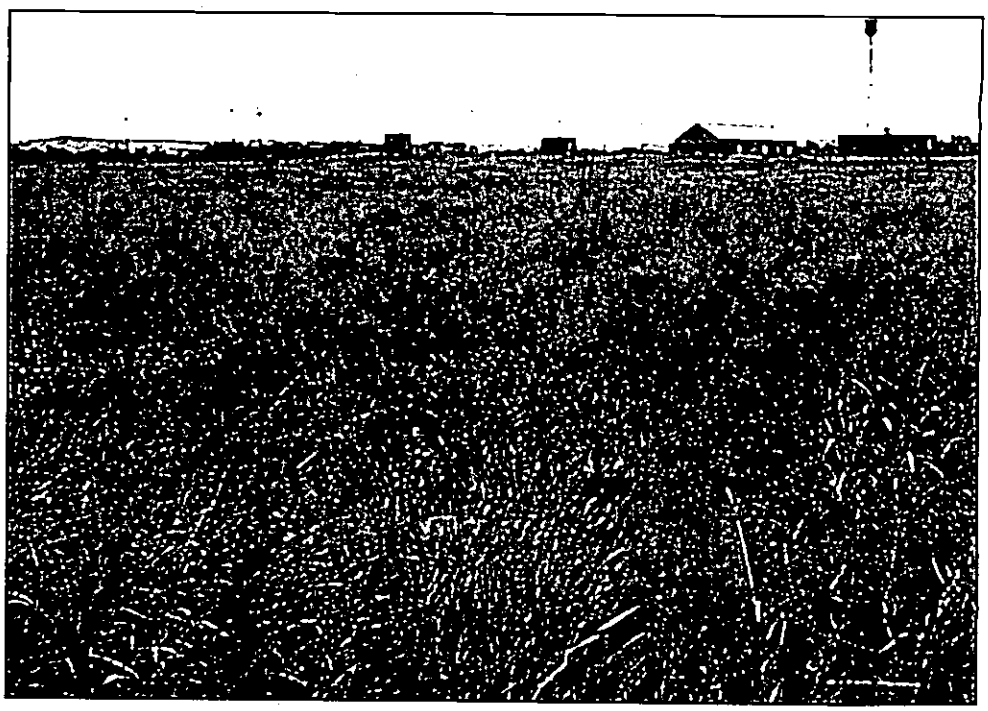
Comments: Overview of DW3.

Site: Drainageway 3

Photo Number: DW3-b

View: Southwest view

Comments: Overview of DW3.



The Environmental Company, Inc.

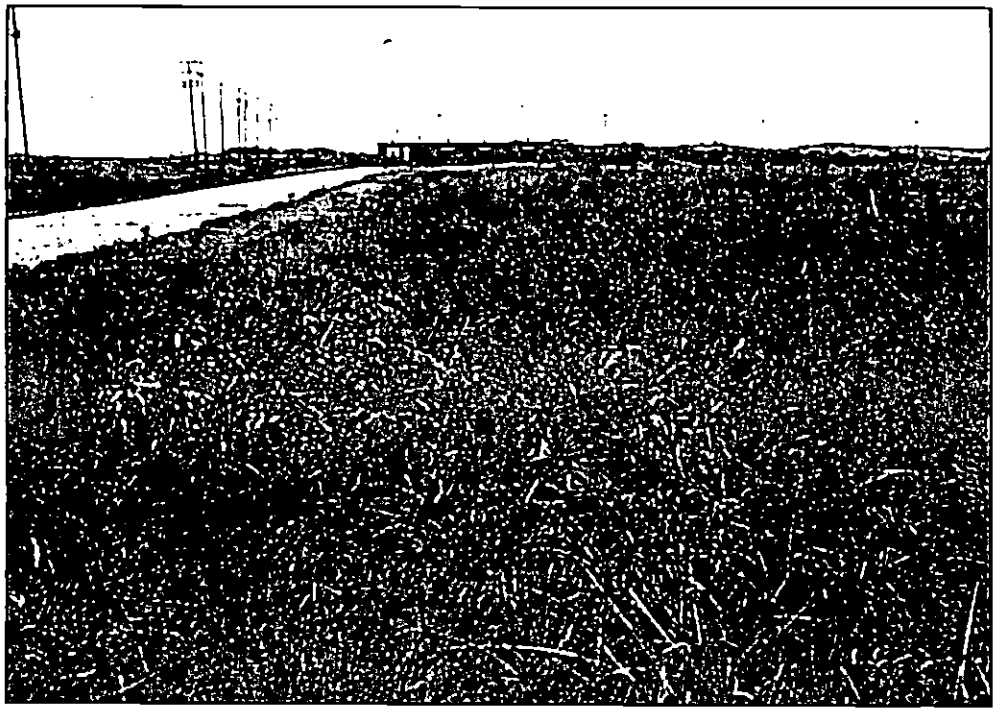
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 4

Photo Number: DW4-a

View: South view

Comments: Overview of DW4 looking toward Building 8514.

The Environmental Company, Inc.

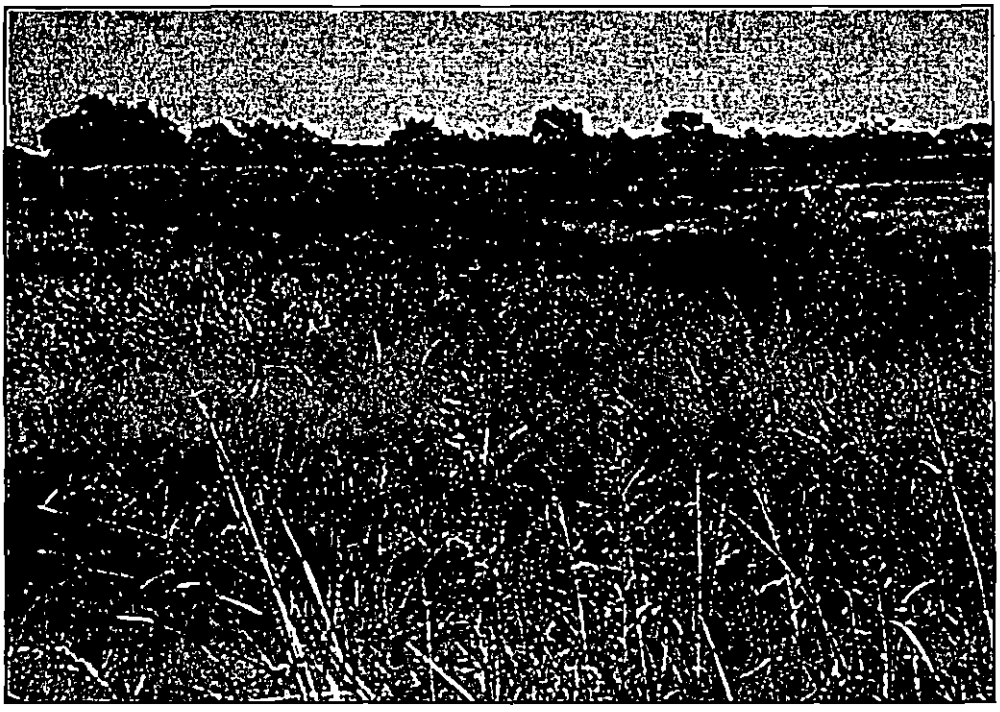
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 5

Photo Number: DW5-a

View: East view

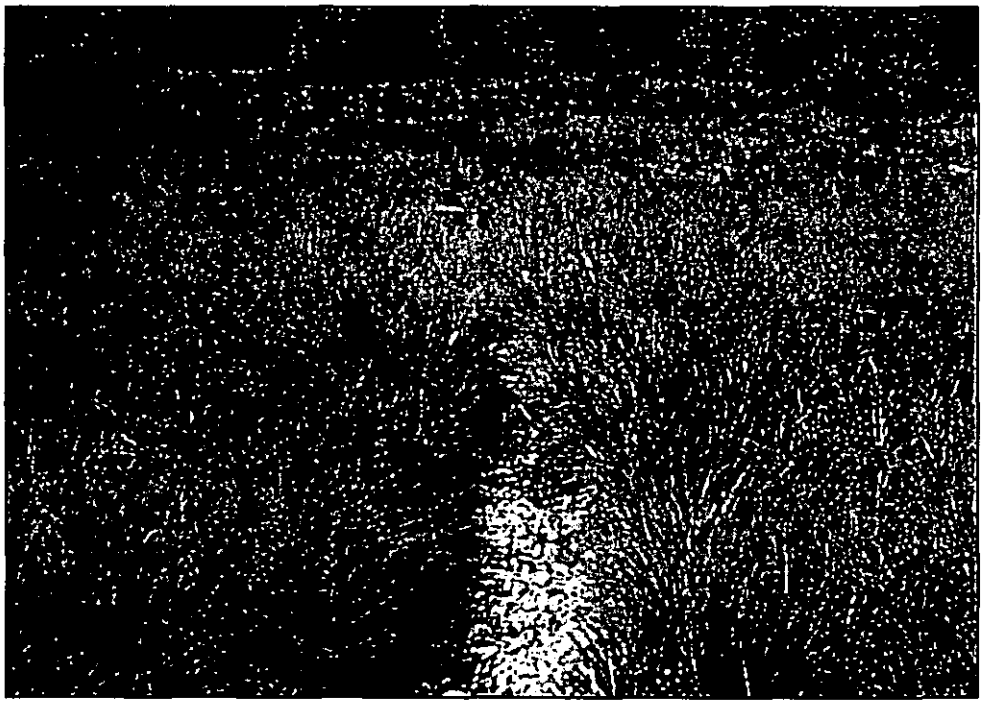
Comments: Overview of D5.

Site: Drainageway 5

Photo Number: DW5-b

View: Northwest view

Comments: View of DW5 outside east fence of the WSA.



The Environmental Company, Inc.

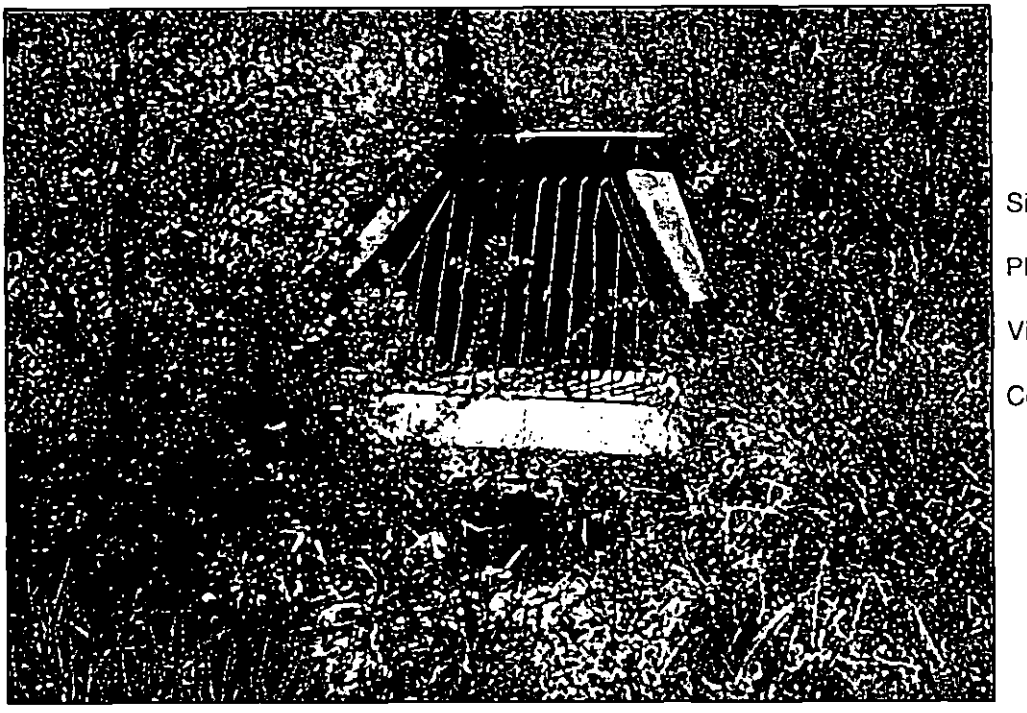
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 5

Photo Number: DW5-c

View: West view

Comments: Drain for DW5 outside east fence.

198 500

The Environmental Company, Inc.

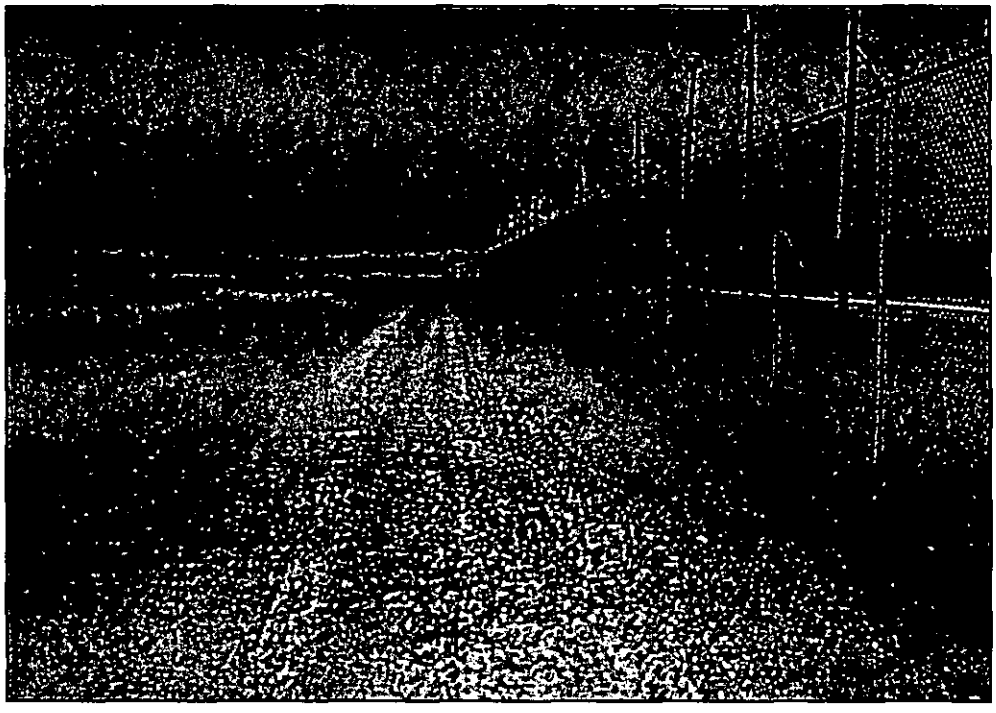
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 6

Photo Number: DW6-a

View: East view

Comments: View of DW6 outside north fence of WSA.

The Environmental Company, Inc.

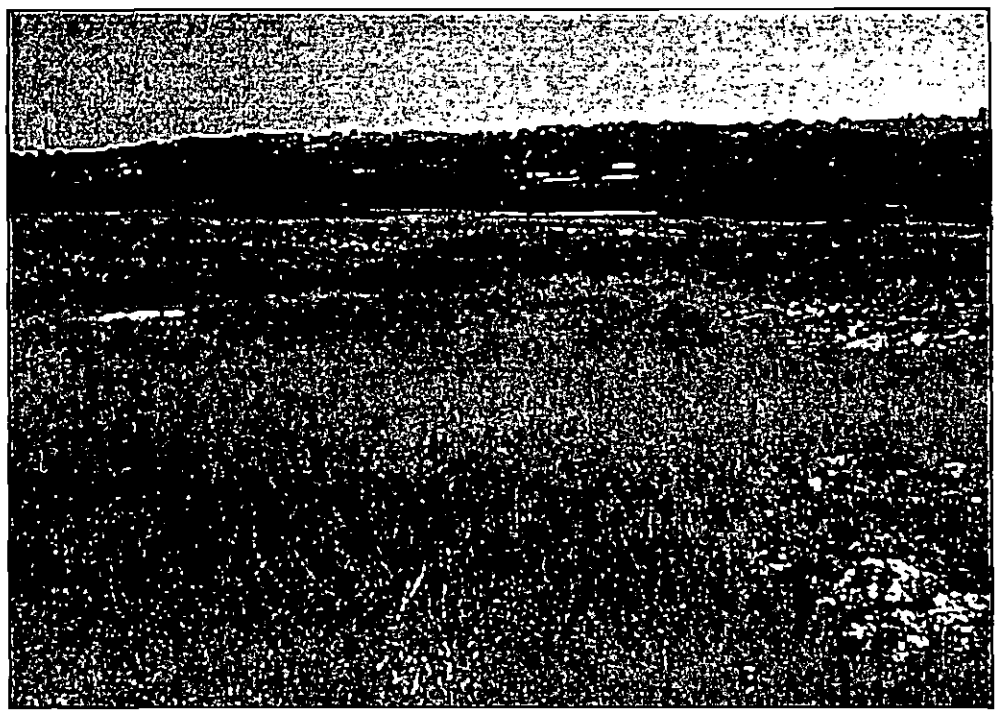
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 8

Photo Number: DW8-a

View: Southeast view

Comments: View of DW8 south of EOD Range.

The Environmental Company, Inc.

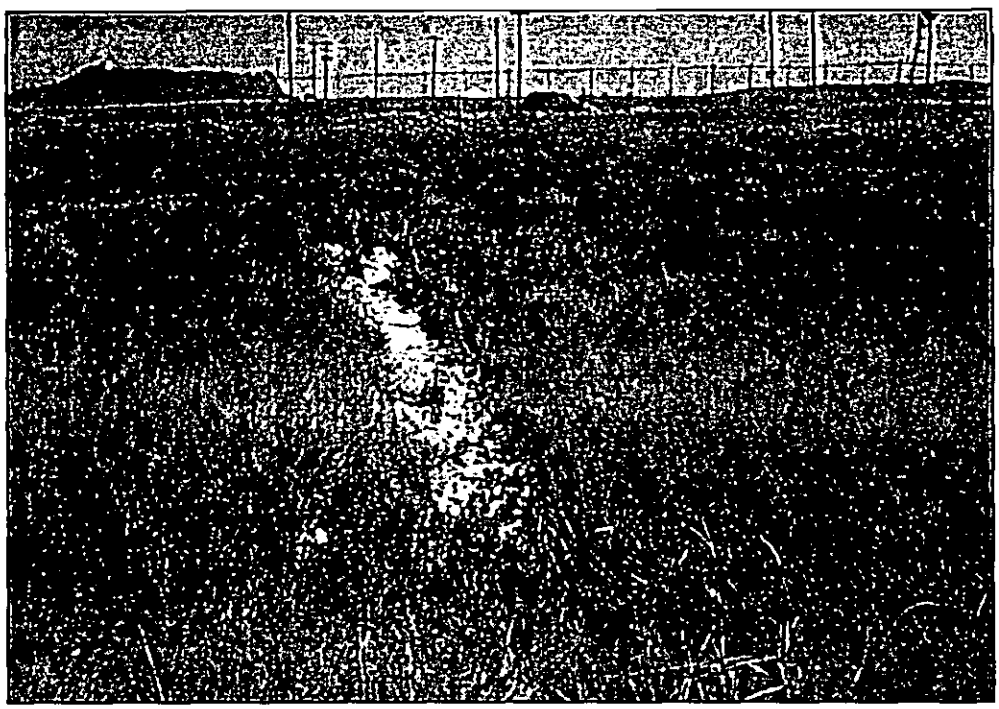
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 9

Photo Number: DW9-a

View: West view

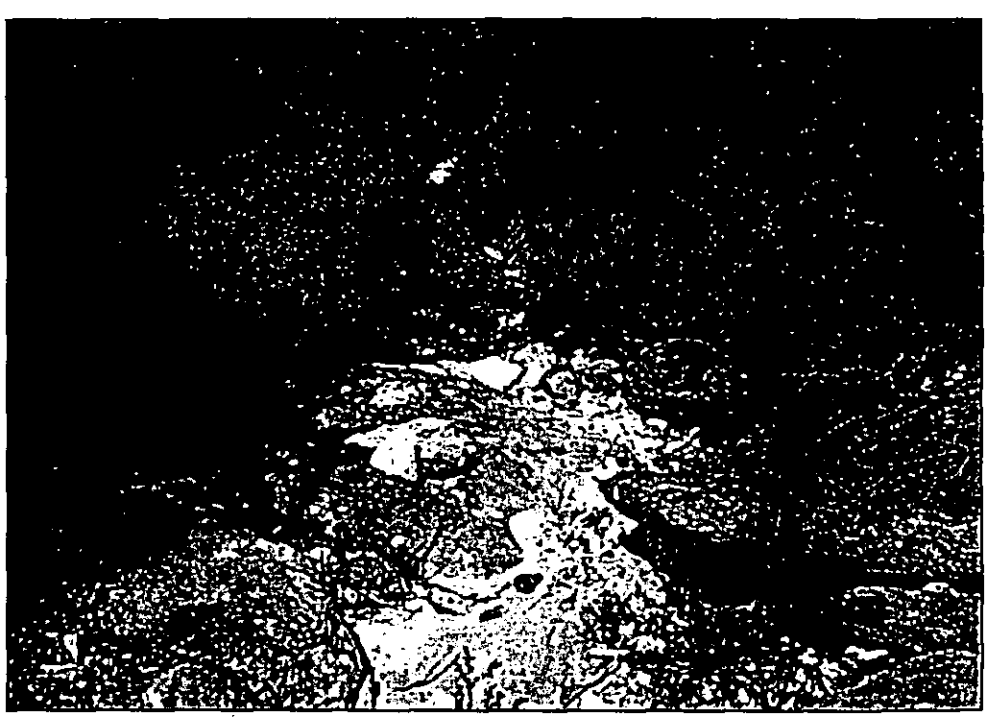
Comments: View of DW9 on north end of EOD Range.

Site: Drainageway 9

Photo Number: DW9-b

View: North view

Comments: View of DW9 outside north fence of WSA.



The Environmental Company, Inc.

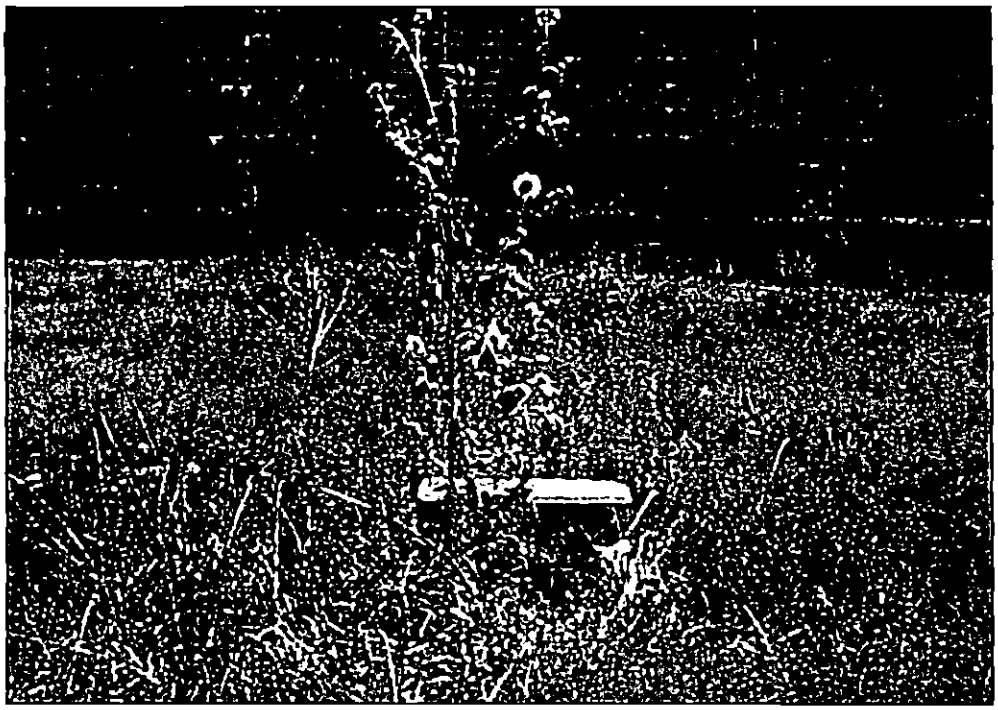
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Drainageway 3

Photo Number: DW3-c

View: South view

Comments: Drain on north side of Building 8505.

The Environmental Company, Inc.

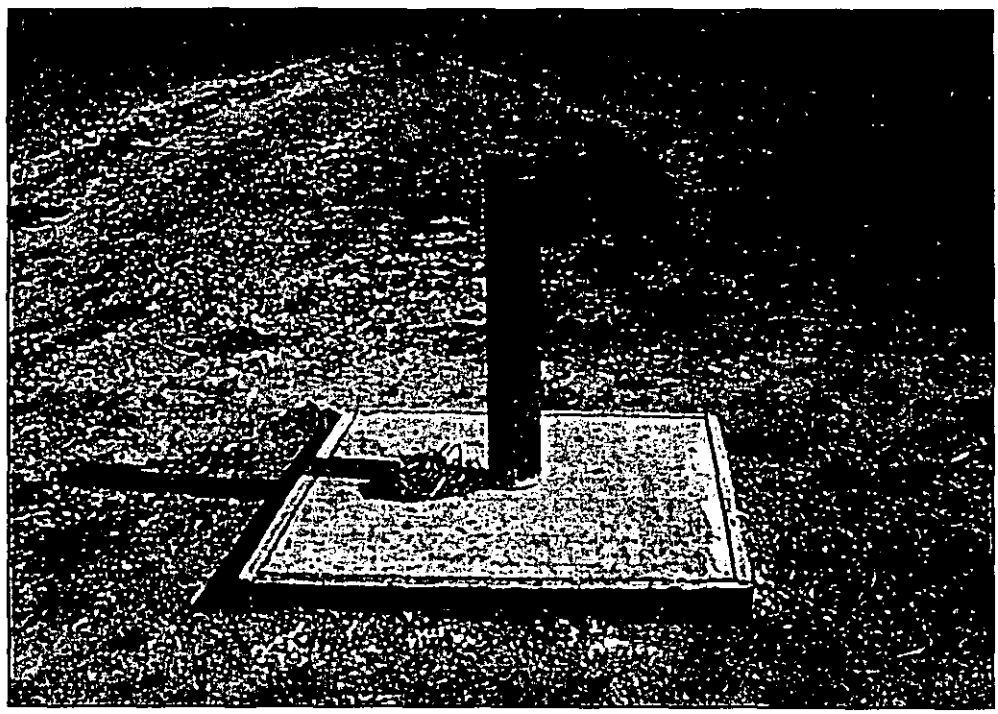
WSA Photographic Record

Client: AFCEE

Location: Fort Worth Texas

Job Number: 3109

Date: August 1997



Site: Mon tor ng We

Photo Number WJEPX925-a

View: North v ew

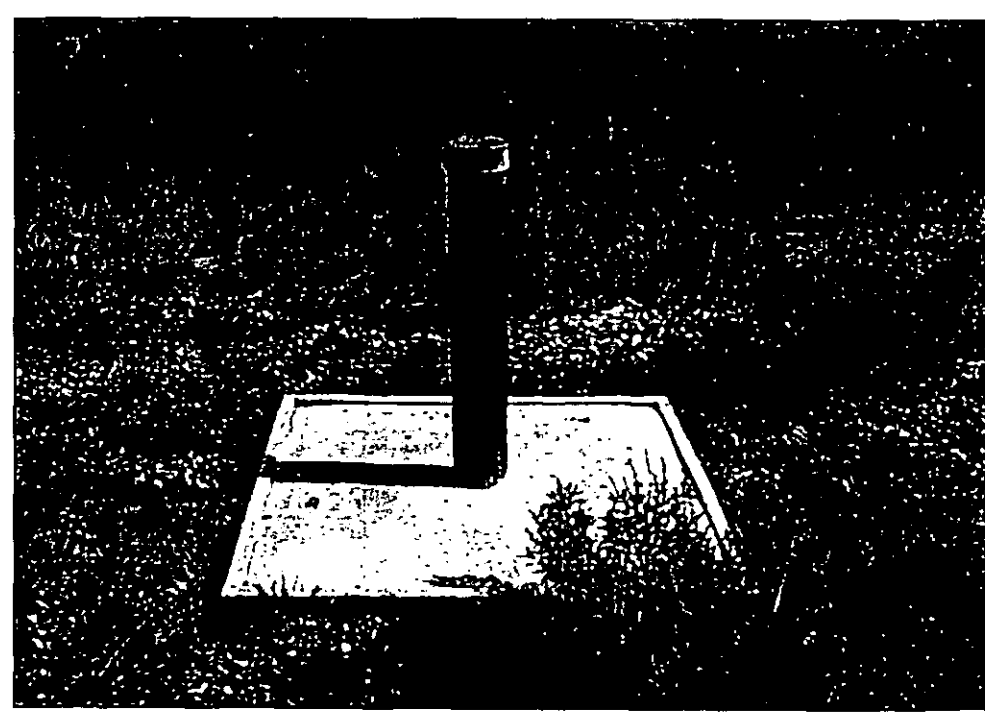
Comments V ew of mon tor ng we west of EOD Range

Site: Monitoring Well

Photo Number: WJEPX926-a

View: North view

Comments: View of monitoring well northwest of EOD Range.



The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Monitoring Well

Photo Number: XU3212-902-a

View: Outside window

Comments: View of WSA main water supply well looking through window of Building 8504.

The Environmental Company, Inc.

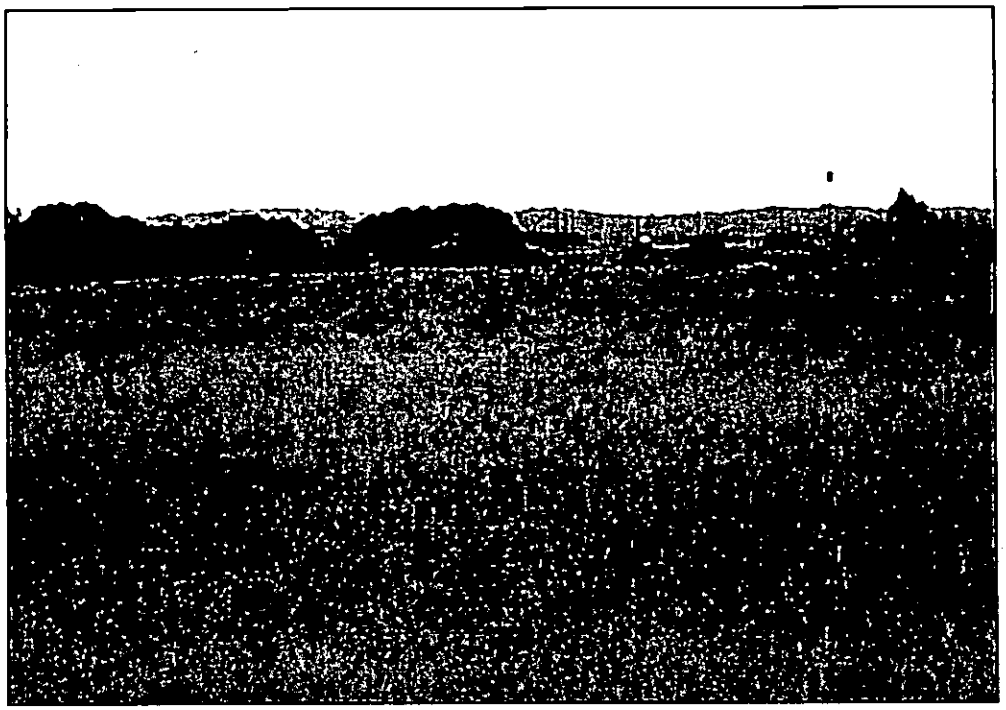
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Background

Photo Number: BK-a

View: Southeast view

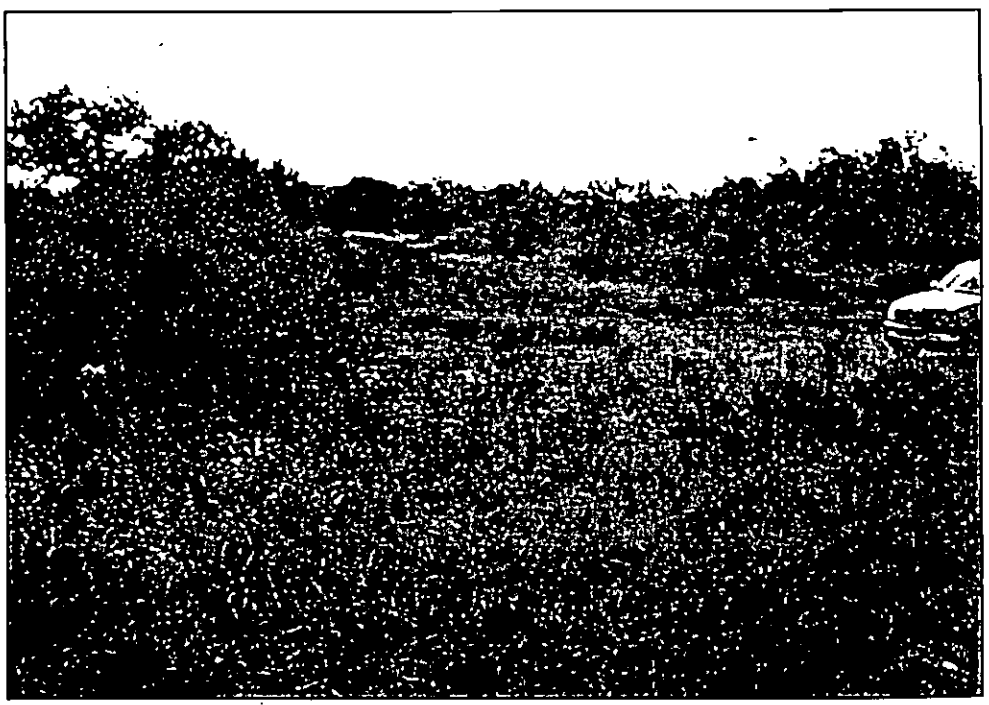
Comments: View of background taken from northwest of EOD Range.

Site: Background

Photo Number: BK-b

View: East view

Comments: Overview of background area northwest of WSA containing sample locations BK-003 and BK-004.



The Environmental Company, Inc.

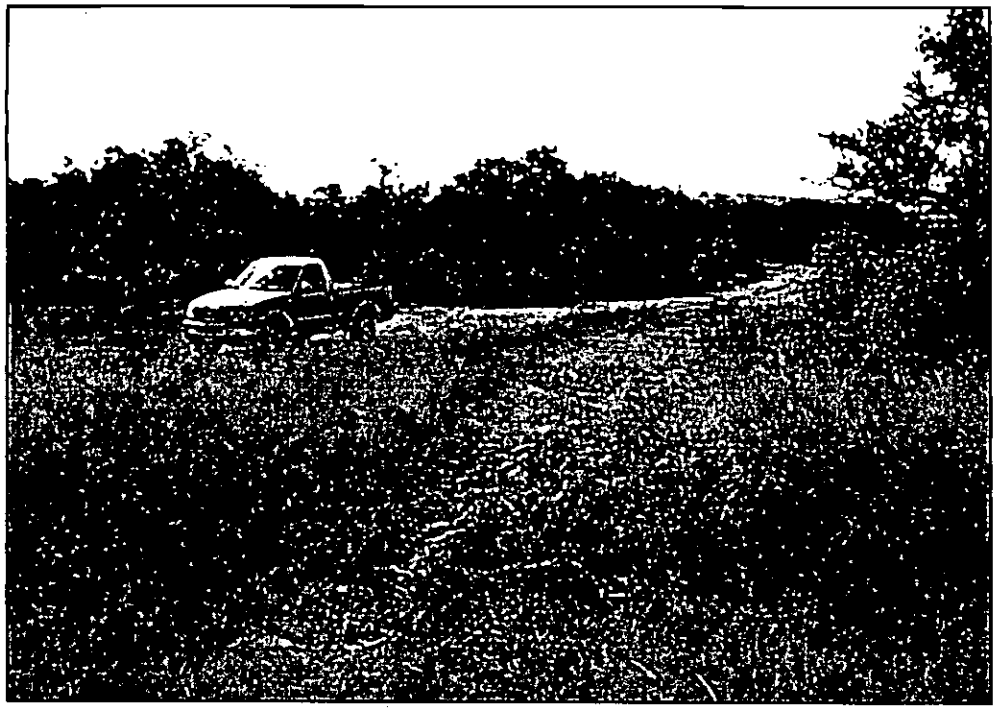
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Background

Photo Number: BK-c

View: Southeast view

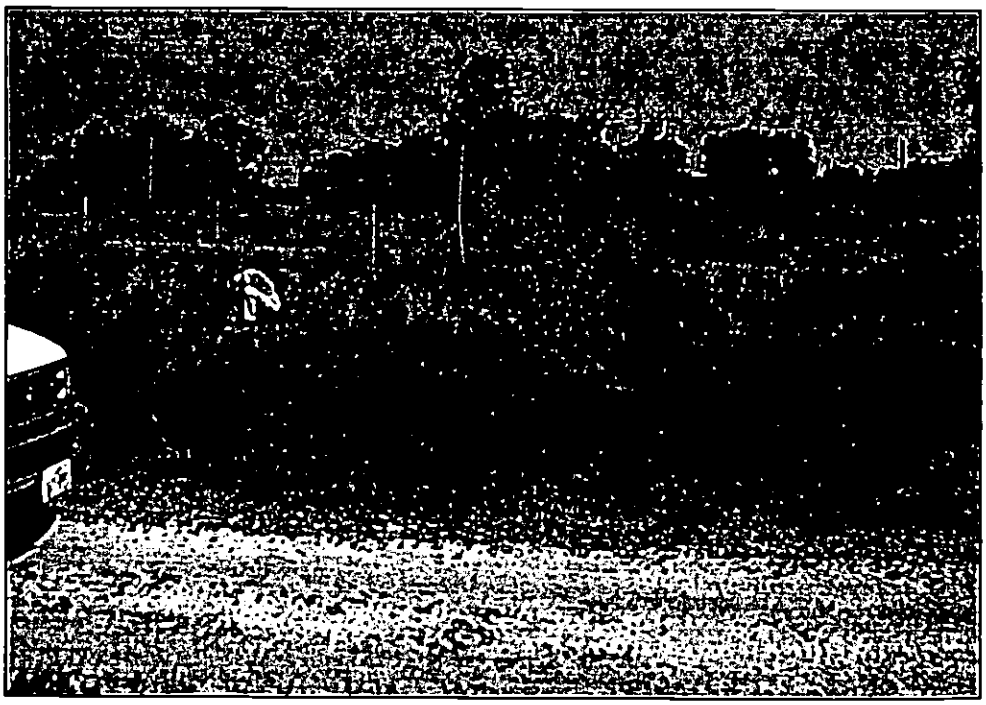
Comments: View of background area northwest of WSA containing sample locations BK-003 and BK-004.

Site: Background

Photo Number: BK-d

View: North view

Comments: Overview of northernmost background area north of WSA containing sample location BK-005.



The Environmental Company, Inc.

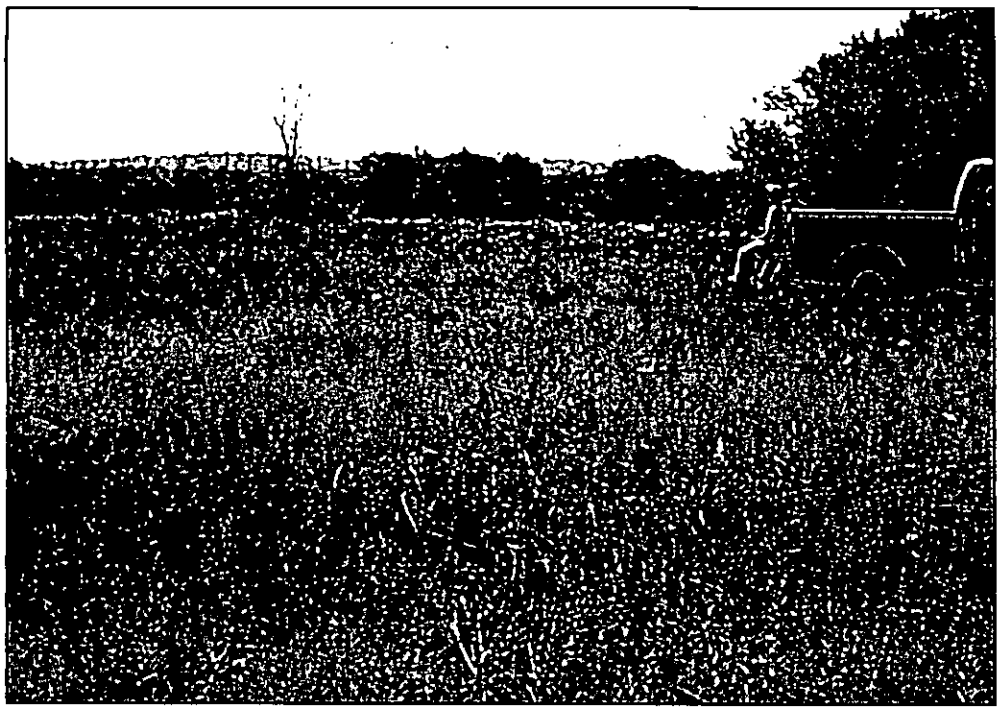
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997



Site: Background

Photo Number: BK-e

View: Southeast view

Comments: Overview of background area northwest of WSA containing sample location BK-006.

The Environmental Company, Inc.

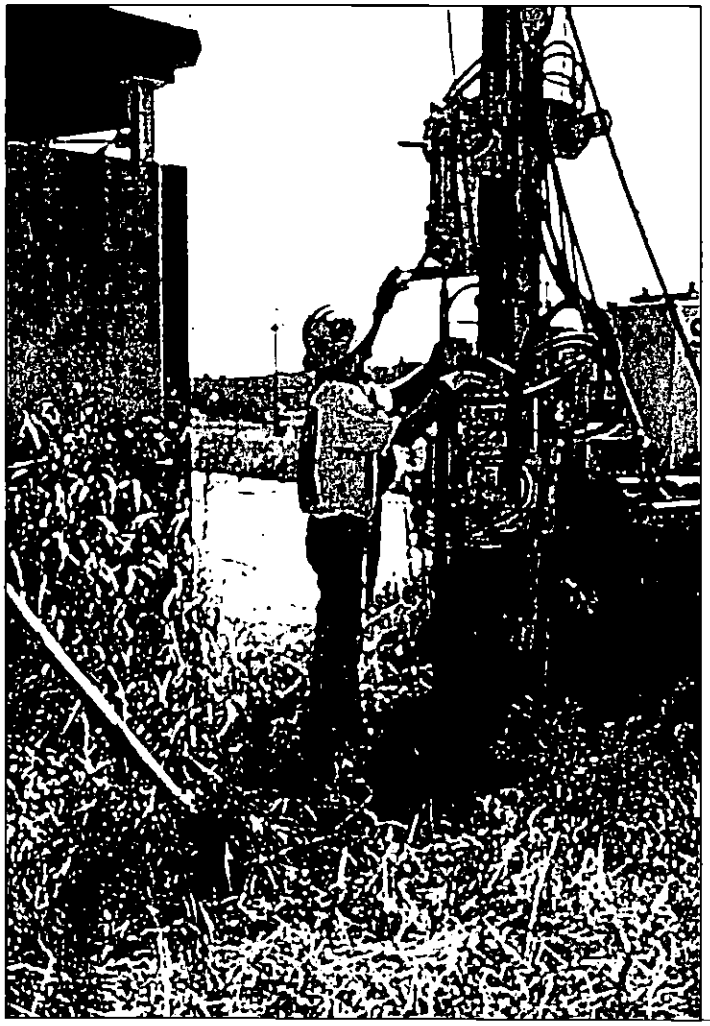
WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

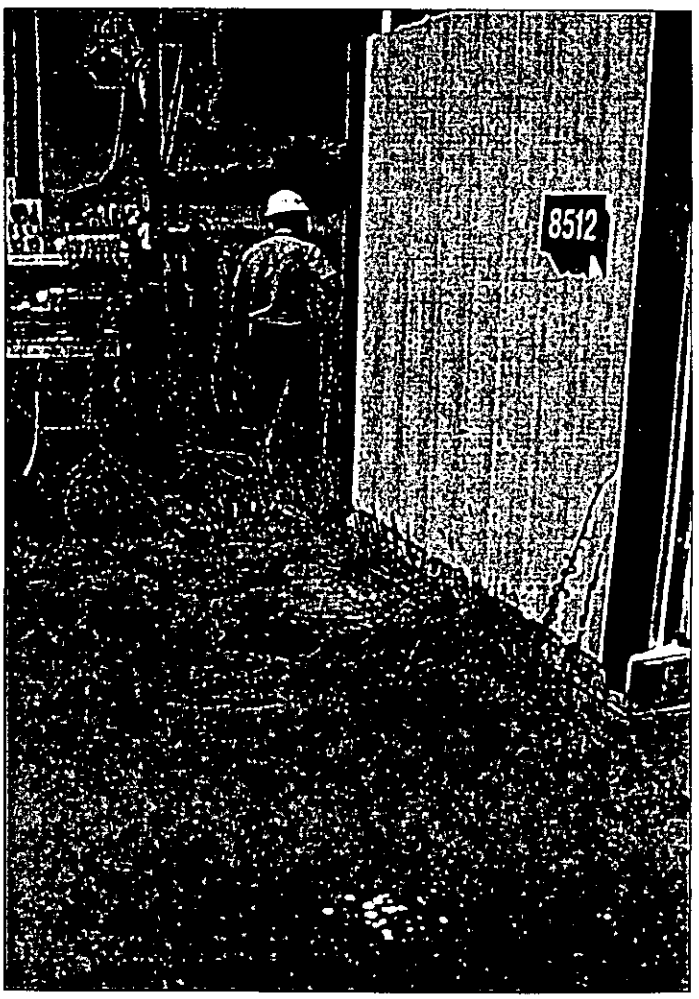


Site: Hazardous Waste Accumulation Point

Photo Number: SA-a

View: Southeast view

Comments: View of drilling operation behind Hazardous Waste Accumulation Point.



Site: Hazardous Waste Accumulation Point

Photo Number: SA-b

View: West view

Comments: View of drilling operation behind Hazardous Waste Accumulation Point.

498 510

The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Sampling/Decon Area

Photo Number: SA-c

View: Sampling Table

Comments: Example of sampling operation.

Site: Sampling/Decon Area

Photo Number: SA-d

View: Sampling Table

Comments: Example of sampling operation.

The Environmental Company, Inc.

WSA Photographic Record

Client: AFCEE

Location: Fort Worth, Texas

Job Number: 3109

Date: August 1997

Site: Contractor Trailer

Photo Number: SA-e

View: North view

Comments: The mighty sampling crew.

498 512

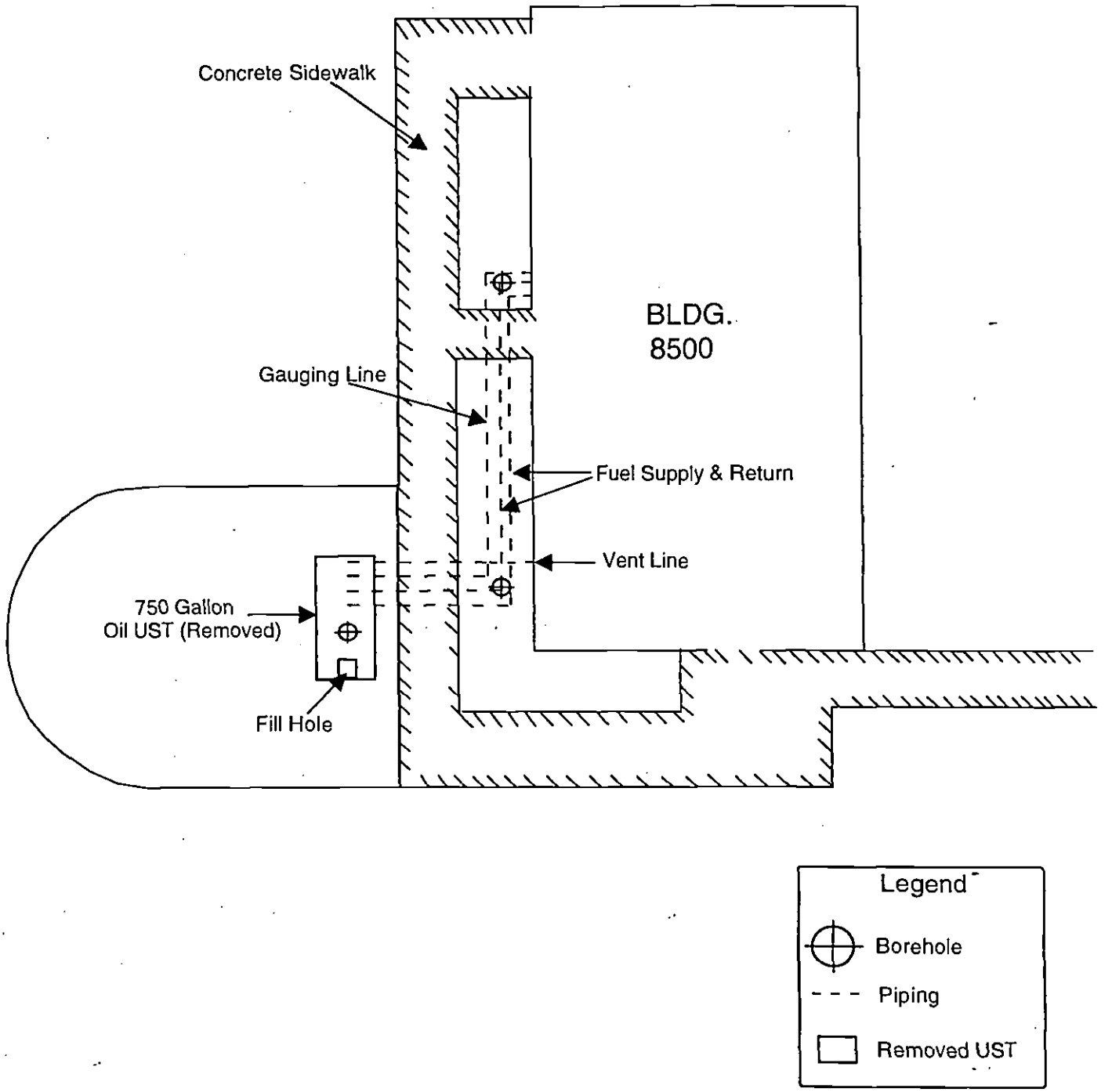
TAB

B

198 513

APPENDIX B

UNDERGROUND STORAGE TANK LOCATION DIAGRAMS



Date	January 1998
Project Manager	B. Duffner
Prepared by	AMM
Project No.	3109-071

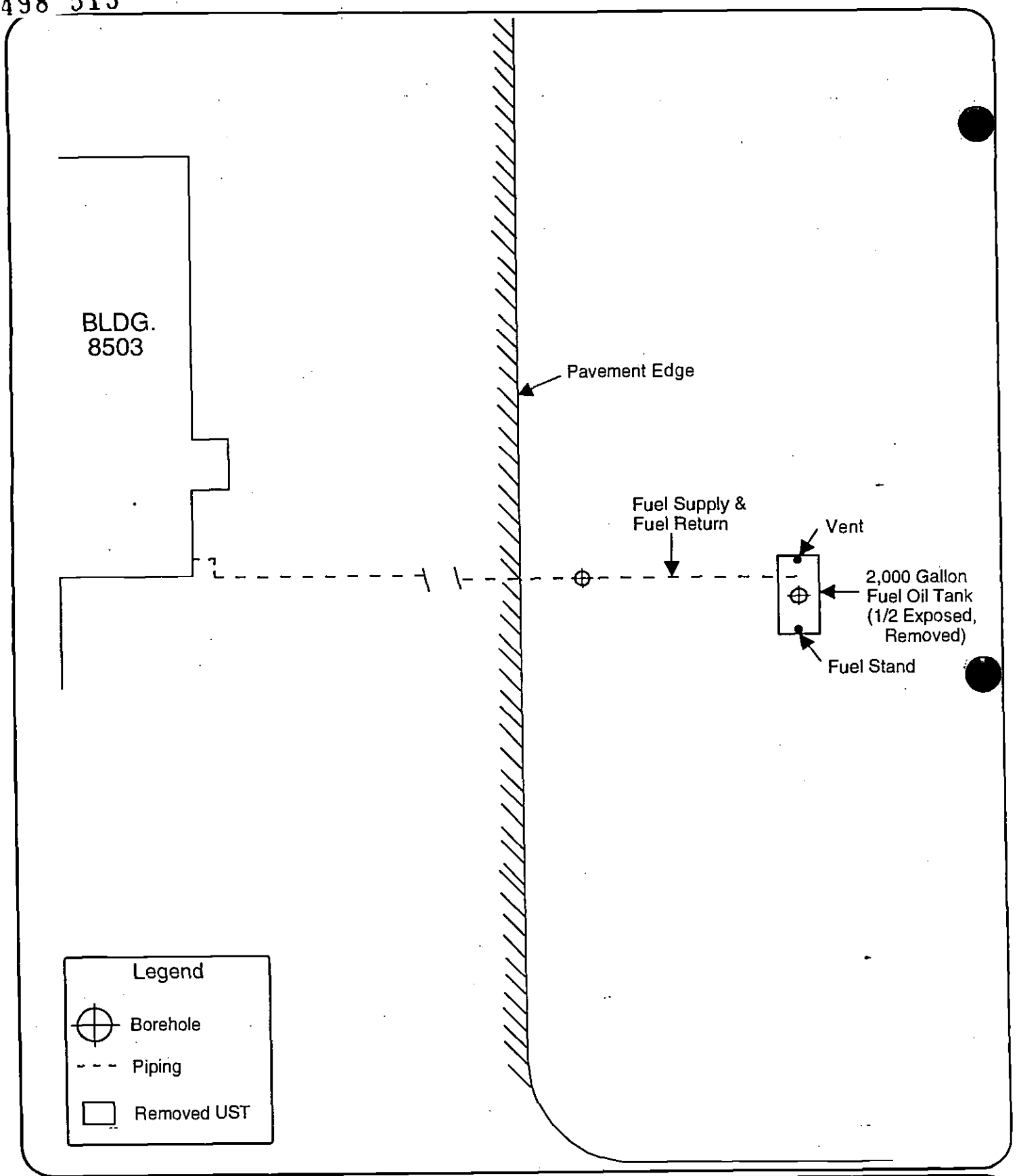
The Environmental Company, Inc.

N

1 inch = 10 feet

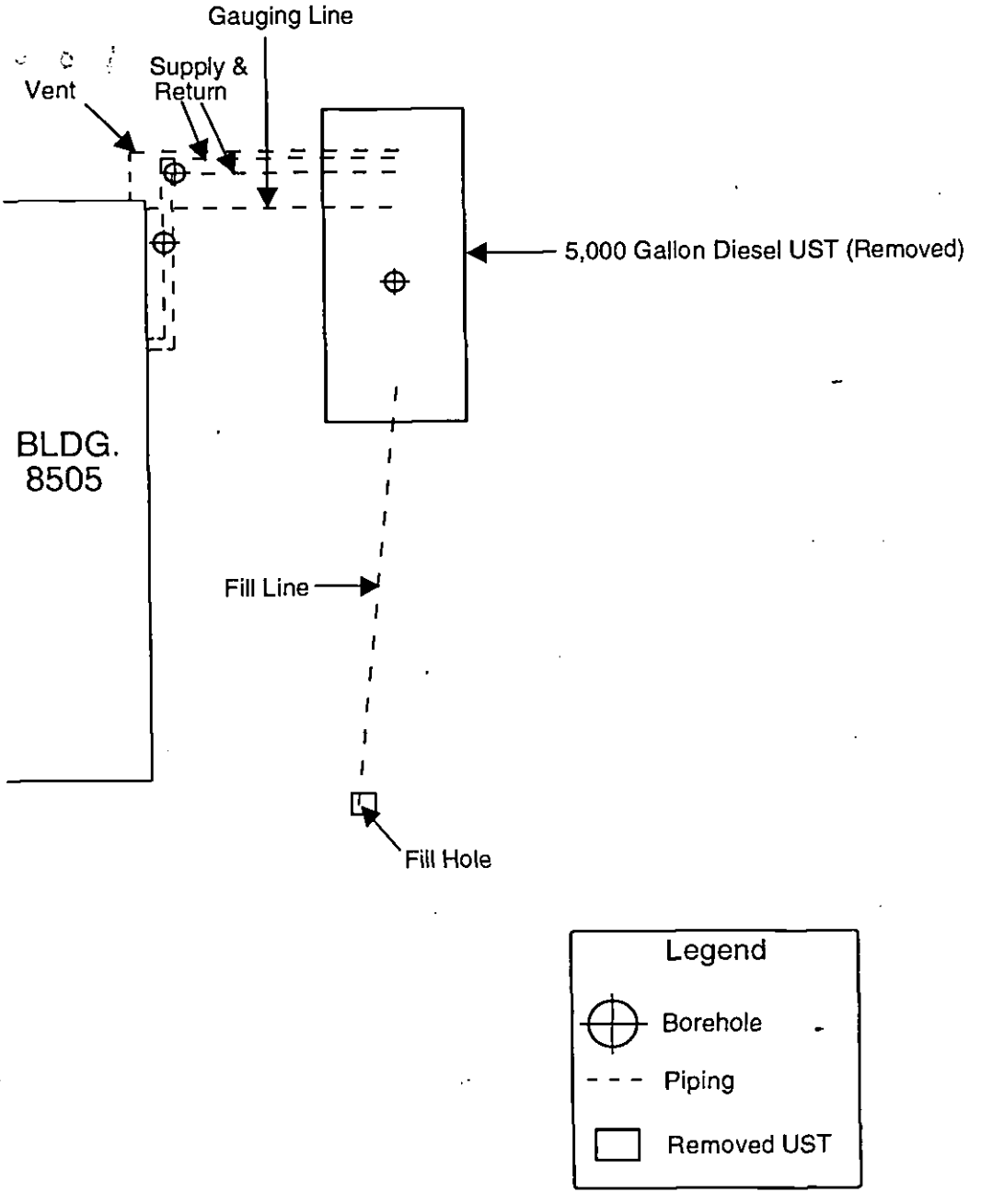
Building 8500
UST Borehole Locations

498 515



Date: January 1998	Project No.: 3109-071	N	1 inch = 20 feet
Project Manager: B. Duffner	The Environmental Company, Inc.		
Prepared by: AMM			

Building 8503
UST Borehole Locations



Date
January 1998

Project No.
3109-071

Project Manager
B. Duffner

Prepared by
AMM

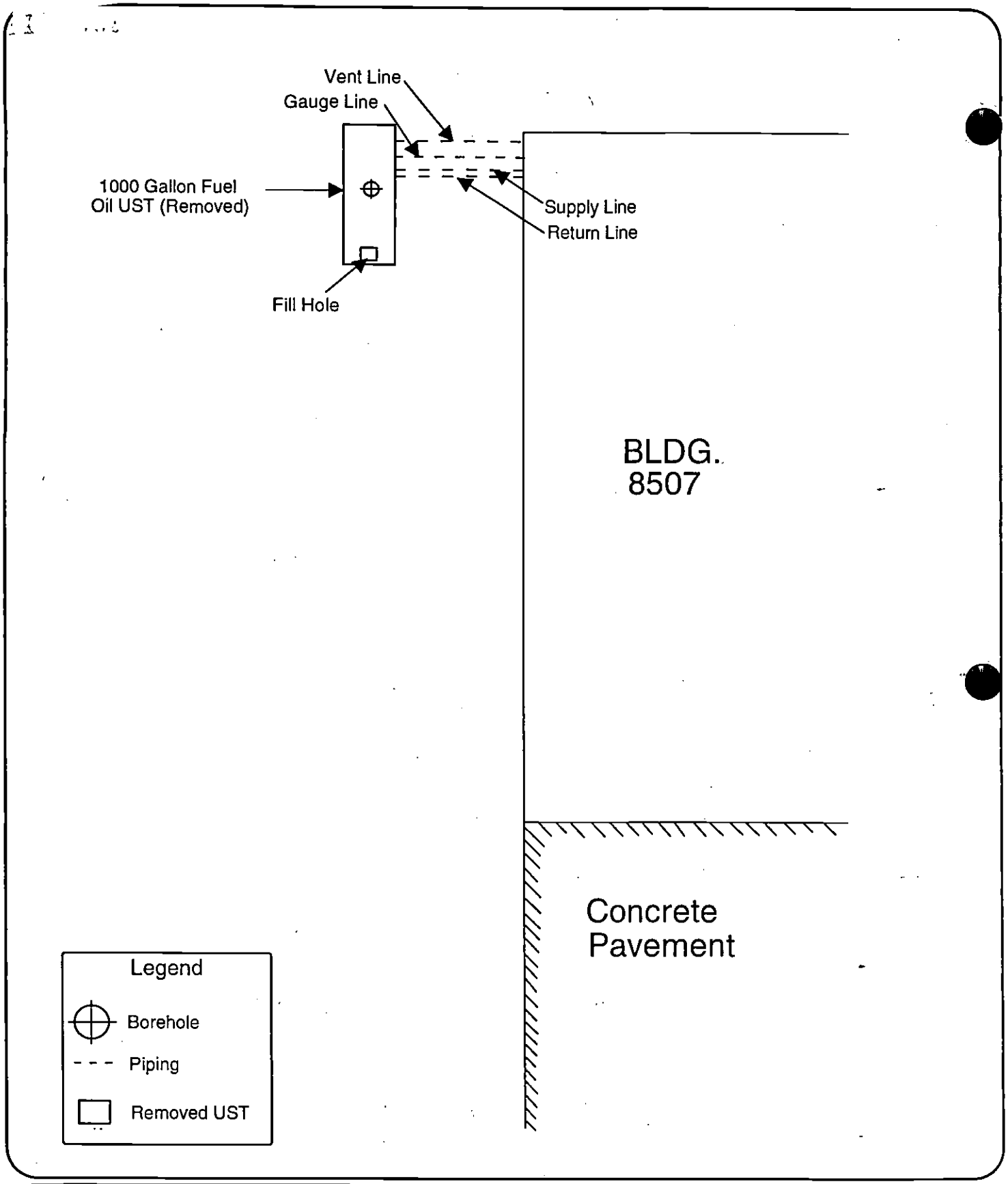
The Environmental Company, Inc.

N

1 inch = 10 feet

Building 8505
UST Borehole Locations

498-517



Date
January 1998

Project No.
3109-071

Project Manager
B. Duffner

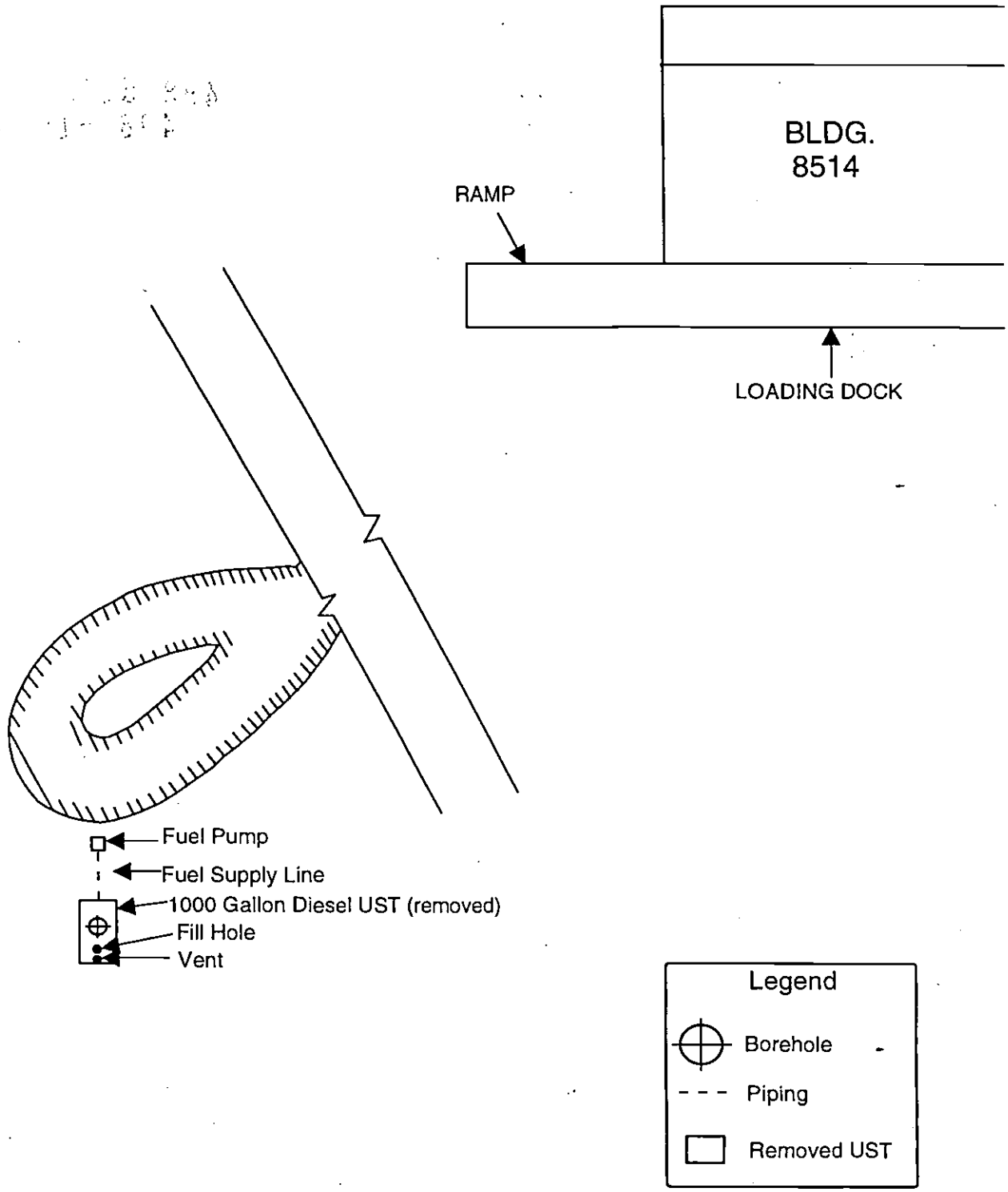
Prepared by
AMM

The Environmental Company, Inc.

N

1 inch = 10 feet

Building 8507
UST Borehole Locations



Date	January 1998
Project No.	3109-071
Project Manager	B. Duffner
Prepared by	AMM

The Environmental Company, Inc.

N

1 inch = 25 feet

Building 8514
UST Borehole Locations

498 519

TAB

C

498 520

APPENDIX C

SURVEYING DATA

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
A1-001	6,965,855.01	2,269,354.64	756.79
A1-002	6,965,855.73	2,269,434.51	754.97
A1-003	6,965,857.48	2,269,533.27	753.18
A1-004	6,965,856.88	2,269,634.64	751.15
A1-005	6,965,859.26	2,269,732.85	749.18
A1-006	6,965,829.87	2,269,317.96	757.97
A1-007	6,965,835.57	2,269,333.42	756.82
A1-008	6,965,835.46	2,269,433.26	754.83
A1-009	6,965,836.48	2,269,532.35	752.61
A1-010	6,965,836.37	2,269,635.18	750.72
A1-011	6,965,838.22	2,269,734.64	748.07
A1-012	6,965,837.60	2,269,828.82	746.88
A1-013	6,965,733.77	2,269,311.84	759.56
A1-014	6,965,733.75	2,269,335.83	759.07
A1-015	6,965,735.52	2,269,435.24	757.28
A1-016	6,965,736.26	2,269,535.01	754.60
A1-017	6,965,737.74	2,269,633.91	752.07
A1-018	6,965,739.35	2,269,734.54	749.04
A1-019	6,965,632.59	2,269,314.62	759.27
A1-020	6,965,633.83	2,269,336.42	758.90
A1-021	6,965,634.35	2,269,436.14	756.93
A1-022	6,965,637.59	2,269,536.71	755.37
A1-023	6,965,637.26	2,269,635.16	752.52
A1-024	6,965,534.40	2,269,315.74	758.48
A1-025	6,965,534.64	2,269,334.62	756.67
A1-026	6,965,536.73	2,269,435.67	755.72
A1-027	6,965,537.23	2,269,535.19	753.88
A1-028	6,965,435.64	2,269,437.09	752.03
A1-029	6,965,885.17	2,269,361.80	756.55
A1-030	6,965,906.36	2,269,359.83	755.74
A1-031	6,965,899.89	2,269,333.00	756.73
A1-032	6,965,925.86	2,269,313.96	756.49
A1-033	6,965,886.13	2,269,284.59	757.31
A1-034	6,965,833.64	2,269,285.41	758.29
A1-100	6,965,632.60	2,269,314.62	759.27
A1-101	6,965,612.59	2,269,314.62	759.27
A1-102	6,965,652.59	2,269,314.62	759.27
A1-103	6,965,622.59	2,269,324.62	759.77
A1-104	6,965,642.59	2,269,324.62	759.77
A1-110	6,965,435.44	2,269,437.09	752.03
A1-111	6,965,445.64	2,269,437.09	752.03
A1-112	6,965,435.64	2,269,447.09	752.03
A1-113	6,965,425.64	2,269,437.09	752.03
A1-114	6,965,435.64	2,269,427.09	752.03
A2-001	6,966,360.64	2,269,738.32	742.43

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
A2-002	6,966,362.59	2,269,772.61	742.66
A2-003	6,966,363.13	2,269,961.85	741.17
A2-004	6,966,363.11	2,269,997.58	740.96
A2-005	6,966,363.74	2,270,178.89	739.10
A2-006	6,966,367.18	2,270,211.01	738.94
A2-007	6,966,368.84	2,270,390.29	737.37
A2-008	6,966,366.78	2,270,426.54	737.16
A3-001	6,965,458.58	2,269,264.30	757.22
A3-002	6,965,458.17	2,269,227.00	756.84
A3-003	6,965,457.41	2,269,157.27	756.29
A3-004	6,965,447.94	2,269,114.87	756.10
A3-005	6,965,398.49	2,269,107.43	756.61
A3-006	6,965,352.57	2,269,109.10	756.49
A3-007	6,965,302.80	2,269,108.73	756.73
A3-008	6,965,260.96	2,269,106.00	756.52
A3-009	6,965,253.75	2,269,105.35	756.40
A3-010	6,965,248.92	2,269,109.38	756.40
A3-011	6,965,228.09	2,269,116.39	756.31
A3-012	6,965,220.46	2,269,166.92	756.00
A3-013	6,965,219.14	2,269,220.92	755.90
A3-014	6,965,219.89	2,269,269.93	755.06
A3-015	6,965,353.04	2,269,100.72	755.70
A3-016	6,965,303.10	2,269,100.58	756.22
A3-017	6,965,254.03	2,269,097.45	755.91
A3-018	6,965,248.58	2,269,115.49	756.78
A3-019	6,965,248.36	2,269,122.92	756.80
A3-020	6,965,274.36	2,269,115.24	756.78
A3-021	6,965,274.56	2,269,121.06	756.84
A3-024	6,965,280.76	2,269,080.85	755.60
A3-025	6,965,236.95	2,269,080.69	754.94
A3-100	6,965,468.58	2,269,264.30	757.22
A3-101	6,965,468.17	2,269,227.00	756.84
A3-102	6,965,467.41	2,269,157.27	756.29
A3-103	6,965,457.94	2,269,111.87	756.10
A3-104	6,965,218.09	2,269,116.39	755.31
A3-105	6,965,210.46	2,269,166.92	755.00
A3-106	6,965,209.14	2,269,220.92	754.90
A3-107	6,965,209.89	2,269,269.93	754.06
A3-110	6,965,483.17	2,269,192.27	760.00
A3-111	6,965,468.00	2,269,100.00	760.00
A3-112	6,965,398.49	2,269,082.43	760.00
A3-113	6,965,352.57	2,269,084.10	760.00
A3-114	6,965,483.17	2,269,192.00	760.00
A3-115	6,965,194.00	2,269,244.50	753.50
A3-120	6,965,351.57	2,269,109.10	756.49

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
A3-121	6,965,361.57	2,269,109.10	756.49
A3-122	6,965,342.57	2,269,109.10	756.49
A3-123	6,965,353.04	2,269,095.72	756.49
A3-130	6,965,243.36	2,269,122.92	756.80
A3-131	6,965,248.36	2,269,129.92	756.80
A3-132	6,965,274.36	2,269,120.24	756.78
A3-133	6,965,274.36	2,269,110.24	756.78
A4-001	6,964,909.31	2,270,421.75	738.20
A4-002	6,964,909.84	2,270,417.52	738.23
A4-003	6,964,917.16	2,270,423.25	738.22
A4-004	6,964,916.41	2,270,417.12	738.22
A5-001	6,964,878.55	2,271,214.55	743.05
A5-002	6,964,974.71	2,271,213.01	743.17
A5-003	6,964,906.50	2,271,140.14	741.98
A5-004	6,964,982.87	2,271,152.82	743.57
BD-001	6,965,915.75	2,269,425.86	755.27
BD-002	6,965,916.49	2,269,451.42	754.85
BD-003	6,965,918.05	2,269,640.59	750.97
BD-004	6,965,918.02	2,269,665.87	750.78
BD-005	6,965,920.24	2,269,853.39	746.74
BD-006	6,965,920.13	2,269,879.25	746.31
BD-007	6,965,921.99	2,270,067.35	742.24
BD-008	6,965,922.15	2,270,093.23	741.69
BD-009	6,965,924.11	2,270,281.57	738.05
BD-010	6,965,924.19	2,270,306.86	737.57
BD-011	6,965,925.89	2,270,495.34	733.46
BD-012	6,965,926.46	2,270,521.01	733.53
BD-013	6,966,278.41	2,270,636.22	735.23
BD-014	6,966,278.36	2,270,610.55	735.14
BD-015	6,966,276.87	2,270,421.76	737.64
BD-016	6,966,275.95	2,270,396.49	737.80
BD-017	6,966,274.74	2,270,207.99	739.52
BD-018	6,966,274.09	2,270,182.17	739.75
BD-019	6,966,272.18	2,269,994.08	741.40
BD-020	6,966,271.77	2,269,968.75	741.50
BD-021	6,966,270.06	2,269,769.05	743.01
BD-022	6,966,269.75	2,269,743.50	743.08
BD-100	6,965,916.49	2,269,451.00	754.85
BD-101	6,965,914.49	2,269,449.42	754.85
BD-102	6,965,923.24	2,269,853.39	746.74
BD-103	6,965,920.24	2,269,853.69	746.74
BD-104	6,965,916.49	2,269,455.00	746.74
BD-105	6,965,910.49	2,269,451.42	746.74
BD-106	6,965,902.80	2,269,377.68	755.87
BD-107	6,965,908.47	2,269,407.26	755.57

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
BD-108	6,965,909.21	2,269,469.63	754.75
BD-109	6,965,903.54	2,269,498.96	754.55
BD-110	6,965,905.02	2,269,592.64	751.67
BD-111	6,965,910.69	2,269,622.22	751.27
BD-112	6,965,910.69	2,269,684.09	750.38
BD-113	6,965,905.02	2,269,713.43	750.18
BD-114	6,965,907.24	2,269,805.37	747.74
BD-115	6,965,912.91	2,269,834.96	747.24
BD-116	6,965,912.66	2,269,897.57	746.01
BD-117	6,965,906.99	2,269,926.90	745.71
BD-118	6,965,908.96	2,270,019.34	742.84
BD-119	6,965,914.63	2,270,048.92	742.54
BD-120	6,965,914.63	2,270,111.54	741.49
BD-121	6,965,908.96	2,270,140.87	741.09
BD-122	6,965,910.93	2,270,233.56	739.05
BD-123	6,965,916.60	2,270,263.14	738.55
BD-124	6,965,916.85	2,270,325.01	737.17
BD-125	6,965,911.18	2,270,354.35	736.67
BD-126	6,965,912.91	2,270,447.28	734.36
BD-127	6,965,918.58	2,270,476.86	733.86
BD-128	6,965,919.07	2,270,539.23	733.33
BD-129	6,965,913.40	2,270,568.56	732.83
BD-130	6,966,283.41	2,269,695.43	743.78
BD-131	6,966,277.49	2,269,725.01	743.58
BD-132	6,966,277.74	2,269,787.38	742.51
BD-133	6,966,283.65	2,269,816.71	742.31
BD-134	6,966,285.38	2,269,920.74	741.70
BD-135	6,966,279.46	2,269,950.32	741.60
BD-136	6,966,279.71	2,270,012.44	741.30
BD-137	6,966,285.63	2,270,041.78	741.20
BD-138	6,966,287.60	2,270,134.22	740.25
BD-139	6,966,281.68	2,270,163.80	740.00
BD-140	6,966,282.42	2,270,226.16	739.22
BD-141	6,966,288.34	2,270,255.50	738.90
BD-142	6,966,289.57	2,270,348.43	738.80
BD-143	6,966,283.65	2,270,378.01	738.30
BD-144	6,966,284.39	2,270,439.89	737.24
BD-145	6,966,290.31	2,270,469.22	736.74
BD-147	6,966,292.04	2,270,562.40	736.14
BD-148	6,966,286.12	2,270,591.98	735.44
BD-149	6,966,286.12	2,270,654.35	735.03
BD-150	6,966,292.04	2,270,683.68	734.83
BK-001	6,966,940.00	2,268,330.31	775.68
BK-002	6,966,751.26	2,268,743.82	759.25
BK-003	6,966,828.77	2,269,172.33	741.63

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
BK-004	6,966,884.15	2,268,875.86	750.32
BK-005	6,967,211.11	2,269,078.35	745.38
BK-006	6,967,041.17	2,268,789.51	748.00
BK-007	6,966,581.44	2,268,821.07	757.00
BK-008	6,966,435.01	2,268,979.33	752.00
BK-009	6,967,711.72	2,269,298.88	741.56
BK-010	6,967,352.27	2,270,101.92	698.00
DW1-001	6,965,398.36	2,269,095.78	755.00
DW1-002	6,965,352.78	2,269,093.08	754.14
DW1-003	6,965,303.34	2,269,091.02	753.36
DW1-004	6,965,281.71	2,269,089.49	753.22
DW1-005	6,965,258.49	2,269,088.44	752.66
DW1-006	6,965,249.37	2,269,089.00	752.94
DW1-007	6,965,228.30	2,269,087.13	752.38
DW1-008	6,965,180.11	2,269,087.11	751.78
DW1-009	6,965,205.56	2,269,194.44	753.51
DW1-010	6,965,017.18	2,269,273.21	741.77
DW1-100	6,965,393.36	2,269,095.78	755.00
DW1-101	6,965,203.30	2,269,087.13	752.08
DW1-102	6,965,155.11	2,269,087.11	751.58
DW1-103	6,965,195.56	2,269,194.44	752.51
DW1-104	6,965,137.11	2,269,092.11	751.28
DW1-105	6,965,117.11	2,269,097.11	750.88
DW2-001	6,966,051.30	2,269,735.86	747.87
DW2-002	6,966,060.79	2,270,208.96	736.50
DW2-003	6,965,983.47	2,270,594.64	729.52
DW3-001	6,965,352.39	2,269,755.49	742.57
DW3-002	6,965,458.15	2,270,377.54	735.00
DW3-003	6,965,803.27	2,270,596.58	728.87
DW3-100	6,965,310.35	2,269,714.84	743.30
DW3-101	6,965,358.41	2,269,756.03	742.77
DW3-102	6,965,351.15	2,269,742.57	742.93
DW3-103	6,965,310.35	2,269,714.84	743.28
DW3-104	6,965,362.66	2,269,795.67	742.53
DW3-105	6,965,370.09	2,269,853.67	741.72
DW3-106	6,965,309.35	2,269,714.84	743.28
DW3-107	6,965,309.87	2,269,731.15	744.40
DW3-108	6,965,289.32	2,269,715.67	743.48
DW3-109	6,965,309.37	2,269,695.99	745.72
DW3-110	6,965,384.66	2,269,766.40	746.49
DW3-111	6,965,336.76	2,269,769.73	744.54
DW3-112	6,965,390.89	2,269,853.46	745.01
DW3-113	6,965,354.68	2,269,855.25	743.81
DW3-114	6,965,389.65	2,269,902.78	743.80
DW3-115	6,965,369.06	2,269,903.77	741.73

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
DW3-116	6,965,350.81	2,269,906.13	744.14
DW3-117	6,965,370.16	2,269,953.97	740.97
DW3-118	6,965,364.60	2,270,053.49	740.14
DW3-119	6,965,412.08	2,269,795.85	746.13
DW3-120	6,965,417.04	2,269,896.29	743.82
DW3-121	6,965,416.41	2,269,996.77	742.04
DW3-122	6,965,389.51	2,269,954.09	742.78
DW3-123	6,965,350.63	2,269,953.80	742.81
DW3-124	6,965,322.20	2,269,955.14	742.75
DW3-125	6,965,384.55	2,270,054.18	741.28
DW3-126	6,965,345.76	2,270,052.39	741.60
DW3-127	6,965,369.35	2,270,102.75	739.22
DW3-128	6,965,370.98	2,270,152.93	739.25
DW3-129	6,965,419.51	2,270,200.78	738.96
DW3-130	6,965,368.97	2,270,202.86	738.80
DW3-131	6,965,318.22	2,270,204.97	739.43
DW3-132	6,965,367.72	2,270,252.77	738.46
DW3-133	6,965,367.69	2,270,302.42	738.04
DW3-134	6,965,419.29	2,270,099.37	740.59
DW4-001	6,965,316.40	2,270,631.20	738.84
DW4-002	6,965,786.02	2,270,624.20	729.89
DW4-100	6,965,315.40	2,270,631.20	738.84
DW4-101	6,965,326.40	2,270,631.20	738.84
DW4-102	6,965,306.40	2,270,629.20	738.84
DW4-103	6,965,326.40	2,270,621.20	739.84
DW4-104	6,965,306.40	2,270,621.20	739.84
DW5-001	6,965,859.11	2,270,918.55	719.92
DW5-002	6,966,066.60	2,271,043.35	723.41
DW5-003	6,965,923.60	2,271,291.85	708.20
DW5-004	6,965,999.58	2,271,340.92	706.40
DW6-001	6,966,548.61	2,270,324.22	724.63
DW6-002	6,966,533.59	2,270,740.98	730.51
DW7-001	6,966,227.69	2,269,401.13	739.36
DW8-001	6,965,248.59	2,268,454.43	760.81
DW8-002	6,964,716.05	2,268,568.03	732.98
DW9-001	6,966,098.71	2,268,880.92	740.52
DW9-002	6,966,471.80	2,269,413.89	719.37
DW9-003	6,966,412.00	2,269,383.00	735.00
EOD-001	6,965,906.00	2,268,062.00	779.00
EOD-002	6,966,016.04	2,268,140.77	771.20
EOD-003	6,966,021.60	2,268,278.00	763.00
EOD-004	6,965,831.60	2,268,383.10	769.00
EOD-005	6,965,811.60	2,268,488.10	769.00
EOD-006	6,965,886.60	2,268,608.10	759.00
EOD-007	6,966,086.60	2,268,468.10	748.00

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
EOD-008	6,965,911.82	2,268,282.10	766.44
EOD-009	6,965,623.70	2,268,216.09	779.32
EOD-010	6,965,834.16	2,268,276.30	771.39
EOD-011	6,965,836.60	2,268,198.10	774.00
EOD-100	6,965,886.40	2,268,608.10	759.00
EOD-101	6,965,896.60	2,268,608.10	758.00
EOD-102	6,965,886.60	2,268,618.10	759.50
EOD-103	6,965,876.60	2,268,608.10	759.50
EOD-104	6,965,886.60	2,268,598.10	759.00
EOD-110	6,965,623.50	2,268,216.09	779.32
EOD-111	6,965,623.70	2,268,226.09	779.32
EOD-112	6,965,613.70	2,268,216.09	779.32
EOD-113	6,965,623.70	2,268,206.09	779.32
LCH-001	6,964,675.60	2,269,515.60	733.00
LCH-002	6,964,643.00	2,269,478.00	729.80
LCH-003	6,964,642.40	2,269,515.40	730.20
LCH-100	6,964,643.00	2,269,477.00	730.00
LCH-101	6,964,625.00	2,269,484.00	726.00
SP-001	6,964,849.00	2,269,627.00	736.00
SP-002	6,964,763.00	2,270,118.00	738.00
SP-003	6,965,656.00	2,271,253.00	733.00
SP-004	6,965,286.00	2,268,485.00	766.00
TRF-001	6,965,363.30	2,269,677.92	746.81
TRF-002	6,965,359.33	2,269,696.28	746.55
TRF-003	6,965,361.71	2,269,631.71	747.53
TRF-004	6,965,216.32	2,269,709.07	743.66
TRF-005	6,965,460.41	2,269,197.42	756.46
TRF-006	6,965,146.84	2,269,085.24	751.32
TRF-007	6,965,050.21	2,269,453.50	740.48
TRF-008	6,965,057.39	2,270,232.50	739.67
TRF-009	6,965,151.34	2,270,733.43	743.28
TRF-010	6,965,281.26	2,270,732.33	742.43
TRF-011	6,965,835.31	2,269,563.59	752.00
TRF-012	6,965,840.08	2,270,164.82	739.55
TRF-013	6,965,917.60	2,270,725.66	728.80
TRF-014	6,966,361.83	2,270,391.79	737.40
TRF-015	6,966,349.71	2,269,672.72	741.76
TRF-016	6,965,770.82	2,269,226.71	763.09
UST-001	6,965,497.14	2,269,248.25	759.35
UST-002	6,964,894.46	2,270,416.52	737.84
UST-003	6,964,935.86	2,269,332.27	740.67
UST-004	6,964,932.28	2,269,333.82	740.51
UST-005	6,964,929.90	2,269,355.24	740.46
UST-006	6,965,326.30	2,269,794.90	743.71
UST-007	6,965,325.48	2,269,786.89	744.00

Soil Borehole Coordinates and Elevations

Location	Northing	Easting	Elevation (ft)
UST-008	6,965,334.06	2,269,786.60	743.79
UST-009	6,965,348.69	2,269,833.66	743.77
UST-010	6,965,477.13	2,269,248.02	755.95
WJEPX925	6,965,700.41	2,267,890.73	787.02
WJEPX926	6,966,434.80	2,268,238.60	771.50
XU3212-901	6,965,032.17	2,269,364.63	744.16
XU3212-902	6,965,180.31	2,269,694.64	742.86

PROPERTY DESCRIPTION

Being a 246.850 acre tract of land situated in the F.W. Shoeverling Survey, Abstract No. 1398, the E. Cathey Survey, Abstract No. 392, the Socorro Farming Co. Survey, Abstract No. 1840, the J.M. Rice Survey, Abstract No. 1799, the S.B. Hopkins Survey, Abstract No. 673, the G.B. Kenney Survey, Abstract No. 920, the E.L. Alford Survey, Abstract No. 2000, and the J.P. Woods Survey, Abstract No. 1886, Tarrant County, Texas, said 246.850 tract of land being all of a 247 acre tract of land condemned by the United States of America with the "Judgment on Declaration of Taking No. 1" recorded in Volume 2873, Page 583, Deed Records, Tarrant County, Texas and being corrected in Volume 3338, Page 242, Deed Records, Tarrant County Texas, said 246.850 acre tract of land being more particularly described by metes and bounds as follows:

BEGINNING at a concrete monument with brass cap stamped "Corps of Engineers" found in the west line of said 247 acre tract of land and being in the easterly line of a 35 acre tract of land deeded to Rudy E. Lambert and recorded in Volume 6485, Page 157 of the Deed Records, Tarrant County, Texas, from which the southwest corner of said E.L. Alford Survey, Abstract No. 2000 and the southeast corner of said J.T. Allen Survey, Abstract No. 67 bears, as described by deed recorded in Volume 3338, Page 242, Deed Records, Tarrant County, Texas, North 26 degrees 50 minutes 00 seconds West, a distance of 430.00 feet, and from which a point for the northeast corner of said G.B. Kenney Survey, Abstract No. 920 bears, as recorded in Volume 3338, Page 242, Deed Records, Tarrant County, Texas, North 59 degrees 10 minutes 00 seconds East, a distance of 755.00 feet;

THENCE North 05 degrees 24 minutes 49 seconds East, with the most westerly line of said 247 acre tract of land and with the easterly line of said 35 acre tract of land, a distance of 1840.03 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most westerly northwest corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" being a corner in the easterly line of said 35 acre tract of land;

THENCE North 50 degrees 53 minutes 31 seconds East, with the northwesterly line of said 247 acre tract of land, a distance of 1120.13 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most northerly northwest corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being on a common line with a 234.49 acre tract of land deeded to Nathaniel L. Myers as recorded in Volume 5827, Page 07 of the Deed Records, Tarrant County, Texas;

THENCE North 89 degrees 21 minutes 01 seconds East, with the north line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, a distance of 1885.13 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most northerly northeast corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in a common line with said 234.49 acre tract of land;

THENCE South 47 degrees 44 minutes 51 seconds East, with the northeast line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, a distance of 1144.06 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most easterly northeast corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in a common line with said 234.49 acre tract of land;

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THENCE South 02 degrees 05 minutes 04 seconds East, with the east line of said 247 acre tract of land and with a west line of said 243.49 acre tract of land, a distance of 1380.13 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for an interior ell corner in the east line of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in the west line with said 234.49 acre tract of land;

THENCE South 89 degrees 59 minutes 49 seconds East, with the east line of said 247 acre tract of land and with the west line of said 243.49 acre tract of land, a distance of 169.99 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for an exterior ell corner in the east line of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in the west line with said 234.49 acre tract of land;

THENCE South 00 degrees 00 minutes 11 seconds West, with the east line of said 247 acre tract of land and with the west line of said 243.49 acre tract of land, a distance of 201.09 feet to a 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Forth Worth, Tx." set for an exterior ell corner of said 247 acre tract of land, said 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Fort Worth, Tx." also being a corner in the west line with said 234.49 acre tract of land;

THENCE North 89 degrees 59 minutes 49 seconds West, with the east line of said 247 acre tract of land and with the west line of said 234.49 acre tract of land, a distance of 328.94 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the an interior ell corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in the west line with said 234.49 acre tract of land;

THENCE South 38 degrees 43 seconds 55 minutes West, with the southeast line of said 247 acre tract of land and with the west line of said 234.49 acre tract of land, a distance of 1200.62 feet to a 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Forth Worth, Tx." set for the most southerly southeast corner of said 247 acre tract of land said 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Fort Worth, Tx." also being a corner in a common line with said 234.49 acre tract of land;

THENCE North 87 degrees 16 minutes 05 seconds West, with the south line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, a distance of 1360.69 feet to concrete monument with brass cap stamped "Corps of Engineers" found for a corner in the south line of said 247 acre tract of land, said concrete monument stamped "Corps of Engineers" also being a corner in a common line with said 234.49 acre tract of land;

THENCE South 89 degrees 36 minutes 30 seconds West, with the south line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, passing at a distance of 366.73 feet a point for a common corner of said 234.49 acre tract of land, said point being the most southerly northeast corner of said 35 acre tract of land, in all, a distance of 1011.50 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most southerly southwest corner of said 247 acre tract of land, said concrete monument stamped "Corps of Engineers" also being a corner in the east line with said 35 acre tract of land;

THENCE North 39 degrees 08 minutes 27 minutes West, with the southwesterly line of said 247 acre tract of land and with the east line of said 35 acre tract of land, a distance of 861.85 feet to THE POINT OF BEGINNING and containing 10,752,765 square feet or 249.850 acres of land, more or less.

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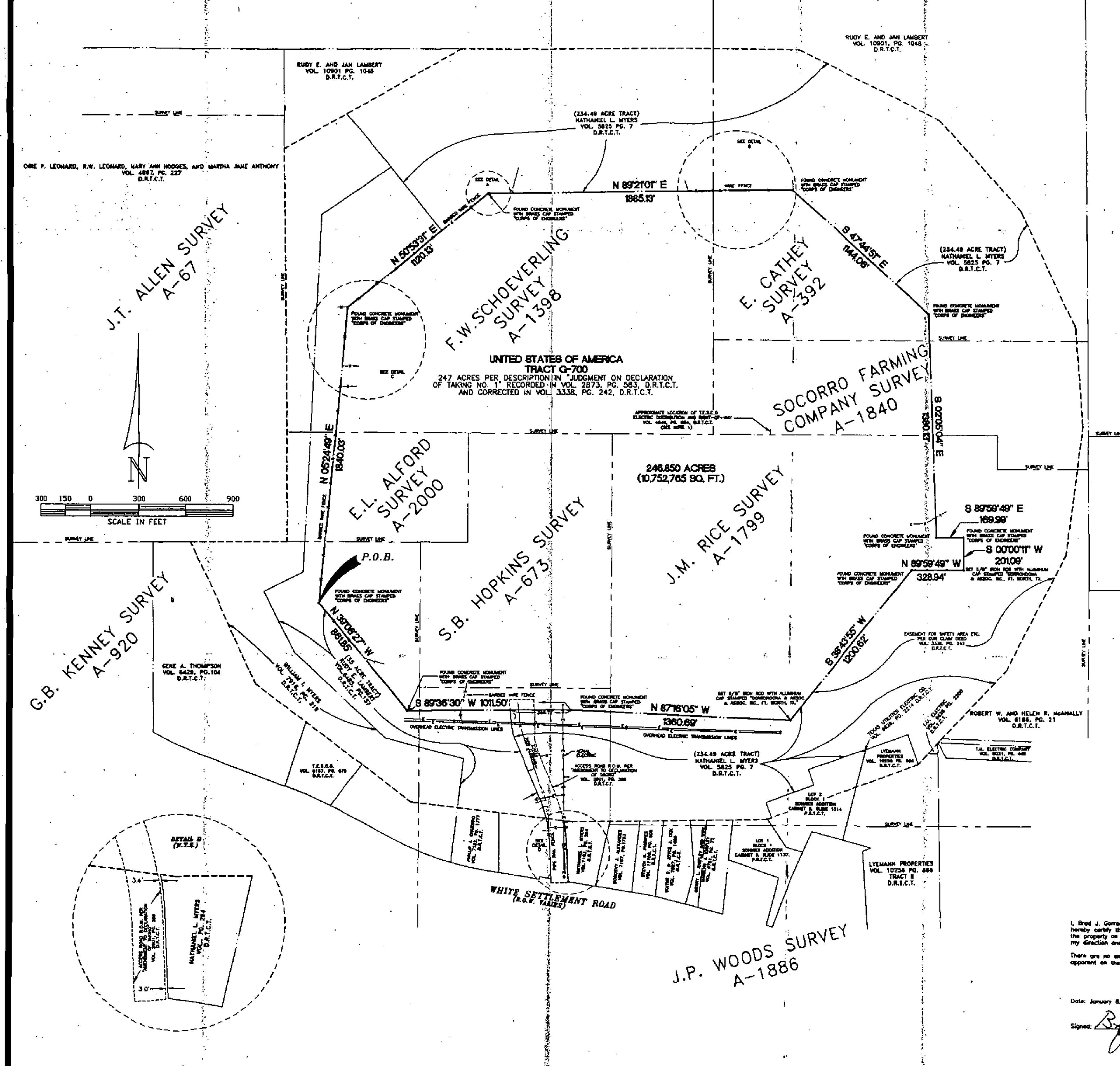

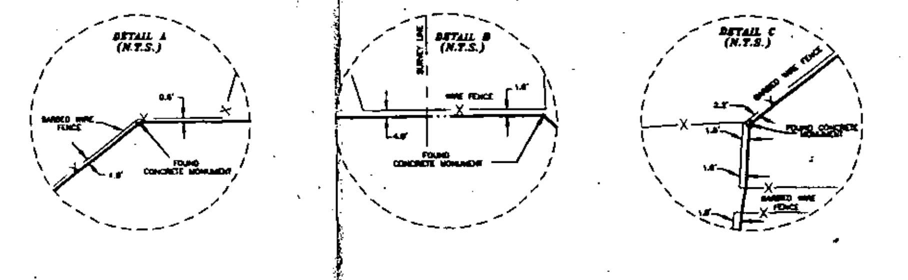

PROPERTY DESCRIPTION

Being a 246.850 acre tract of land situated in the F.W. Shoeverling Survey, Abstract No. 1398, the E. Cathey Survey, Abstract No. 392, the Socorro Farming Co. Survey, Abstract No. 1840, the J.M. Rice Survey, Abstract No. 1799, the S.B. Hopkins Survey, Abstract No. 673, the G.B. Kenney Survey, Abstract No. 920, the E.L. Alford Survey, Abstract No. 2000, and the J.P. Woods Survey, Abstract No. 1886 Tarrant, County, Texas, said 246.850 tract of land being all of a 247 acre tract of land condemned by the United States of America with the "Judgment on Declaration of Taking No.1" recorded in Volume 2873, Page 583, Deed Records, Tarrant County, Texas and being corrected in Volume 3338, Page 242, Deed Records, Tarrant County Texas, said 246.850 acre tract of land being more particularly described by metes and bounds as follows:

BEGINNING at a concrete monument with brass cap stamped "Corps of Engineers" found in the west line of said 247 acre tract of land and being in the easterly line of a 35 acre tract of land deeded to Rudy E. Lambert and recorded in Volume 6485, Page 157 of the Deed Records, Tarrant County, Texas, from which the southwest corner of said E.L. Alford Survey, Abstract No. 2000 and the southeast corner of said J.T. Allen Survey, Abstract No. 67 bears, as described by deed recorded in Volume 3338, Page 242, Deed Records, Tarrant County, Texas, North 28 degrees 50 minutes 00 seconds West, a distance of 430.00 feet, and from which a point for the northeast corner of said G.B. Kenney Survey, Abstract No. 920 bears, as recorded in Volume 3338, Page 242, Deed Records, Tarrant County, Texas, North 59 degrees 10 minutes 00 seconds East, a distance of 755.00 feet;

THENCE North 05 degrees 24 minutes 49 seconds East, with the most westerly line of said 247 acre tract of land and with the easterly line of said 35 acre tract of land, a distance of 1840.03 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most westerly northwest corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" being a corner in the easterly line of said 35 acre tract of land;

THENCE North 50 degrees 53 minutes 31 seconds East, with the northwesterly line of said 247 acre tract of land, a distance of 1120.13 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most northerly northwest corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being on a common line with a 234.49 acre tract of land deeded to Nathaniel L. Myers as recorded in Volume 5827, Page 07 of the Deed Records, Tarrant County, Texas;

THENCE North 89 degrees 21 minutes 01 seconds East, with the north line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, a distance of 1885.13 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most northerly northeast corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in a common line with said 234.49 acre tract of land;

THENCE South 47 degrees 44 minutes 51 seconds East, with the northeast line of said 247 acre tract of land and with a common line of said 243.49 acre tract of land, a distance of 1144.06 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most easterly northeast corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in a common line with said 234.49 acre tract of land;

THENCE South 02 degrees 05 minutes 04 seconds East, with the east line of said 247 acre tract of land and with a west line of said 243.49 acre tract of land, a distance of 1380.13 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for an interior ell corner in the east line of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in the west line with said 234.49 acre tract of land;

THENCE South 89 degrees 59 minutes 49 seconds East, with the east line of said 247 acre tract of land and with the west line of said 243.49 acre tract of land, a distance of 169.99 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for an exterior ell corner in the east line of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in the west line with said 234.49 acre tract of land;

THENCE South 00 degrees 00 minutes 11 seconds West, with the east line of said 247 acre tract of land and with the west line of said 243.49 acre tract of land, a distance of 201.09 feet to a 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Forth Worth, Tx." set for an exterior ell corner of said 247 acre tract of land, said 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Fort Worth, Tx." also being a corner in the west line with said 234.49 acre tract of land;

THENCE North 89 degrees 59 minutes 49 seconds West, with the east line of said 247 acre tract of land and with the west line of said 234.49 acre tract of land, a distance of 328.94 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the an interior ell corner of said 247 acre tract of land, said concrete monument with brass cap stamped "Corps of Engineers" also being a corner in the west line with said 234.49 acre tract of land;

THENCE South 38 degrees 43 seconds 55 minutes West, with the southeast line of said 247 acre tract of land and with the west line of said 234.49 acre tract of land, a distance of 1200.62 feet to a 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Forth Worth, Tx." set for the most southerly southeast corner of said 247 acre tract of land said 5/8" iron rod with aluminum cap stamped "Gorrondona & Assoc. Inc., Fort Worth, Tx." also being a corner in a common line with said 234.49 acre tract of land;

THENCE North 87 degrees 16 minutes 05 seconds West, with the south line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, a distance of 1360.69 feet to concrete monument with brass cap stamped "Corps of Engineers" found for a corner in the south line of said 247 acre tract of land, said concrete monument stamped "Corps of Engineers" also being a corner in a common line with said 234.49 acre tract of land;

THENCE South 89 degrees 36 minutes 30 seconds West, with the south line of said 247 acre tract of land and with a common line of said 234.49 acre tract of land, passing at a distance of 366.73, feet a point for a common corner of said 234.49 acre tract of land, said point being the most southerly northeast corner of said 35 acre tract of land, in all, a distance of 1011.50 feet to a concrete monument with brass cap stamped "Corps of Engineers" found for the most southerly southwest corner of said 247 acre tract of land, said concrete monument stamped "Corps of Engineers" also being a corner in the east line of said 35 acre tract of land;

THENCE North 39 degrees 08 minutes 27 minutes West, with the southeasterly line of said 247 acre tract of land and with the east line of said 35 acre tract of land, a distance of 861.85 feet to THE POINT OF BEGINNING and containing 10,752,765 square feet or 249.850 acres of land, more or less.

NOTE 1:
THE LEGAL DESCRIPTION OF THE ABOVE SHOWN DISTRIBUTION AND RIGHT-OF-WAY EASEMENT RECORDED IN VOLUME 4646, PAGE 684, DEED RECORDS, TARRANT COUNTY, TEXAS, IS NOT CORRECTLY DESCRIBED AND DOES NOT CROSS THE INTENDED TRACT OF LAND AND COULD BE LOCATED OUTSIDE THE LIMITS OF THE SURVEY SHOWN HEREON.

BASIS OF BEARING:
ALL BEARINGS ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NAD-83, THE NORTH CENTRAL ZONE, BASED ON A G.P.S. SURVEY AND ESTABLISHED ALONG THE WEST LINE (NORTH 05°24'49"EAST, 1840.03).

I, Brad J. Gorrondona, Registered Professional Land Surveyor, do hereby certify that the plat shown hereon accurately represents the property as determined by on on the ground survey made under my direction and supervision, and that all corners are as shown.

There are no encroachments, easements, conflicts, or protrusions apparent on the ground, except as shown.

Date: January 8, 1998

Signed: [signature]
Brad J. Gorrondona, R.P.L.S. No. 4684

STATE OF TEXAS — REGISTERED — BRAD J. GORRONDONA — #4684 — PROFESSIONAL LAND SURVEYOR

BOUNDARY SURVEY
OF
FORT WORTH NAVAL AIR STATION
OFFSITE WEAPONS STORAGE FACILITY
BEING A
246.850 ACRE TRACT OF LAND
SITUATED IN THE
F.W. SHOEVERLING SURVEY, ABSTRACT No. 1398
E. CATHEY SURVEY, ABSTRACT No. 392
SOCORRO FARMING CO. SURVEY, ABSTRACT No. 1840
J.M. RICE SURVEY, ABSTRACT No. 1799
S.B. HOPKINS SURVEY, ABSTRACT No. 673
G.B. KENNEY SURVEY, ABSTRACT No. 920
E.L. ALFORD SURVEY, ABSTRACT No. 2000
J.P. WOODS SURVEY, ABSTRACT No. 1886
TARRANT COUNTY, TEXAS

GORRONDONA & ASSOCIATES, INC.
6737 BRENTWOOD STAIR ROAD, SUITE 224
FORT WORTH, TEXAS 76112
PHONE (817)496-1424 FAX (817)496-1768

RCRA FACILITIES INVESTIGATION N.A.S. FORT WORTH	ACAD FILE: 809B.DWG		
JOB NO. 9704-809	DATE: JAN. 8, 1997	CHECKED BY: BJG	DWN BY: JLR

498 532

TAB

D

498 533

APPENDIX D

BOREHOLE LOGS

GEOLOGIC BOREHOLE LOG

198 5342

Borehole (Location) ID: A1-001

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Northwest corner of field (Alarid area) near road				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2"	Total Depth (Feet)	1.2'
Date/Time Drilling Started	8/25/97 0945	Date/Time Total Depth Reached	8/25/97 0948		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/18/97		
1	Ø					CM	LS	Drillers able to get down only 7 inches before hitting solid bedrock. No sample recovery.		
								Bedrock is lime-stone.		
2										
3										
4										
5										
6										
7										
8										

498 5351

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-002

Page 1 of 1

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description A1 grid area along southern edge of road			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 1.0'	
Date/Time Drilling Started 8/25/97 0950	Date/Time Total Depth Reached 8/25/97 0954		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface sample collected 8/18/97		
1	Ø					CM	LS	Drillers able to get down only 6 inches before hitting solid bedrock. No sample recovery. Bedrock is limestone.		
2										
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1 - 003

Job	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid area along southern edge of road				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)		Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/25/97 10:00		Date/Time Total Depth Reached	10:10 8/25/97	

Depth (feet)	Sampling: % Recov	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
	0-0.5' surface sample collected 8/18/97							0.5-2.5" 2.5Y 8/4 Sand & bits of rock -- saprolite + indurated light gray limestone; dry, non-plastic; sandy material may be from side of road rather than in situ material		3rd sleeve used for VOA sample → A1-003-02 VOC, SVOC, T-metals,
1	50%	0.5' -2.5'		Ø		GM	SDGR			
2										
3						CM	LS	Refusal at 2.5' against limestone bedrock		
4										
5										
6										
7										
8										

498 537

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-004

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid area, along southern side of road.				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	E. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5'
Date/Time Drilling Started	8/25/97 10:30	Date/Time Total Depth Reached	10:45 8/25/97		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1, 2	15"/24" 62%	0.5-2.5'		Ø		GM	SDGR	0.5-2.5' 2.5Y 8/3 silt & clay + sand + chunks of limestone; dry, non-plastic; no odor [Road gravel + weathered limestone?]		3rd sleeve used for VOA; sample A1-004-02 analyzed for VOC, SVOC, T-metals, Hg
3, 4	21"/24" 88%	2.5-4.5'		Ø		CLML	STCL	2.5-4.5' 2.5Y 6/3 Clay & silt; moderately plastic, moist, no odor, very few chunks of bedrock		A1-004-03 analyzed for VOC, SVOC, T-metals, Hg; 3.0-3.5' sleeve used for VOC; all analyses E/A (extract) archive; except VOC
5, 6, 7, 8						GM	LS	* Note: the driller was getting gravel from the road bed in the hole & pushing the gravel down. He was getting no sample material, so he moved 1 ft to south & started over.		

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-005

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid area, along southern side of road				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5'
Date/Time Drilling Started	8/25/97 11:10	Date/Time Total Depth Reached	11:25 8/25/97		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface Sample Collected 8/18/97		
1	(10"/24") 42%	0.5' - 2.5'		∅		GM	SDGR	0.5-2.5' Sand (2.5y 8/4) + chunks of limestone -- may be fill material falling in hole		A1-005-02 VOC, SVOC, T-metals, Hg
2										
3	(18"/24") 75%	2.5' - 4.5'		∅		CL	CLAY	2.5-4.5' 2.5y 8/3 to 2.5y 7/4 Clay with some silt, moderately plastic to plastic, dry, no odor		A1-005-03 VOC, SVOC (E/A) T-metals & Hg (E/A)
4										
						CM	LS	Refusal at 4.5' against limestone bedrock		
5										
6										
7										
8										

498 539

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-006

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid area, 2nd row to south, along eastern edge of road.				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)		Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/25/97 11:40		Date/Time Total Depth Reached	11:47 8/25/97	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1	100%			∅		CH	CLAY	0.5-2.5' 2.5Y 7/2 clay; sandy gravel in upper portion; clay is plastic, stiff, dry, very little coarse material		A1-006-02 VOC, SVOC, T-metals, Hg; 1.5-2.0 sleeve used for VOC
2										
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

498 510

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-007

Site ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 2nd row to south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/25/97 11:50			Date/Time Total Depth Reached	11:57 8/25/97

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample Collected 8/18/97		
1	20" / 24"	0.5-2.5'		Ø		CL	CLAY	0.5-2.5' 2.5Y 5/3 (lt olive brn) Clay w/ minor small gravel & trace root material; contains $CaCO_3$ concretions		A1-007-02 VOC (1.0-1.5' sleeve used), SVOC, T-metals, Hg
2	83%									
3						CM	LS	* Used 2 spoons & got halfway down each time. Made it to 2.5' where they hit refusal against limestone bedrock.		
4										
5										
6										
7										
8										

498 541

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-008

AFID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description A1 grid, 2nd row south of bunkers			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5	
Date/Time Drilling Started 8/25/97 12:03		Date/Time Total Depth Reached 12:06 8/25/97	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface Sample Collected 8/18/97		
1	(18"/24") 75%	0.5' – 2.5'		Ø		CL	CLAY	0.5-2.5' 2.5Y 7/2 Clay, trace sand, non-plastic to moderately plastic, traces of small fossils (?) [heavily weathered limestone]		A1-008-02 VOC (1.5-2.0'), SVOC, T-metals, Hg
2										
3						CM	LS	Refusal at 2.5' against limestone bedrock		
4										
5										
6										
7										
8										

198 542

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-009

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 2nd row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	8/25/97 1315	Date/Time Total Depth Reached	8/25/97 1325		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface Sample Collected 8/18/97		
1	(15"/24") 62%	0.5-2.5'		18		CLML	STCL	0.5-2.5' 2.5Y 8/1 to 2.5Y 8/3 Clay and silt, trace small fossils, non-plastic to moderately plastic, stiff, dry Saprolite & heavily weathered limestone		A1-009-02 VOC (1.5-2.0' sleeves), SVOC, T-metals, Hg
2										
3	(23"/24") 96%	2.5-4.5'		20.1		CL	CLAY	2.5-4.5' 2.5Y 6/2 to 2.5Y 7/2 Clay with minor silt, moderately plastic, stiff, moist at bottom		A1-009-03 Same analyses as for sample above, all but VOC analyses are E/A Testout archives
4										
5						CM	LS	refusal at 4.5' against limestone		
6										
7										
8										

498-543

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-010

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 2nd row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	8/25/97 1330	Date/Time Total Depth Reached	8/25/97 1405		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1	18"/24" 75%	0.5-2.5'		15				0.5-2.5 2.5Y 6/2 Clay w/trace silt and small fossils, some rootlets in upper foot, dry, stiff, moderately plastic; [Saprolite]		A1-010-02 A1-010-05 VOC, SVOC, T-metals, Hg, Explosives, Pest/PCB's
2										
3	22"/24" 92%	2.5-4.5'		10		CL	CLAY	2.5-4.5' 2.5Y 6/2 same as above, more plastic; have some very dry silty material which may have fallen down from higher up in the hole [Saprolite]		A1-010-0[illegible] A1-010-06 VOC, remainder E/A (extract/archive only): SVOC, T-metals, Hg, Explosives, Pest/PCB's
4										
5						CM	LS	Refusal at 4.5' against limestone. Driller moved 1' to east and collected material for the duplicate samples -- same intervals used for samples in dup hole		
6										
7										
8										

498 544

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-011

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 2nd row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.7'
Date/Time Drilling Started	8/25/97 1410	Date/Time Total Depth Reached	8/25/97 1435		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample Collected 8/18/97		
1	(12"/24") 50%	0.5-2.5		5 ppm		CL	CLAY	0.5-2.7' 2.5Y 7/2 Clay, some rootlets in upper portion of spoon, plastic, damp from spoon		A1-011-02 VOC, SVOC, T-metals, Hg
2										
	2"	2.5-2.7						Refusal at 2.7' -- Only 2" of recovery. Looks like limestone at base of spoon.		
3						CM	LS			
4										
5										
6										
7										
8										

498 545

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-012

Page 1 of 1

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 2nd row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	3.5
Date/Time Drilling Started	8/25/97 14:35	Date/Time Total Depth Reached	14:55 8/25/97		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface		
1	17"/24" 71%	0.5-2.5'		5		CLML	STCL	0.5-2.5" 2.5G6/6 to 2.5Y 3/3 DK brown silty clay with small weathered fossils in upper 1.5' of material, contains roots; rest of material is olive yellow clay w/small fossils, moderately plastic, stiff, no odor		A1-012-02 also MS/MSD VOC, SVOC, T-metals, Hg
2						CL	Clay			
3	12"/12" 100%	2.5-3.5'		6		CLML	STCL	2.5-3.5' 2.5Y 8/3 Clay and silt -- heavily weathered limestone, has some rock texture & small fossils		A1-012-C * No MS/MSD VOC, SVOC [E/A] T-metals [E/A], Hg
4						CM	LS	Refusal at 3.5' To do MS/MSD, had driller move a few inches east & drill a new hole. Tried to get an MS/MSD pair at the lower depth, but there wasn't enough material. We are sending 2 full brass sleeves for a field sample and MS/MSD pair, rather than 3 full sleeves (for VOA analyses).		
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198 546

Borehole (Location) ID: A1-013

Site ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 3rd row south of bunker drains				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	Felton Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.75'
Date/Time Drilling Started	8/27/97 07:25	Date/Time Total Depth Reached	07:30 8/27/97		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface Sample		
1	15" recovery	0.5-1.75'				GM	SDGR	0.5-1.75' 2.5Y 7/6 upper 6" sand & gravel for road bed, clay below		A1-013-C2 VOA's, T-metals & Hg, SVOCs
						CL	CLAY			
2						CM	LS	Refusal at 1.75' against limestone bedrock		
3										
4										
5										
6										
7										
8										

498 547

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-014

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 3rd row south of bunker drains				
Establishing Company	The Environmental Co.	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2'
Date/Time Drilling Started	8/27/97 07:33	Date/Time Total Depth Reached	07:37 8/27/97		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1 ~~9~~	12" recovery	0.5-2.0'				CL	CLAY	0.5'-2.0' 2.5Y 8/2 heavily weathered limestone -- weathered to mod. plastic clay		A1-014-02 VOC, SVOC, T-metals, Hg
2 ~~10~~						CM	LS	Refusal at 2.0' against limestone bedrock		
3 ~~11~~										
4 ~~12~~										
5 ~~13~~										
6 ~~14~~										
7 ~~15~~										
8 ~~16~~										

498 548

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-015

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description A1 grid, 3rd row south of bunkers			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.0'	
Date/Time Drilling Started 8/27/97 7:45	Date/Time Total Depth Reached 8/27/97 7:50		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample Collected 8/18/97		
1 ~~8~~	18" recovery	0.5-2.0'				CLML	STCL	0.5-2.0' 2.5Y 7/6 clay & silt, dry, cohesive, soft, mod. plastic		A1-015-02 VOC, SVOC, T-metals, Hg
2 ~~10~~						CM	LS	Refusal at 2.0' against limestone bedrock		
3 ~~11~~										
4 ~~12~~										
5 ~~13~~										
6 ~~14~~										
7 ~~15~~										
8 ~~16~~										

498 549

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-016

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 3rd row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.0'
Date/Time Drilling Started	8/27/97 7:51		Date/Time Total Depth Reached	7:53 8/27/97	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1	(22"/24") 92%	0.5-2.5'		130				0.5'-2.5' 2.5Y, 7/2 Clay & silt (weathered limestone), dry, stiff, few pieces gravel, flaggy parting (shaly limestone) *PID readings are suspect -- meter has been fluctuating wildly; also giving "lamp failure" readings during calibration		A1-016-02 VOC, SVOC, T-metals, Hg
2						CLML	STCL			
3	18" recovery	2.5-4.0'		153				2.5-4.0' 2.5Y 7/2 same as above, no gravel		A1-016-0 VOC; E/A (extract/archive) for SVOCs, T-metals, Hg
4						Cm	LS	Refusal at 4.0' against limestone		
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 550

Borehole (Location) ID: A1-017

ID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description A1 grid, 3rd row south of bunker drain, easternmost sample			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 6.5'	
Date/Time Drilling Started 8/27/97 0805		Date/Time Total Depth Reached 8/27/97 0840	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1, 2	100%	0.5-2.5'		161		CLML	STCL	0.5-2.5' Clay w/some silt 2.5Y 7/6, chunks of light gray limestone, flaggy limestone		A1-017-02 VOC, SVOC, T-metals, Hg
3, 4	100%	2.5-4.5'		200 HS 2		CL	CLAY	2.5-4.5' 2.5Y 8/1 to 2.5Y6/6 clay, trace silt, plastic, dry to moist, stiff, no limestone chunks, cohesive clay		
5, 6	100%	4.5-6.5'		170 HS 76				4.5-6.5' Same as above, but with some zones of more competent limestone		A1-017-03 VOC; E/A (extract/archive for SVOC, T-metals, Hg)
7, 8						CM	LS	Refusal at 6.5' against limestone		

498 551

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-018

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 4th row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5'
Date/Time Drilling Started	8/27/97 0845			Date/Time Total Depth Reached	8/27/97 0910

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected 8/18/97		
1	18"/24" 75%	0.5-2.5'		200 HS 49		OH	CLAY	0.5-2.5 2.5Y 5/3 (grayish brown) to 2.5Y 4/2 (dark grayish brown) Clay, trace root material, plastic, moist, stiff, cohesive, probably high organic content		A1-018-02 VOC, SVOC, T-metal, Hg
2										
3	24"/24" 100%	2.5-4.5'		13 (HS 26)		CL	CLAY	2.5-4.5' upper 9" same as above, below is light gray heavily weathered limestone, mostly pale gray mod. plastic clay		A1-018-0[illegible] VOC; E/A[illegible] SVOC, T-metals, Hg
4										
5						CM	LS	Refusal at 4.5' against limestone		
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-019

PID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Algrid, 4th row south of bunkers			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.2'	
Date/Time Drilling Started 8/27/97 0913		Date/Time Total Depth Reached 8/27/97 0917	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1	R'' recovery	0.5-2.2'		310		GM	SDGR	0.5'-2.2 feet 0.5-1.5' is a mix of sand & gravel probably from road, has reddish-orange color; remainder is 2.5Y 8/3 (pale yellow) clay & silt, dry, stiff, some microfossils, has texture of flaggy limestone, some $CaCO_3$ concretions		A1-019-02 VOC, SVOC, T-metals, tlg
2						CLML	STCL			
						CM	LS	Refusal against limestone at 2.2'		
3										
4										
5										
6										
7										
8										

498 553

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-020

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 4th row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.2'
Date/Time Drilling Started	8/27/97 0920	Date/Time Total Depth Reached	8/27/97 0927		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/18/97		
1	19" recovery	0.5-2.2'		27.0 HS 30.3		CLML	STCL	0.5-2.2' 2.5Y 8/2 flagg's, highly weathered limestone; still competent; but mostly clay & silt, stiff, non-plastic		A1-020-02 SVOC, VOC, T-metals, Hg
2										
						CM	LS	Refusal against limestone at 2.2'		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 554

Borehole (Location) ID: A1-021

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	A1 grid, 4th row South of bunkers		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5
Date/Time Drilling Started	8/27/97 9:27	Date/Time Total Depth Reached	8/27/97 9:45

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1, 2	24"/24" 100%	0.5-2.5'		36 dup 50		CLML	STCL	0.5-2.5' 2.5 y 7/3 (pale yellow) Clay silt, stiff, dry, non-plastic, crumbles (has texture of finely limestone)		A1-021-02 A1-021-05 VOC, SVOC, T-metals, Hg, Pest/PCB's, explosives
3						CM	LS	Refusal at 2.5' against limestone * Drillers moved rig and re-drilled to get enough material for duplicate		
4, 5, 6, 7, 8										

498 555

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-022

AFID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	A1 grid, 4th row south of bunker drains.		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	4.5		
Date/Time Drilling Started	8/27/97 0950	Date/Time Total Depth Reached	8/27/97 1015

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	ppm PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1, 2	24"/24" 100%	0.5-2.5'		HS 303		CLML	STCL	0.5-2.5' Clay+silt 2.5Y 8/2 (pale yellow), stiff, non-plastic, dry, chunks of indurated limestone, $CaCO_3$ concretions		A1-022-02 VOC, SVOC, T-metals, Hg
3, 4	24"/24" 100%	2.5-4.5'		10 HS 244		CHML	STCL	2.5-4.5' Clay + silt 2.5Y 8/2, plastic, dry, microfossils(?), stiff, chunks of limestone, $CaCO_3$ concretions		A1-022-03 VOC; E/A f[illegible] SVOC, T-metals, Hg
5, 6, 7, 8						CM	LS	Refusal at 4.5' against limestone bedrock		

GEOLOGIC BOREHOLE LOG

498-5569

Borehole (Location) ID: A1-023

Site: CRSWL	SiteID: 18 (WSA)	Location Type: BOREHOLE (BH)	
Location Description: A1 grid, 4th row south of bunkers			
Establishing Company: The Environmental Co	Geologist: L. Myers	Drilling Company: Maxim	
Drilling Foreman: F. Robinson	Ground Surface Elevation:	Datum:	
Sampling Device: Split spoon	Borehole Diameter (Inches): 2	Total Depth (Feet): 6.5'	
Date/Time Drilling Started: 8/27/97 10:20	Date/Time Total Depth Reached: 8/27/97 10:55		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1, 2	24" 100%	0.5-2.5'		26		OL	STCL	0.5-2.5' mottled dk brown w/ white spots of $CaCO_3$ to 2.5Y 6/4 w/ white $CaCO_3$ spots; clay + silt, dry, mod. plastic to non-plastic; roots in upper 6" of spoon; white spots are probably $CaCO_3$ concretions		A1-023-02 VOC, SVOC, T-metals, Hg
3, 4	24" 100%	2.5-4.5'		HS 35				2.5-4.5' N7 light gray clay, plastic, moist, stiff, has some texture of flaggy LS, no $CaCO_3$ concretions		
5, 6	24" 100%	4.5-6.5'		20 HS 69.1		CL	CLAY	4.5-6.5' 2.5Y 7/4 (pale yellow) Clay, moist, plastic, stiff, no caliche $CaCO_3$ spots or indurated limestone		A1-023-03 VOC; EIA for SVOC, T-metals - Hg
7, 8						CM	LS	Refusal at 6.5' against limestone bedrock		

498 557

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-024

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description A1 grid, 5th row south of bunkers			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.0'	
Date/Time Drilling Started 8/27/97 1100		Date/Time Total Depth Reached 8/27/97 1107	

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	18"/15"	0.5-2.0'		3.5		GM	SDGR	0.5-2.0' Sand + gravel (from road?) down to 1.5'. fn 1.5-20 2.5Y 8/1 very stiff clay / highly weathered limestone		A1-024-02 VOC, SVOC, T-metals, Hg
						CL	CLAY			
2						CM	LS	Refusal at 2.0' against limestone bedrock		
3								*PID abruptly died; we restarted it & it seemed to work fine		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 558

Borehole (Location) ID: A1-025

Project	CRSWL	Site ID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 5th row south of bunker drains				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/27/97 11:10			Date/Time Total Depth Reached	8/27/97 11:25

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	24" 100%	0.5-2.5'		7.9' (dup 12.0) HS 10.7 (dup 8.0)		CL	CLAY	0.5-2.5' 2.5Y 7/3 (pale yellow), clay to clay & silt, stiff, dry, non-plastic to moderately plastic, contains chunks of unweathered limestone		A1-025-02 A1-025-05 VOC, SVOC, T-metals, Hg
2										
3						Cm	LS	Refusal at 2.5' against limestone bedrock. * Drillers moved rig a few inches & redrilled to get enough material for a duplicate.		
4										
5										
6										
7										
8										

498 559

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-026

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, 5th row South of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/27/97 11:30			Date/Time Total Depth Reached	8/27/97 11:37

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	24" 100%	0.5-2.5'		7.7 HS 8.2		CL	CLAY	0.5-2.5 2.5Y 7/6 mottled w/white Heavily weathered limestone, some clay mixed w/more indurated limestone		A1-026-02 VOC, SVOC, T-metals, t/c
2										
						CM	LS	Refusal at 2.5' against limestone bedrock		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 560

Borehole (Location) ID: A1-027

Page ____ of ____

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, easternmost sample in 5th row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/27/97 11:40	Date/Time Total Depth Reached	8/27/97 11:45		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	20"/24" 83%	0.5-2.5'		Ø HS 5.3		CL	CLAY	0.5-2.5' 2.5Y 3/2 (very dk grayish brown) to 2.5Y 7/6 mottled with white; clay mixed with more indurated limestone, lots of texture saprolite + weathered limestone		A1-027-02 VOC, SVOC, T-metals, Hg
2										
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

498-561

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-028

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid, only sample in 6th row south of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5'
Date/Time Drilling Started	8/27/97 11:50	Date/Time Total Depth Reached	8/27/97 12:00		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample Collected 8/19/97		
1, 2	24" 100%	0.5-2.5'		Ø HS 15.8		OL	STCL	0.5 - 2.5' 2.5Y 5/6 to 2.5Y 7/6 darker material is a mix of silt & clay, small limestone nodules (caliche ?), some roots; lighter material towards base of interval is a mix of clay & chunks of limestone		A1-028-02 VOC, SVOC, T-metals, Hg
3, 4	24" 100%	2.5-4.5'		Ø HS 5.6		CL	CLAY	2.5-4.5' 2.5Y 7/2 clay with white to clear calcite crystals, moist, plastic, stiff, grades into heavily weathered & very stiff limestone, some $CaCO_3$ concretions		A1-028-03 VOC; E/A SVOC, T-metals Hg
5						CM	LS	Refusal at 4.5' against limestone bedrock		
6, 7, 8										

498 562

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-029

IID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid area north of road, closest to Bunker 8531				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.0'
Date/Time Drilling Started	8/27/97 1320	Date/Time Total Depth Reached	8/27/97 1327		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/19/97		
1	18"/18"	0.5-2.0'		HS 188		GM	SDGR	0.5-2.0' 10YR 7/4 sandy material mixed w/chunks of limestone, lower 6" is 2.5Y 7/2 clay mixed w/more indurated limestone		A1-029-02 VOC, SVOC, T-metals, Hg
2						CL	CLAY			
						CM	LS	Refusal at 2.0' against limestone		
3										
4										
5										
6										
7										
8										

498 563

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-030

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 grid area north of road, north and west of A1-029				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.0'
Date/Time Drilling Started	8/27/97 1330			Date/Time Total Depth Reached	8/27/97 1340

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	18"/18"	0.5-2.0'				CLML	STCL	0.5-2.0' 2.5Y 7/6 (yellow), Clay and silt, stiff, nonplastic, dry, cohesive; heavily weathered limestone with some rootlets; some more indurated zones mixed in w/clay		A1-030-02
2						CM	LS	Refusal at 2.0' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-031

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 arid area north of road, at northeast corner of road intersection				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/27/97 1342	Date/Time Total Depth Reached	8/27/97 1350		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	100%	0.5-2.5'		7.0 HS 90.2		GM	SDGR	0.5-2.5' Upper 1' is a mix of 10YR 7/4 sandy material with chunks of limestone (road material?); below is 2.5Y 7/2 clay limestone saprolite (can still see textures); dry, cohesive, stiff		A1-031-02 VOC, SVOC, T-metals, Hg
2						CL	CLAY			
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

498 565

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-032

Page 1 of 1

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description A1 grid area north of road, north of A1-031			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.0'	
Date/Time Drilling Started 8/27/97 1352		Date/Time Total Depth Reached 8/27/97 1355	

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample Collected 8/19/97		
1	18"/18"	0.5-2.0		Ø		GM	SDGR	0.5-2.0 Same as A1-031 (-> upper 1' is a mix of 10YR 7/4 sand + chunks of limestone; below is 2.5 Y 7/2 clay limestone - saprolite (still has textures); dry, cohesive, stiff		A1-032-02 VOC, SVOC, T-metals, Hg
						CL	CLAY			
2						CM	LS	Refusal at 2.0' against limestone bedrock		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 566

Borehole (Location) ID: A1-033

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A1 Grid Area west of road, due west of A1-031				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	1.5'
Date/Time Drilling Started	8/27/97 1357	Date/Time Total Depth Reached	8/27/97 1400		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	12"/12"	0.5-1.5'		1		GC	GVCL	0.5-1.5' Chunks of limestone mixed with gray clay and reddish limy sand		A1-033-02 VOC, SVOC, T-metals, Hg
2						CM	LS	Refusal against bedrock at 1.5'		
3										
4										
5										
6										
7										
8										

498-5670

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A1-034

Page 1 of 1

AFID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	A1 grid area west of road, south of A1-033		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	2.5'		
Date/Time Drilling Started	8/27/97 1402	Date/Time Total Depth Reached	8/27/97 1407

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	24" 100%	0.5-2.5'		B HS 65.1		GM	SDGR	0.5-2.5' Upper 1' is red sandy material with limestone chunks; lower 1' is 2.5Y 7/2 clay + weathered limestone [road fill material? then Saprolite]		A1-034-02 VOC, SVOC, T-metal, -Hg
2						CL	CLAY			
3						CM	LS	Refusal at 2.5' against limestone bedrock		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498568

Borehole (Location) ID: A2-001

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A2 grid north of bunkers, westernmost sample site				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	1.25'
Date/Time Drilling Started	8/27/97 14:15			Date/Time Total Depth Reached	8/27/97 14:20

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	8"/8"	0.5-1.25		10		OH	CLAY	0.5'-1.25' 2.5Y 3/2 clay with white chunks of limestone, rootlets:		A2-001-02 VOC (4 oz jar), SVOC, T-metals Hg
2						CM	LS	Refusal at 1.25' against highly weathered pale gray limestone		
3										
4										
5										
6										
7										
8										

498 569

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A2-002

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	A2 grid north of bunkers		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	1.0'		
Date/Time Drilling Started	8/27/97 1423	Date/Time Total Depth Reached	8/27/97 1427

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/19/97		
1	6"/6"	0.5-1.0		Ø		OH	CLAY	0.5-1.0 2.5Y 3/2 clay w/white chunks of limestone, root material; refusal against pale gray weathered limestone		A2-002-01 VOC, SVOC, T-metals, Hg
						CM	LS			
2								*Redrilled at 0825 on 8/28/97 to provide more sample material		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 570

Borehole (Location) ID: A2-003

IID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	A2 grid north of bunkers		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 1.5'
Date/Time Drilling Started	8/27/97 1430	Date/Time Total Depth Reached	8/27/97 1440

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface Sample Collected 8/19/97		
1	12"/12"	0.5-1.5'		Ø		OH	CLAY	0.5-1.5' 2.5Y 3/2 dark brown clay with root material & limestone bits; some very large, angular pieces of limestone in the spoon; towards bass of spoon becomes pale gray clay + more indurated		A2-003-01 VOC, SVOC, T-metals, Hg
2						CM	LS	limestone, flaggy texture refusal against limestone at 1.5'		
3										
4										
5										
6										
7										
8										

498 571

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A2-004

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A2 Grid area north of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.5'
Date/Time Drilling Started	8/27/97 1445	Date/Time Total Depth Reached	8/27/97 1450		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	(ppm) PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/19/97		
1	12"/12"	0.5-1.5'		Ø HS 9.1		OH	CLAY	0.5-1.5' 2.5Y 3/2 dark brown clay soil with pieces of limestone or $CaCO_3$ concretions, plus root material; grades into pale gray clay + weathered limestone		A2-004-02 A2-004-05 VOC only (on - 8/27/97)
2						CM	LS	Refusal at 1.5' against limestone * Redrilled at 8:30 on 8/28/97 to provide more sample material.		A2-004-02 SVOC, T-meta & Hg on 8/28/97
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 572

Borehole (Location) ID: A2-005

IID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	A2 grid area north of bunkers		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim.
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 3.0'
Date/Time Drilling Started	8/27/97 1510	Date/Time Total Depth Reached	8/27/97 1518

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface sample collected 8/19/97		
1	24"	0.5-2.5'		2.0		OH	CLAY	0.5-2.5' 2.5Y 3/2 clay soil w/white $CaCO_3$ & rootlets; chunks of pebble & cobble-sized limestone; grades into 2.5Y 5/4 brown clay + pieces of more indurated limestone with some zones of pale gray clay or highly weathered limestone		A2-005-02 MS/MSD VOC, SVOC, T-metals, Hg
	100%			HS 17						
2						CL	CLAY			
	6"	2.5-3.0'		Ø				2.5-3' 2.5Y 5/4 brown clay + pieces of limestone; refusal against pale gray limestone.		
3						CM	LS			
								*Drillers put in a second hole a few inches away to get enough material for the MS/MSD.		
4										
5										
6										
7										
8										

498 573

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A2-006

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A2 grid north of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/27/97 15:20	Date/Time Total Depth Reached	8/27/97 15:25		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected 8/19/97		
1	20"/24" 83%	0.5-2.5'		3 HS 3		OH	CLAY	0.5-2.5' 2.5Y 5/4 brown clay with $CaCO_3$ concretions -- looks almost like a conglomerate because there's so many concretions; refusal against pale gray limestone		A2-006-02 A2-006-05 VOC, SVOC, T-metals, Hg
2										
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A2-007

IID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A2 grid north of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	Felton Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	1.5'
Date/Time Drilling Started	8/28/97 07:20	Date/Time Total Depth Reached	8/28/92 0730		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/19/97		
1	12"/12"	0.5-1.5'		22		OH	CLAY	0.5-1.5' Clay [illegible] pieces of CaCO3 (limestone or [illegible]) [illegible] material) [illegible] weathered limestone		A2-007-02 VOAs, SVOCs, metals [illegible]
						Cm	LS	Refusal at 1.5' against limestone		
2								Drillers had to drill a 2nd hole at the site to get enough material for a sample		
3										
4										
5										
6										
7										
8										

498 575

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A2-008

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	A2 grid north of bunkers, easternmost sample				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.5'
Date/Time Drilling Started	8/28/97 0735	Date/Time Total Depth Reached	8/28/97 0745		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/19/97		
1 9	12" / 12	0.5-1.5'		13		OH	CLAY	0.5-1.5' Clay (crumbly [illegible] pieces of $CaCO_3$ + some rock material at bottom of spoon, have 3.5 ft/s (yellow) [illegible] + pieces of moss [illegible] limestone (saprolite + weathered [illegible])		A2-008-01 [illegible] Test/Pit Explosives
2 10						Cm	LS	Refusal at 1.5' against [illegible] *Driller had to drill a second hole at this site to get enough material for a sample.		
3 11										
4 12										
5 13										
6 14										
7 15										
8 16										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-001

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area around Building 8503, northeast of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	3.8'
Date/Time Drilling Started	8/28/97 0830	Date/Time Total Depth Reached	0837 8/28/97		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/20/97		
1	24" 100%	0.5-2.5'		13		OH	CLAY	0.5-2.5' Upper 8" is chromate brown organic soil with CaSO4 chunks or concretions, root matrix; below is 2.5Y 8/3 (pale yellow) porous looking material, mix of clay & limestone pieces; lowest 8" is 2.5Y 7/6 (yellow) clay w/ some limestone, med. plastic, has flaky limestone texture		A3-001-02 VOC, SVOC, T-metals, Hg
2				HS 1.5		CL	CLAY			
3	15"	2.5-3.8'		3.6 HS 1.9				2.5-3.8' 2.5Y 7/3 (pale yellow) clay + some zones of more indurated ls, dry, med. plastic, stiff		A3-001-03 VOC; E/A for SVOC, T-metals Hg
4						CM	LS	Refusal at 3.8' against flaky limestone		
5										
6										
7										
8										

498 577

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-002

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Sampling area around building 8503, north of building		
Establishing Company	The Environmental Co	Geologist	L. Moore
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	1.8		
Date/Time Drilling Started	8/28/97 0845	Date/Time Total Depth Reached	8/28/97 0855

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
1	15"	0.5-1.8'		11 HS ∅		OH	CLAY	0.5-1.8' 2.5Y 4/6 (dk olive brown) Clay, lots of organic material, including rootlets; includes pebbles of limestone, plus some ls concretions		A3-002-02 VOC, SVOC, T-metals, Hg
2						CM	LS	* Drillers did a second hole to get more material for sampling. This material included much more of the light gray plastic clay found at A3-003. Refusal at 1.8' against limestone		
3										
4										
5										
6										
7										
8										

198 578

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-003

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area around Building 8503, north of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Solid spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/28/97 0900	Date/Time Total Depth Reached	8/28/97 0905		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
						OH	CLAY	0.5-2.5' approx 2" of organic soil + roots; most of the sample is 2.5Y 7/2 (light gray) Clay, moist, plastic, stiff, traces of rootlets, some texture (Saprolite)		A3-003-02 VOC, SVOC, T-metals, Hg
1	22"/24"	0.5-2.5'		5.3		CL	CLAY			
				HS 1.5						
2	92%									
						CM	LS	Refusal against bedrock		
3										
4										
5										
6										
7										
8										

498 579

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-004

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Sampling area around Building 8503, northwest of building		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split-spoon	Borehole Diameter (inches)	2
Total Depth (Feet)	1.5'		
Date/Time Drilling Started	8/28/97 0910	Date/Time Total Depth Reached	8/28/97 0920

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' surface sample collected 8/20/97		
	13"	0.5-1.5'		1.5 HS Ø		CH CL	CLAY CLAY	0.5-1.5 1" of organic, dk brown topsoil; remainder is 2.5Y 7/2 (light gray) clay, stiff, plastic, moist, no odor, some rootlets throughout, some limestone texture (veins, fossils)		A3-004-02 complete suite of analyses
1						CM	LS	* Drilled twice to get enough material for sample Refusal at 1.5' against light gray limestone		
2										
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

4198 580

Borehole (Location) ID: A3-005

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Sampling area around Building 8503, west of building		
Establishing Company	The Environmental Co	Geologist	Drilling Company
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5'
Date/Time Drilling Started	8/28/97 0925	Date/Time Total Depth Reached	8/28/97 0932

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
						OH	CLAY	0.5-2.5' upper 1" is light brown organic soil with roots; the remainder is 2.5Y 7/2 (light gray) clay, moist, stiff, plastic, has some limestone textures, some spots of calcite & chunks of limestone		A3-005-C2 VOC, SVOC, T-metals, Hg
1	24" (100%)	0.5-2.5'		5.1		CL	CLAY			
2				HS 25						
						CM	LS	Refusal at 2.5' against limestone		
3										
4										
5										
6										
7										
8										

498 581

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-006

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area rear building 8503, west of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	E. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/28/97 0935	Date/Time Total Depth Reached	8/28/97 0940		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
1	20"/24"	0.5-2.5'		7.0		CL	CLAY	0.5-2.5' 2.5Y 6/6 (olive yellow) to 2.5Y 8/3 (pale yellow) clay w/ chunks of $CaCO_3$, grades into paler material with equal mix of clay & more indurated pale gray limestone.		A3-006-02 VOC, SVOC, T-metals, Hg
2				HS 2.6						
						CM	LS	Refusal at 2.5' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 582

Borehole (Location) ID: A3-007

Page 1 of 1

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sample area near building 8503, west of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Solitsoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/28/97 0945	Date/Time Total Depth Reached	8/28/97 0950		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface sample collected 8/20/97		
1	24" (100%)	0.5-2.5'		HS 11.1		OH	CLAY	0.5-2.5' Upper 13" is is 2.5Y 4/3 (olive brown) clay with rootlets (prob high in organics), small pieces of $CaCO_3$; grades into 2.5Y 7/4 (pale yellow) mix of clay + pieces of limestone, has limestone textures, plus some roots		A3-007-02 VOC, SVOC, T-metals, Hg
2						CL	CLAY			
3						Cm	LS	Refusal at 2.5' against bedrock		
4										
5										
6										
7										
8										

498 583

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-008

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Sampling area near building 8503; west of SWMU 59		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Solitsocon	Borehole Diameter (Inches)	2
Total Depth (Feet)	6.5'		
Date/Time Drilling Started	8/28/97 0955	Date/Time Total Depth Reached	8/28/97 1020

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								*Note: drilled once & didn't get enough material, so moved rig & re-drilled 0-0.5' Surface Sample Collected 8/20/97		
1	100%	0.5-2.5'		Ø		OH		0.5-2.5' 2.5Y 5/2 (grayish brown) clay w/some limestone chunks &/or $CaCO_3$ concretions, root material, stiff, dry, mod. plastic		A3-008-02 VOC, SVOC, T-metals, Hg
2				HS 10.8						
3	21"/24"	2.5-4.5'		3			CLAY	2.5-4.5 clay 2.5Y 7/4 (pale yellow), moist, stiff, plastic, small pieces of limestone &/or $CaCO_3$ concretions, some limestone textures, no odor		
4	88%					CL				
5	22"/24"	4.5-6.5'		1.5				4.5-6.5' Same as above Some larger concretions in this interval		A3-008-03 VOC; E/A for SVOC, T-metals Hg
6	92%			HS Ø						
7						CM	LS	Refusal at 6.5' against limestone		
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-009

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near building 8503, west of SWMU 59				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	8.5'
Date/Time Drilling Started	8/28/97 1030			Date/Time Total Depth Reached	8/28/97 1240

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
1	21"/24" 20%	0.5-2.5'		1.8				0.5-2.5' 2.5Y 4/3 (olive brown) clay w/some pieces of weathered limestone and some $CaCO_3$ concretions, rootlets present, amount of limestone increases with depth, dry, stiff, moderately plastic		A3-009-02 full suite of analysis A3-009-05
2										
3	18"/24" 75%	2.5-4.5'		1.1				2.5-4.5' Same as above, roughly half clay & half limestone & concretions; at 4.0', amount of clay has increased dramatically		
4						CL	CLAY			
5	22"/24" 92%	4.5-6.5'		Ø				4.5-6.5' White to 2.5Y 8/2 (pale yellow) clay, moist, plastic, stiff, no odor, scattered concretions		
6										
7	24"/24" 100%	6.5-8.5'		Ø				6.5'-8.5' Clay 2.5Y 7/6 (yellow), moist, plastic, stiff, some limestone fragments, very few concretions from 6.5-7' is the white clay from the previous interval		A3-009-03 full suite of analysis A3-009-06
8										

498 585

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-009

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Sampling area near building 8503, west of SWMU 59			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 8.5'	
Date/Time Drilling Started 8/28/97 1030		Date/Time Total Depth Reached 8/28/97 1055	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
						CL	CLAY			
9						CM	LS	Refusal at limestone at 8.5'		
								*Drillers moved rig a few inches & redrilled to get enough material for duplicates		
10										
11										
12										
13										
14										
15										
16										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-010

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near building 8503, west of SWMU 59				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	8.5'
Date/Time Drilling Started	8/28/97 1255			Date/Time Total Depth Reached	8/28/97 1335

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface soil sample collected 8/20/97		
1, 2	100%	0.5-2.5'		1 (HS 0.7)		OH	CLAY	0.5-2.5 2.5Y 3/2 Clay, organic, with mottled & $CaCO_3$ concretions, for upper 1 foot, grades into 2.5Y 6/4 (light yellowish brn) clay + limestone & $CaCO_3$ concretions, moist, non-plastic to mod. plastic		A3-010-02 VOC, SVOC, T-metals, Hg
3, 4	20"/24" 83%	2.5-4.5'		Ø (HS Ø)		CH	CLAY	2.5-4.5' Mottled pale gray & 2.5Y 7/4 (pale yellow), Clay with chunks of more indurated limestone		
5, 6	22"/24" 92%	4.5-6.5'						4.5-6.5' 2.5Y 7/6 (yellow) clay with $CaCO_3$ concretions, some large, moist, plastic, moderately stiff; some zones of more white clay		
7, 8	24"/24" 100%	6.5-8.5'		Ø (HS Ø)				6.5-8.5' 2.5Y 8/2 (pale yellow) to light gray clay w/few $CaCO_3$ concretions, moist, plastic, stiff, some limestone texture Refusal against limestone		A3-010-03 VOC, SVOC, T-metals, Hg

498 587

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-010

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near building 8503, west of sump 59				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	8.5'
Date/Time Drilling Started	8/28/97 1255	Date/Time Total Depth Reached	8/28/97 1335		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
						CL	CLAY			
						CM	LS	Refusal at 8.5' against limestone		
9										
10										
11										
12										
13										
14										
15										
16										

GEOLOGIC BOREHOLE LOG

498 588

Borehole (Location) ID: A3-011

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near building 8503, southwest of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	10.5'
Date/Time Drilling Started	8/28/97 1340		Date/Time Total Depth Reached	8/28/97 1425	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
1	19"/24"	0.5-2.5'		Ø				0.5-2.5' Clay, 2.5Y 5/3 (light olive brown) with white pieces of limestone or $CaCO_3$ concretions, dry, stiff, non- to moderately plastic; up to 50% ls or $CaCO_3$ pieces		A3-011-02 VOC, SVOC, T-metals, Hg
2	79%			HE Ø				* upper portion may be fill -- driller reports some voids; have some large pieces of gravel in with the clay + soil		
						DH				
3	20"/24"	2.5-4.5'		Ø				2.5-4.5' Clay, 2.5Y 4/3 (olive brown) w/ varying amounts of small to very large $CaCO_3$ concretions & chunks of limestone, moist, plastic to moderately plastic, stiff [Fill?]		
4	83%									
5	24"/24"	4.5-6.5'		Ø			CLAY	4.5-6.5' Clay, as above, to 5.2' 5.2-6.5' Clay 2.5Y 8/6 (yellow) with $CaCO_3$ concretions, but fewer than in brown clay, moist, plastic, stiff; from 6.25-6.5', have some limestone texture [Saprolite]		
6	100%									
						CL				
7	20"/24"	6.5-8.5'		Ø				6.5-8.5' Clay, as above amts of $CaCO_3$ concretions vary		
8	83%									

498589

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-011

AFIID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Sampling area near building 8503 southwest of building		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 10.5'
Date/Time Drilling Started	8/28/97 1340	Date/Time Total Depth Reached	8/28/97 1425

Depth (feet)	Sampling: % Recov	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
9	24"/24" 100%	8.5-10.5'		Ø		CL	CLAY	8.5-10.5 Clay, 2.5Y 6/4 (light yellowish brown), stiff, moist, plastic, $CaCO_3$ concretions, some quite large		A3-011-03 VOC; E/A for SVOC, T-metals, Hg
10										
11								Never hit refusal in this hole -- drilling halted at 10.5'		
12										
13										
14										
15										
16										

GEOLOGIC BOREHOLE LOG

498 590

Borehole (Location) ID: A3-012

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near Building 8503, south of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	10.5'
Date/Time Drilling Started	8/28/97 1440			Date/Time Total Depth Reached	8/28/97 1505

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected 8/20/97		
1	24"/24" 100%	0.5-2.5		∅ HS ∅		OH		0.5-2.5' Clay 2.5Y 5/3 (light olive brn) to 2.5Y 3/3 (dark olive brown), some organic content, some small $CaCO_3$ concretions, rootlets, non-plastic to moderately plastic		A3-012-02 VOC, SVOC, T-metals, etc
2										
3	22"/24" 92%	2.5-4.5		∅ HS ∅		CL	CLAY	2.5-4.5' Clay, as above, becoming more plastic, losing root material		
4										
5	23"/24" 96%	4.5-6.5		∅ HS 1		GC	GVCL	4.5-6.5 Clay, same as above, to ~5.8' ft; 5.8-6.5', Clay + limestone fragments mixed, 2.5Y 7/6 (yellow) mottled w/ white; some zones have more clay than others; clay is moist, stiff, moderately plastic		
6										
7	24"/24" 100%	6.5-8.5		∅ HS ∅		CL	CLAY	6.5-8.5' Clay, same as above, fewer $CaCO_3$ concretions ↓ 2.5Y 7/6, moist, stiff, moderately plastic		
8										

498 591

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-012

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near Building 8503, south of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	10.5'
Date/Time Drilling Started	8/28/97 1440	Date/Time Total Depth Reached	8/28/97 1505		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
9	24"/24"			Ø HS 1.5		CL	CLAY	8.5-10.5 Clay, same as above, very plastic, some large concretions		A3-012-03 VOC; E/A for SVOC, T-metals Hg
10										
								Did not hit refusal		
11										
12										
13										
14										
15										
16										

GEOLOGIC BOREHOLE LOG

498 592

Borehole (Location) ID: A3-013

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Sampling area near Building 8503, south of building		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	E. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 10.5'
Date/Time Drilling Started	8/28/97 15:20	Date/Time Total Depth Reached	8/28/97 1555

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface Sample collected 8/20/97		
1	24"/24" 100%	0.5-2.5		Ø		OH	CLAY	0.5'-2.5' Clay, from 2.5Y 4/2 (dark grayish brown) to 2.5Y 7/4 (pale yellow) -> darker material has more organics, including roots; clay has lots of $CaCO_3$ concretions no matter what color it is		A3-013-02 VOC, SVOC, T-metals, etc
2						CL	CLAY			
3	No Recovery					NSNR	NSNR	2.5-4.5' No recovery, Driller has been hitting large voids Fill material? Gravel plugging splitspoon		
4										
5	24"/24" 100%	4.5-6.5'		Ø				4.5-6.5' 2.5Y 4/2 (dark grayish brown) Clay, moist, moderately plastic, stiff, no odor, some $CaCO_3$ concretions, most very small, but some over 2mm in diameter		
6										
7	24"/24" 100%	6.5-8.5		Ø		CL	CLAY	6.5-8.5' Clay 2.5Y 6/4 (light yellowish brown), moist, plastic, stiff; zones of $CaCO_3$ concretions, where the concretions make up over 50% of the material, then zones with no concretions		
8										

498 593

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-013

AFID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Sampling near building 8503, south of building			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Marim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 10.5'	
Date/Time Drilling Started 8/28/97 1520	Date/Time Total Depth Reached 8/28/97 1555		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								8.5-10.5 Clay, same as above		
9	24"/24"	8.5-10.5		Ø		CL	CLAY			→ Water at 9 feet Sample A3-013 Collected just above water table (from 7.0 to 9.0 feet) w/ Volatiles from 8.5 to [illegible] A3-013-03 VOC; E/A for SVOC, T-metals, Hg
10	100%									
								No refusal -- stopped because we hit the water table		
11										
12										
13										
14										
15										
16										

GEOLOGIC BOREHOLE LOG

498 594

Borehole (Location) ID: A3-014

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Sampling area near Building 8503, southwest of building		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 10.5'
Date/Time Drilling Started	8/29/97 07:25	Date/Time Total Depth Reached	8/29/97 0800

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
1	24"/24"			12.2		OH	CLAY	0.5-2.5' Upper 1 foot is 2.5Y 5/2 (grayish brown), clay w/organic matter & rootlets, [illegible] CaCO3 concretions, [illegible] 7/6 (yellow) w/ [illegible] & some concretions, moist, plastic		A3-014-02 VOC, SVOC, T-metals, Hg
2	100%			HC Ø						
3	17"/24"			15.5				2.5-4.5 Clay, 2.5Y 5/3 (grayish brown), moist, plastic to stiff, plastic, [illegible] concretions [illegible] small. Hit voids in this interval [Fill?]		
4	71%									
5	24"/24"			23.0		CL	CLAY	4.5-6.5 4.5-5.0 clay, same as above; 5.0-6.5 clay 2.5Y 5/3 (pale yellow), moist, plastic, stiff, no odor; CaCO3 concretions		
6	100%									
7	24"/24"			5.5				6.5-8.5 Clay, same as 5.0-6.5 interval above		
	100%									
8										

498 5951

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-014

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling near building 8503, southwest of building				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Solitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	10.5'
Date/Time Drilling Started	8/29/97 0725	Date/Time Total Depth Reached	8/29/97 0800		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
9	24"/24" 100%	8.5-10.5		Ø		CL	CLAY	8.5-10.5 Clay 2.5Y 7/6 (yellow) wet, stiff, plastic, few $CaCO_3$ concretions, no odor		Water at 9 feet. A3-014-03 from 7-9 ft VOC; E/A for SVOC, T-metals Hg
10										
11								Did not hit refusal -- stopped at water table		
12										
13										
14										
15										
16										

GEOLOGIC BOREHOLE LOG

498 596

Borehole (Location) ID: A3-015

IID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near Building 8503, northwest of SWMU 59				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	8/29/97 0810			Date/Time Total Depth Reached	8/29/97 0815

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected 8/20/97		
1	24" 100%	0.5-2.5		1.5 HS 5.4		CL	CLAY	0.5-2.5 2.5Y 8/3 (pale yellow) Clay + silt, moist, moderately plastic to non-plastic, high percentage of $CaCO_3$ concretions		A3-015-02 VOC, SVOC, T-metals, Hg Explosives, Pest/PCB's
2										
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

498 597

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-016

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near Building 8503, west of SWMU 59				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	4.3'
Date/Time Drilling Started	8/29/97 0820	Date/Time Total Depth Reached	8/29/97 0830		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected 8/20/97		
1, 2	24"/24" 100%	0.5-2.5				CL	CLAY	0.5-2.5' 2.5Y 7/6 (yellow), Clay, moist, mod. plastic to non-plastic, mod. stiff, no odor; over 50% of the material is $CaCO_3$ concretions, usually small ones		A3-016-02 MS/MSD also (did not need to redrill to get extra material) VOC, SVOC, T-metals, Hg
3, 4	21"/24" 88%	2.5-4.3		40 HS 5.5				2.5-4.3' Clay, same as above, but with pieces of more indurated limestone		A3-016-03 VOC; E[illegible]r SVOC, T-metal Hg
5, 6, 7, 8						CM	LS	Refusal at ~4.3' against bedrock * Had to change PID's at A3-016-02 (battery failure w/old one)		

GEOLOGIC BOREHOLE LOG

498 598

Borehole (Location) ID: A3-017

HID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Sampling area near Building 8503, southwest of SWMU 59				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	6.5'
Date/Time Drilling Started	8/29/97 0840	Date/Time Total Depth Reached	8/29/97 0855		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	19"/24" 79%	0.5-2.5'		11.1 HS 2.7		OL	STCL	0.5-2.5 2.5Y 4/2 (dark grayish-brown) Clay + silt, non-plastic, dry, mod. stiff, contains root material, small $CaCO_3$ concretions Fill		A3-017-02 VOC, SVOC, T-metals, Hg
2										
3	18"/24" 75%	2.5-4.5'		7.0 HS 2.7				2.5-4.5' same as above-3.3' 3.3-4.5' 2.5Y 8/4 (pale yellow) Clay, moist, mod. plastic, stiff, many $CaCO_3$ concretions		
4										
5	24"/24" 100%	4.5-6.5'		Ø HS Ø		CL	CLAY	4.5-6.5 Clay, same as above, grading into clay 2.5Y 8/1 (white), moist, plastic, stiff, some limestone textures, still a few $CaCO_3$ concretions		A3-017-03 VOC, E/F fo SVOC, T-meta Hg
6										
7						CM	LS	Refusal at 6.5' against bedrock		
8										

498 599

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-018

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Southwest corner of Building 8512, along cracks in concrete		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	7.8		
Date/Time Drilling Started	8/29/97 0945	Date/Time Total Depth Reached	8/29/97 1020

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								14" of concrete		
1										
2	18"/24" 75%	1.2-3.2		20.2		OL	STCL	1.2-3.2 2.5Y 4/2 (dark grayish brown) clay + silt, moist, moderately plastic, mod. stiff, some small $CaCO_3$ concretions, some root material upper sleeve contained residue & bits of concrete Probably fill		A3-018-02 full suite of analyses * Not enough material for Headspace screening
3										
4	24" 100%			2.4 HS 0.1				3.2-5.2 Same as above Clay content increases with depth, color becomes a little lighter, number and size of concretions increases		
5										
6	24" 100%	5.2-7.2'		Ø		CL	CLAY	5.2-7.2 Same as above to 5.5' 5.5-7.2' 2.5Y 7/4 (pale yellow) to white clay, moist, plastic, stiff Contains small $CaCO_3$ concretions		A3-018-03 full suite of analyses * Not enough material for head space screening
7										
8	0%					NSNR	NSNR	Drilled another 6" & hit refusal, no recovery in spoon		

GEOLOGIC BOREHOLE LOG

498 600

Borehole (Location) ID: A3-019

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Southeast corner of Building 8512, along cracks in concrete				
Establishing Company	The Environmental Co	Geologist	L. Muggs	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	7.0
Date/Time Drilling Started	8/29/97 1530			Date/Time Total Depth Reached	8/29/97 1050

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								12" of concrete		
1										
2	21"/24" 88%	1.0-3.0		Ø HS Ø		CH	CLAY	1.0-3.0 1.0-2.0 2.5Y 7/6 (yellow) clay, plastic, moist, stiff, bits of gravel; 2.0-3.0 2.5Y 4/3 (olive brown) clay w/some silt, many $CaCO_3$ concretions, moist, mod. plastic, no odors		A3-019-02 complete suite of analyses
3										
4	20"/24" 83%			Ø		CL	CLAY	3.0-5.0 Same as above, but color gradually changes to 2.5Y 7/4, amount of clay also increases; have series of high numbers of $CaCO_3$ concretions		
5										
6	24"/24" 100%	5.0-7.0		Ø		CH	CLAY	5.0-7.0 2.5Y 6/6 (olive yellow) clay, moist, plastic, stiff, no odor, up to 50% of material is $CaCO_3$ concretions, but no real LS texture		A3-019-03 Complete suite of analyses
7						CM	LS	Refusal against rock at 7.0 bgs		
8										

498 601

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-020

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Northwest corner of Building 8512, along cracks in concrete			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 7.1	
Date/Time Drilling Started 8/29/97 11:05		Date/Time Total Depth Reached 8/29/97 11:20	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1								13" of concrete		
2	12"/24" 50%			Ø		OL	STCL	1.1 - 3.1 Large void. Clay + silt 2.5Y 3/2 (very dark grayish brown), Clay + silt, non-plastic, dry, $CaCO_3$ concretions [Fill]		Not enough recovery for sample
3										
4	18"/24" 75%	3.1-5.1		Ø				3.1-5.1 2.5Y 7/6 (yellow) Clay, moderately plastic, dry, roughly half the material is $CaCO_3$ concretions; also contains some pieces of fossiliferous limestone -- may account for lack of recovery (piece of limestone in splitspoon)		A3-020-02 full suite of analyses
5						CL	CLAY			
6	24"/24" 100%	5.1-7.1		Ø				5.1-7.1 Clay, 2.5Y 7/6 (yellow) to white, moist, stiff, plastic, cohesive, no odors, some $CaCO_3$ concretions, but no limestone chunks		A3-020-03 full suite of analyses
7										
8						CM	LS	Refusal against limestone at 7.1 ft bgs		

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-021

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Northeast corner of Building 8512, along cracks in concrete				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	7.2
Date/Time Drilling Started	8/29/97 12:30	Date/Time Total Depth Reached	8/29/97 12:45		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1								14" of concrete		
2	19"/24" 79%	1.2-3.2		Ø		OL	STCL	1.2-3.2 2.5Y 5/3 (light olive brown) clay + silt, mod. plastic, dry, full of $CaCO_3$ concretions		A3-021-02 full suite of analyses
3										
4	22"/24" 92%	3.2-5.2		Ø HS Ø				3.2-5.2 2.5Y 8/2 (pale yellow) to white clay w/ high percentage of $CaCO_3$ concretions; changes from clay + silt above at ~4'		
5						CL	CLAY			
6	24"/24" 100%	5.2-7.2		Ø HS Ø				5.2-7.2 Same as above, higher clay content & fewer concretions		A3-021-03 + A3-021-06 full suite of analyses
7										
8						CM	LS	Refusal at 7.2' bgs (6' below concrete)		

498 6037

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A3-024

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Grid at Building 8503, on rise west of Drainage way 1		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.5'		
Date/Time Drilling Started	8/29/97 1255	Date/Time Total Depth Reached	8/29/97 1300

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface soil sample		
1	24" 100%	0.5-2.5'		Ø		OL	STCL	0.5-2.5' 2.5Y 6/3 (light yellowish brown) Clay + silt, dry, mod. plastic, crumbles because of all the $CaCO_3$ nodules in it, root material; grades into 2.5Y 8/3 (pale yellow) Clay + $CaCO_3$ concretions, mod. plastic, moist, stiff		A3-021-02 full suite of analyses
2										
						CM	LS	Refusal at 2.5'		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198 604

Borehole (Location) ID: A3-025

Project	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Grid around Building 8503, on rise west of Drainageway 1				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	8/29/97 1305	Date/Time Total Depth Reached	8/29/97 1315		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	24" 100%	0.5-2.5		Ø		OL	STCL	0.5-2.5 2.5Y 4/2 (dark grayish brown) grading into 2.5Y 7/6 (yellow) Clay with some silt, some roots; $CaCO_3$ concretions up 50% of material; dry, mod. plastic, no odor		A3-025-02 full suite of analyses
2										
3	20"/24" 83%	2.5-4.5		Ø		CL	CLAY	2.5-4.5 Same as above 2.5Y 7/4 pale yellow clay w/lots of $CaCO_3$ concretions; clay content increases w/depth & number of concretions decreases; dry, stiff		A3-025-03 full suite of analyses
4										
						CM	LS	Refusal at 4.5' against bedrock		
5										
6										
7										
8										

498 605

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A4-001

Page 1 of 1

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description North side of vehicle fueling area			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Martin	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 1.5'	
Date/Time Drilling Started 9/04/97 0750	Date/Time Total Depth Reached 9/04/97 0755		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1	12" total	0.5-1.5		59* NS 10		CL	CLAY	0-0.5 Surface soil sample collected. Clay 0.5-1.5 2.5Y 2.5/1 (black), dry, very stiff, med. plastic to plastic, [illegible] conditions at base of spoon, had fragments of [illegible] fragments, some root material.		[illegible] TPH, [illegible]
						CM	LS	Refusal at 1.5' against limestone		
2								* Tried to use dense sampling, and the PID is having trouble coping with the moisture		
3								* Tried out to 2' holes but to get enough sample material		
4										
5										
6										
7										
8										

498 606

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: FU-002

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	North of vehicle fueling area				
Establishing Company	The Environmental Co	Geologist	L. Mujera	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.5
Date/Time Drilling Started	9/04/97 0820			Date/Time Total Depth Reached	9/04/97 0825

Depth (feet)	Sampling: % Recov	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	2"	0.5-1.5		81 HS 63		CL	CLAY	0.5-1.5 [illegible] Clay (Black) dry, very stiff, not plastic by feel, small coal [illegible], some rocks, [illegible] of spoon had broken pieces of [illegible] limestone		FU-002-[illegible] BTEX, TPH, PAH
2						CM	LS	Refusal at 1.5 against limestone. * Drillers put in two holes here to get enough material for a sample		
3										
4										
5										
6										
7										
8										

498 607

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A4-003

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	North of vehicle fueling area		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (inches)	2
Total Depth (Feet)	1.5		
Date/Time Drilling Started	9/04/97 0830	Date/Time Total Depth Reached	9/04/97 0840

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	12" total	0.5-1.5		10		CL	CLAY	0.5-1.5 2.5Y 2.5/1 (black) Clay, dry, very silty, [illegible] to plastic, [illegible] consistence, [illegible] moist towards 1.5', have mix of clay & limestone fragments		A4-003-02 BTEX, TPH, PAH
2						CM	LS	1.5' Refusal against limestone		
								* Drillers put in a hole here to get enough sample material		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 608 A

Borehole (Location) ID: A4-224

IID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	North of vehicle fueling station				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.5
Date/Time Drilling Started	9/04/97 0850	Date/Time Total Depth Reached	9/04/97 0905		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	[illegible]	[illegible] 1.5		[illegible] 15		CL	CLAY	0.5-1.5 [illegible] (black) [illegible] very stiff [illegible] small $CaCO_3$ [illegible]		A4-224 BTEX, TPH, PAH
2						CM	LS	refusal at 1.5' against limestone * [illegible]		
3										
4										
5										
6										
7										
8										

498 609

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A5-001

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Disturbed area southeast of WSA, southeastern corner of grid			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 4.5	
Date/Time Drilling Started 9/03/97 1345	Date/Time Total Depth Reached 9/03/97 1400		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	22"/24"	0.5-2.5		Ø				0.5-4.5 Clay, 2.5Y 6/6 (olive yellow) to N7 (light gray), moist, stiff, mod. plastic to plastic, no odor; upper 1 foot is dried out and may have some silt mixed in		A5-001-02 VOC, SVOC, Pest/PCB, Explosives, T-metals, Hg
2						CL	CLAY	some limestone textures near base of interval		
3	100%	2.5-4.5		Ø						A5-001-03 VOC, [illegible] SVOC, P/PCB, T-metal, Hg
4										
5						CM	LS	Refusal at 4.5' against limestone		
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A5-002

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Disturbed area southeast of WSA, northeastern corner of arid				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	1.5
Date/Time Drilling Started	9/03/97 1405	Date/Time Total Depth Reached	9/03/97 1420		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithilication, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	12"	0.5-1.5		Ø		CL	CLAY	0.5-1.5 Clay 2.5Y 7/1 (light gray), mod. plastic, stiff, moist, full of $CaCO_3$ concretions, up to 70% of the material, sizes range from pinpoint to very large cobbles		A5-002-02 complete suite of analyses
2						CM	LS	Refusal at 1.5' against bedrock * Drilled redrilled at site to get enough material to sample		
3										
4										
5										
6										
7										
8										

498 611

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: A5-003

Page 1 of 1

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Disturbed area southeast of WSA. Southwestern corner of grid				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	3.5
Date/Time Drilling Started	9/03/97 1430			Date/Time Total Depth Reached	9/03/97 1455

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø		CL	CLAY	0.5-3.5 Clay, 2.5Y 6/6 (olive yellow) with zones of lightgray, moist, plastic, stiff, $CaCO_3$ concretions, upper 1' has dried out		A5-003-02 A5-003-05 Complete suite of analyses
2										
3	12"	2.5-3.5		Ø						A5-003-123 complete suite of analyses, all Extract/Prep except VOCs
4						CM	LS	Refusal at 3.5' against bedrock		
5								* Had to redrill at this site to get enough material for the duplicate sample. With the re-drill, had only enough material to get the regular sample at A5-003-03		
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 612

Borehole (Location) ID: AS-004

HID	CRSWL	Site/ID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Disturbed area southeast of WSA, northwestern corner of grid				
Establishing Company	The Environmental Co	Geologist	L. Muers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.7'
Date/Time Drilling Started	9/04/97 0735			Date/Time Total Depth Reached	9/04/97 0740

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	15" [illegible]	0.5-1.7'		Ø HS 5		GM	GVST	0.5 - 1.7 Limy silty sand [illegible] of weathered [illegible] (2.5Y 8/[illegible] pale yellow)		AS-004 [illegible] Full [illegible]
2						CM	LS	1.7 Refusal at bedrock * Drilled twice at same spot to get enough material for sample		
3										
4										
5										
6										
7										
8										

498 613

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-001

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain at front of 8531. west of door				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	2.5'
Date/Time Drilling Started	9/02/97 1235	Date/Time Total Depth Reached	9/02/97 1237		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface soil sample collected		
		0.5-2.5'				CL	STCL	0.5-0.7 Dark brown organic topsoil (clay & silt) w/ roots		BD-001-02 Explosives, T-metals, Hg -
1	100%			1				0.7-2.5 2.5Y 7/2 (light gray) heavily weathered limestone [Saprolite]		
				HS		MLCL	STCL	Not clay like in previous holes, just heavily weathered rock, complete with fossils and a fissile texture		
				Ø						
2										
						CM	LS	Refusal at 2.5' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 614

Borehole (Location) ID: BD-002

ID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Bunker drain at front of 8531. east of door			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5	
Date/Time Drilling Started 9/02/97 1245	Date/Time Total Depth Reached 9/02/97 1250		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample		
1	22"/24"	0.5-2.5'		Ø		OL	STCL	0.5-0.8' Dark brown organic topsoil (silt & clay) w/ roots		BD-002-02 Explosives, T-metals, Hg
2	72%			HS 58.4		MLCL	STCL	0.8-2.5' 2.5Y 7/2 (light gray) heavily weathered micritic fossiliferous limestone, has zones of more intense weathering, where limy material has crumbled to silt-size grains, mixed in with zones of more indurated rock		
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

498 615

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD - 003

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain in front of 8533, west of door				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	6.5
Date/Time Drilling Started	9/02/97 12:55	Date/Time Total Depth Reached	9/02/97 13:10		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	100%	0.5-2.5		Ø HS Ø		OH	STCL	0.5-0.9 Dark brown organic topsoil (silt & clay) w/ roots, chunks of limestone 0.9-2.5 2.5 Y 6/6 Clay, mod. plastic, stiff, has limestone textures; mixed in w/ zones of more indurated limestone		BD-003-02 T-metals, Hg Explosives
2										
3	22"/24"	2.5-4.5		Ø HS		CL	CLAY	2.5-4.5 Clay, same as above, color zones of light gray mixed in, few small concretions		
4	92%			Ø						
5	23"/24"	4.5-6.5		Ø HS				4.5-6.5 Same as above		BD-003-03 T-metals, Hg Explosives (Extract/Acid for all analysis)
6	96%			Ø						
7						CM	LS	6.5' Refusal against micritic, fossiliferous limestone		
8										

GEOLOGIC BOREHOLE LOG

498 6116

Borehole (Location) ID: BD-004

ID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Bunker drain in front of 8533, east of dam		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	6.5		
Date/Time Drilling Started	9/02/97 13:15	Date/Time Total Depth Reached	9/02/97 13:35

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	21"/24" 88%	0.5-2.5		Ø HS Ø		OH / CL	STCL / CLAY	0.5-0.8 Dark brown organic topsoil (silt & clay) w/roots, $CaCO_3$ concretions; 0.8-2.5' 2.5Y 7/4 (pale yellow) Clay, nonplastic to mod. plastic, dry, over 50% of the material is $CaCO_3$ concretions with a wide size range (very small to large)		BD-004-02 Explosives, Hg, T-metals
2										
3	100%	2.5-4.5		Ø				2.5-4.5 Clay, 2.5Y 6/8 (olive yellow) with streaks of pale gray, plastic, moist, mod. stiff, scattered $CaCO_3$ concretions, some flaggy texture		
4						CH	CLAY			
5	18"/24" 75%	4.5-6.5		Ø HS Ø				4.5-6.5 Clay, same as above		BD-004-03 Explosives, Hg, T-metals [Left a Archive for all]
6										
7						CM	LS	6.5' refusal against limestone		
8										

498617

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-005

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain in front of 8535, west of door				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/02/97 13:40	Date/Time Total Depth Reached	9/02/97 13:50		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS Ø				0.5-2.5 2.5Y 3/3 organic topsoil Clay & silt, becoming lighter in color with depth, dry, nonplastic, contains small $CaCO_3$ concretions, chunks of weathered limestone, & roots -- up to 50% of the recovered material		BD-005-02 Explosives, Hg, T-metals
2										
						OL	STCL	2.5-4.5 Clay & silt as above		BD-005-03 Extract/A[illegible]s for Explosives, T-metals, Hg
3	20"/24"	2.5-4.5		Ø HS Ø						
4	83%									
						CM	LS	4.5' Refusal against limestone		
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498618

Borehole (Location) ID: BD-006

HID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain in front of 8535, east of door				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.0
Date/Time Drilling Started	9/02/97 13:55	Date/Time Total Depth Reached	9/02/97 14:00		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS Ø		OL	STCL	0.5-1.3 Organic brown topsoil, silt & clay & roots, some fine gravel, non plastic 1.3-2.5 2.5Y 5/4 (light olive brown) Clay mixed with rounded pieces of gravel, scattered $CaCO_3$ concretions, nonplastic, dry [Fill]		BD-006-02 Explosives, Hg T-metals
2										
3	14"/18" 78%	2.5-4.0		Ø HS Ø		GC	FILL	2.5-4.0 Same as 1.3-2.5' interval above		BD-006-03 Extract/Archive for Explosives, & T-metals
4						CM	LS	4.0' Refusal against bedrock		
5										
6										
7										
8										

498 619

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-007

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Bunker drain in front of 8537 west of door		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	3.5		
Date/Time Drilling Started	9/02/97 14:10	Date/Time Total Depth Reached	9/02/97 14:15

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS Ø		OL	STCL	0.5-1.3 Organic brown topsoil (silt & clay) w/roots, non plastic, some small $CaCO_3$ concretions 1.3-2.2 2.5Y 7/3 (pale yellow) clay, mod. plastic, dry, still some roots, $CaCO_3$ concretions (abundant)		BD-007-02 Explosives, Hg T-metals
2						CL	CLAY	2.2-3.5 2.5Y 3/2 (very dark grayish brown), mod. plastic clay, scattered $CaCO_3$ concretions, most small		
3	12"/12"	2.5-3.5		Ø HS Ø						BD-007-03 Extract/A[illegible]ve for all above analyses
4						CM	LS	3.5 Refusal against pale gray limestone		
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 620

Borehole (Location) ID: BD-008

Page 1 of 1

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain in front of 8537, east of door				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/02/97 14:25	Date/Time Total Depth Reached	9/02/97 14:35		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS Ø		OL	STCL	0.5-0.8 Organic topsoil (silt & clay) with roots, dark brown 0.8-2.5 2.5Y 4/2 (dark grayish brown) Clay & silt with roots, rounded gravel, some CaCO3 concretions [Fill]		BD-008-02 Explosives, Hg, T-metals
2										
3	19" / 24" 79%	2.5-4.5'		Ø HS Ø		GC	FILL	2.5-3.5 Same as 0.8-2.5 above 3.5-4.5 Dark grayish brown silt & clay with only traces of gravel and CaCO3 concretions [fill dirt]		BD-008-03 E/A for Explosives, T-metals, Hg
4										
5						CM	LS	4.5' Refusal against bedrock		
6										
7										
8										

498 621

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-009

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain in front of 8539, west of door				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.25
Date/Time Drilling Started	9/02/97 1440	Date/Time Total Depth Reached	9/02/97 1445		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
	15" total	0.5-2.25		∅		OL	STCL	0.5-0.8 Organic dark brown topsoil (silt & clay) w/ root material		BD-009-02 Explosives, Hg, T-metals
1						GC	FILL	0.8-2.5 2.5y 7/3 (pale yellow) to 2.5y 4/2 (dark grayish brown) mix of Clay, silt, and fine gravel, nonplastic, dry [FILL]		
2										
						CM	LS	Refusal at 2.25' against limestone bedrock		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD - 010

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Bunker drain in front of 8539, east of door		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 2.8
Date/Time Drilling Started	9/02/97 1450	Date/Time Total Depth Reached	9/02/97 1500

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface soil sample collected		
1	16" / 24"	0.5-2.5'		Ø				0.5-2.5 2.5Y 3/2 (very dark grayish brown) silt + clay + gravel with high percentage of root material [Fill]		BD-010-02 BD-010-05 Explosives, Hc T-metals
	67%			HS Ø		GC	FILL			
2										
	4"	2.5-2.8		Ø				2.5-2.8 Sand + material as above		No sample
3						CM	LS	Refusal at 2.8' against bedrock		
4								* Driller reported sand in the area where he was drilling-- that's the sand that fell in the second spoon. * Had to redrill a few inches away to get enough material for a duplicate		
5										
6										
7										
8										

498623

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-011

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Bunker drain in front of 8541, west of door		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/02/97 1510	Date/Time Total Depth Reached	9/02/97 1515

Depth (feet)	Sampling: % Recov	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample recovered		
1	18" total	0.5-2.0'		∅		OL	STCL	0.5-1.2 Organic dark brown topsoil (silt & clay) w/ root matter		BD-011-02 Explosives, Hg T-metals
						GC	FILL	1.2-2.0 2.5y 3/2 (very dark grayish brown) Clay w/some silt and with up to 50% pieces of limestone (not rounded gravel, but pieces of bedrock) [Fill]		
2						CM	LS	2.0' refusal against bedrock		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 624

Borehole (Location) ID: BD-012

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Bunker drain in front of 8541, east of door		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.0
Date/Time Drilling Started	9/02/97 1520	Date/Time Total Depth Reached	9/02/97 1525

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	15"/18"	0.5-2.0		Ø		OL	STCL	0.5-1.2 Organic dark brown topsoil (silt & clay) w/root material		BD-012-02 Explosives, T-metals
						GC	FILL	1.2-2.0 2.5Y 3/2 (very dark grayish brown) Clay w/some silt and with large pieces of limestone		
2						CM	LS	2' Refusal against bedrock		
3										
4										
5										
6										
7										
8										

498-625

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-013

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Bunker in front of 8552, east of door			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 1.2'	
Date/Time Drilling Started 9/03/97 0715		Date/Time Total Depth Reached 9/03/97 0725	

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	9" total	0.5-1.2'		3.5 HS 13.4		GC	FILL	0.5-1.2 2.5Y 3/2 (very dark grayish brown) Clay & silt, rounded gravel, angular chunks of limestone, root material		BD-013-02 Explosives, Hg, T-metals
						CM	-S	1.2' refusal against bedrock		
2								* Drillers put in two holes next to each other to get enough material for sample		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-014

CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Bunker drain in front of 9552, west of door			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2.	Total Depth (Feet) 1.5'	
Date/Time Drilling Started 9/03/97 0735		Date/Time Total Depth Reached 9/03/97 0740	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	ppm PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface Soil Sample collected		
1	12" total	0.5-1.5'		HS 15.2		GC	FILL	0.5-1.5' 2.5 Y 3/2 (very dark grayish brown) Clay & silt & chunks of limestone & small rounded gravel; some organic component & root material, in 0.5-0.7 interval [illegible]		BD-014-02 Explosives, T-metals
2						CM	LS	1.5' Refusal against bedrock * Drillers put in two holes at the site to get enough material for a sample		
3										
4										
5										
6										
7										
8										

498 627

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD - 015

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Bunker drain in front of 8560, east of door			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 2.5	
Date/Time Drilling Started 9/03/97 0755	Date/Time Total Depth Reached 9/03/97 0800		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	24" 100%	0.5-2.5		3/2 HS 23		OL	STCL	0.5-0.8' Organic dark brown topsoil, silty clay, with minor root material		BD-015-02 Explosives, Hg, T-metals
2						GC	FILL	0.8-2.5' 2.5Y 3/2 (very dark grayish brown) Clay, dry, nonplastic to moderately plastic, over 50% of the material is large chunks of limestone, have some smaller $CaCO_3$ concretions and some rounded gravel also [Fill]		
3						CM	LS	Refusal at 2.5' against bedrock		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 628

Borehole (Location) ID: BD-016

Project	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Bunker drain in front of 8560, west of door		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 3.0
Date/Time Drilling Started	9/03/97 0805	Date/Time Total Depth Reached	9/03/97 0815

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
						OL	STC	0.5-0.6 Organic dark brown topsoil, silt & clay, with much root material		BD-016-02 Explosives, Hg, T-metals
1	24" 100%	0.5 - 2.5'		17				0.6-2.5' 2.5y 3/2 very dark grayish brown, Clay, dry, non-plastic to rod. plastic, over 50% of the material is large chunks of limestone; some calcareous concretions & rounded gravel also [Fill]		
2				HS 32		GC	FILL			
3	6"	2.5-3.0		Ø				2.5-3.0 Same as above		No sample
						CM	LS	3.0' Refusal against limestone		
4										
5										
6										
7										
8										

498 629

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-017

AFID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Bunker drain in front of 8558, east of door		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	3.5		
Date/Time Drilling Started	9/03/97 0820	Date/Time Total Depth Reached	9/03/97 0840

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5'		4.5 HS 10		OL	STCL	0.5-0.9' Organic dk brown topsoil (silt & clay) with lots of root material		BD-017-02 MS/MSD also Explosives, Hg, T-metals
						GC	FILL	0.9-1.5' 2.5Y 8/2 (pale yellow) clay, nonplastic, dry, over 70% consists of chunks of limestone		
2								1.5-3.0 2.5Y 3/2 (very dark grayish brown) clay, dry, med. plastic, contains small pieces of gravel and some [illegible] concretions		
3	12" total	2.5-3.5		5.5 HS 46.7		GM	FILL	3.0-3.5 Mix of limestone chunks & sand [Fill]		BD-017-03 MS/MSD also Extract/Archive for above analyses
4						CM	LS	Refusal at 3.5' against limestone		
								* Drillers put in a second hole in this same area to get enough material for MS/MSD		
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD - 018

CRSWL	SiteID 18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Bunker drain in front of 8558, west of door		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 3.5
Date/Time Drilling Started	9/03/97 0845	Date/Time Total Depth Reached	9/03/97 0855

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	ppm PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
		0.5-2.5		9.6		OL	STCL	0.5-0.8 Organic dark brown topsoil w/root material		BD-018-02 Explosives, Hg, T-metals
1	100%			HS 35		SD	SAND	0.8-1.3 Sand, med. to coarse grain size, 2.5Y 8/6 (yellow)		
2						GC	FILL	1.3-3.0 2.5Y 3/2 (very dark grayish brown) clay, dry, mod. plastic, with over 50% angular chunks of limestone in some zones		
3	12" total	2.5-3.5		4.9		GM	FILL	3.0-3.5 Fractured chunks of limestone with some sand mixed in.		BD-018-03 Explosives, Hg, T-metals
4						CM	LS	Refusal at 3.5' against limestone		
5										
6										
7										
8										

498 631

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-019

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Bunker drain in front of 8556, east of door		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.7		
Date/Time Drilling Started	9/03/97 0900	Date/Time Total Depth Reached	9/03/97 0910

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	21" / 24"	0.5-2.5		2.7		OL	STCL	0.5-0.8 Organic dark brown topsoil (silt & clay) w/roots		BD-019-C2 Explosives, Hg, T-metals
2	88%			HS 78.1		GC	FILL	0.8-2.5 2.5Y 3/2 (very dark grayish brown) clay, moist, moderately plastic, contains large chunks of limestone, small gravel, & sand [Fill]		
3	2" total					CL / CM	CLAY / LS	2.5-2.7 2.5Y 6/6 (olive yellow) clay w/ $CaCO_3$ concretions and pieces of more indurated limestone; has some limestone texture, so may be saprolite. Refusal at 2.7' against limestone		No sample
4										
5										
6										
7										
8										

198 632 B

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD - 020

CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Bunker drain in front of 8556, west of door			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5	
Date/Time Drilling Started 9/03/97 0912	Date/Time Total Depth Reached 9/03/97 0917		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	14"/24" 58%	0.5-2.5'		2.7		GC	FILL	0.5-2.5' 2.5 Y 5/6 (light olive brown) Clay w/ large chunks of light gray limestone, rounded gravel, & sand [Fill]		BD-020-02 BD-020-05 Explosives, Hg, T-metals Not enough material for headspace
2										
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

498-633

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BD-021

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Bunker drain in front of 8554, east of door		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/03/97 0920	Date/Time Total Depth Reached	9/03/97 0925

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	18" total	0.5-2.0		2.9 HS 12.2		OL	STCL	0.5-0.7 Organic dark brown topsoil w/roots		BD-021-02 Explosives, Hg, T-metals
						GM	FILL	0.7-2.0 Mix of sand, med to coarse, 2.5Y 7/6 (yellow), with chunks of limestone, some heavily weathered, some very fresh [Fill]		
2						CM	LS	Refusal at 2.0' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 634

Borehole (Location) ID: BD-022

CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Bunker drain in front of 8554, west of door			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 1.5	
Date/Time Drilling Started 9/03/97 0930	Date/Time Total Depth Reached 9/03/97 0935		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface soil sample collected		
1	12" total	0.5-1.5		HS 12.2		OL	STCL	0.5-0.7 light brown organic topsoil		BD-022-02 Explosives, Hg T-metals
						CL	CLAY	0.7-1.5 Clay, light gray, and weathered limestone		
2						CM	LS	Refusal at 1.5' against limestone * Shell casing recovered in sample material -- may get some hits in the T-metals analyses		
3										
4										
5										
6										
7										
8										

498 635

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BK-001

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Background location 1, near Jacobs Engineering Well 926		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/05/97 1035	Date/Time Total Depth Reached	9/05/97 1040

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	12" total	0.5-2.0				OL	STCL	0.5-2.0 dark brown silt & clay w/ root material, minor $CaCO_3$ concretions		
2						CM	LS	No sample collected → Refusal at 2.0' * Need at least 4.0 of recovery for each background site (2 samples per site)		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198 636

Borehole (Location) ID: BK-002

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Backaground location 2		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 4.5
Date/Time Drilling Started	9/05/97 1105	Date/Time Total Depth Reached	9/05/97 1125

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CCCE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	21"/24" 88%	0.5-2.5				CLML	STCL	0.5-3.5 Med. brown clay & silt mixed with $CaCO_3$ concretions, concretions up to 50% of the material, dry, nonplastic to mod. plastic		BK-002-02 complete suite of analyses
2										
3	21"/24" 88%	2.5-4.5'								BK-002-03 Extract/Archive for complete suite of analyses
4						CL	CLAY	3.5-4.5 2.5Y 7/6 (yellow) to pale gray clay, dry, stiff, nonplastic, some $CaCO_3$ concretions, has flaggy limestone texture.		
5						CM	LS	Refusal at 4.5' against limestone		
6										
7										
8										

498 637

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BK-003

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Background location 3			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5	
Date/Time Drilling Started 9/05/97 14:35	Date/Time Total Depth Reached 9/05/97 14:50		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	22"/24" 92%	0.5-2.5'				CL	CLAY	0.5-2.5 2.5Y 4/3 (olive brown) Clay, moist, stiff, mod. plastic, full of $CaCO_3$ concretions, some quite large		BK-003-02 MS/MSD also Complete suit of analyses; VOCs in brass sleeve (one sleeve for sample & MS/MS
2										
3						CM	LS	* Refusal at 2.5' on almost limestone with a pale pink coloration		
4								* Drillers put in 3 holes to get enough material to do MS/MSD		
5								* Driller's helper (Dave) reported a slight odor when he broke the spoon apart. No one collecting the samples noticed any odors.		
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198-638

Borehole (Location) ID: BK-004

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Background location 4				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5
Date/Time Drilling Started	9/05/97 14:10	Date/Time Total Depth Reached	9/05/97 14:15		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	22"/24"	0.5-2.5				OL	STCL	0.5-2.5 2.5Y 2.5/1 Black, Clay & Silt, dry, mod. plastic, mod. silty, $CaCO_3$ concretions scattered throughout, usually small, plenty of root material		BK-004-C2 complete suite of analyses
2	92%									
3						CM	LS	Refusal at 2.5' against dark gray fossiliferous limestone		
4										
5										
6										
7										
8										

498639

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BK-005

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Background location 5, north of WSA		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.5		
Date/Time Drilling Started	9/05/97 1420	Date/Time Total Depth Reached	9/05/97 1425

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	19"/24" 79%	0.5-2.5				OL	STCL	0.5-0.8 Dark brown topsoil/silt & clay) w/ root material		BK-005-02 complete suite of analyses
2						GC	LS	0.8-2.5 limestone rubble -- mix of limy sand & silt w/ bits & pieces of limestone		
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

1198640

Borehole (Location) ID: BK-006

IID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Background location 6, near BK-001				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.8
Date/Time Drilling Started	9/05/97 1045	Date/Time Total Depth Reached	9/05/97 1055		

Depth (feet)	Sampling: % Recov	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected.		
1	22"/24"	0.5-2.5				MLCL	STCL	0.5-2.3 2.5Y 5/2 (grayish brown) Silt & clay; dry, nonplastic to med. plastic, firm, contains many small $CaCO_3$ concretions		
2	92%									
	3/4"					GC	LS	2.3-2.8 Pale gray to white limestone rubble		
3						CM	LS	Refusal at 2.8' against limestone * No sample collected -- need material to at least 4 feet so we can get two samples per hole		
4										
5										
6										
7										
8										

498 641

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BK-007

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Background location 7				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/05/97 1455	Date/Time Total Depth Reached	9/05/97 1510		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected 9/05/97, 14:35		
		0.5-2.5				OL	STCL	0.5-0.8' Dark brown silt & clay (top-soil) w/root material		BK-007-02 full suite of analyses
1	20"/24" 83%							0.8-4.5' 2.5y 5/4 (light olive brown) Clay, moist, stiff, mod. plastic, scattered small $CaCO_3$ concretions and root material		
2						CL	CLAY			
3	22"/24"	2.5-4.5								BK-007 [redacted] full suite of analyses plus Grain Size
4	92%							3.5-4.5 Mix of clay & more indurated limestone; clay develops flaggy texture		
5						CM	LS	Refusal at 4.5' against flaggy limestone		
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: BK-008

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Back ground location 8				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson.	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/05/97 15:40	Date/Time Total Depth Reached	9/05/97 16:15		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected 9/05/97, 15:25		
1	22"/24"	0.5-2.5				CL	CLAY	0.5-3.5 2.5Y 4/3 (olive brown) Clay w/some silt, dry, nonplastic to med. plastic, firm, lots of small $CaCO_3$ concretions & root material		BK-008-02 full suite of analyses BK-008-05 full suite of analyses
2										
3	21"/24"	2.5-4.5								BK-008-03 Full suite of analyses plus TOC BK-008-06 Full suite of analyses
4						CH	CLAY	3.5-4.5 2.5Y 6/6 (olive yellow) Clay, moist, plastic, stiff, scattered $CaCO_3$ concretions, some large		
5						CM	LS	Refusal at 4.5' against limestone *Drillers put in 2 holes here to get enough material for sample		
6										
7										
8										

498 643

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-001

Page 1 of 1

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainage way west of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.0'
Date/Time Drilling Started	8/29/97 13:20	Date/Time Total Depth Reached	8/29/97 13:30		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	18"/24" 75%	0.5-2.0		Ø		OH		0.5-2.0 2.5Y 3/2 (very dark grayish brown) organic clay w/lots of roots, some $CaCO_3$ nodules; 1-2 feet, have 2.5Y 7/1 (light gray) clay w/more indurated zones of light gray limestone, dry, non-plastic		DW1-001-02 full suite of analyses
						CL	CLAY			
2						CM	LS	Refusal at 2.0' against limestone * Redrilled a few inches away to get enough material to sample		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1 - 002

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainage way west of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	3.2
Date/Time Drilling Started	8/29/97			Date/Time Total Depth Reached	8/29/97

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface Sample Collected		
1	24" 100%	0.5-2.5'		Ø		OH	CLAY	0.5-2.5 Upper 6" is organic-rich wet clay w/ lots of roots; 1-2.5' 2.5Y 8/2 (pale yellow) clay, very stiff, mod. plastic, moist, a few small $CaCO_3$ concretions; grades into highly weathered limestone (saprolite)		DW1-002-02
2						CL	CLAY			
3	8" Total			Ø				2.5-3.2' White stiff clay moist, plastic, texture of flaggy limestone		
						CM	LS	Refusal at 3.2' against limestone		
4										
5										
6										
7										
8										

498 645

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-003

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Drainage Way 1 west of Building 8503			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet)	
Date/Time Drilling Started 9/02/97 08:05		Date/Time Total Depth Reached 9/02/97 0830	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	24" 100%	0.5-2.5		18.5		OH	CLAY	0.5-1.5' Mix of 2.5Y 7/6 (yellow) clay plus chunks of limestone, some organic material & roots; grades into 2.5Y 8/2 (pale yellow) clay, med. plastic, moist, no odor, some flaggy texture (1.5-2.5')		DW1-003-02 MS/MSD also Full suite of analyses
2										
3	18" total	2.5-4.0		4.2		CL	CLAY	2.5-4.0 Clay, 2.5Y 8/2 (pale yellow) as above		DW1-003-[illegible] MS/MSD *These will be analyzed → no E/A samples
4						CM	LS	Refusal at 4.0' against limestone *Redrilled entire hole to get enough material for MS/MSD		
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 646

Borehole (Location) ID: DW01-004

UID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainage way west of Building 2503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	3.7
Date/Time Drilling Started	9/02/97 0835	Date/Time Total Depth Reached	9/02/97 0950		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface sample collected		
1	75%	0.5-2.5		Ø		OL	STCL	0.5-1.0 mix of Clay & silt, dark brown, some roots, some gravel (very fine) [Fill] 1.0-2.5 Clay, 2.5Y 7/2 (light gray), moderately plastic, moist, no odor, some flaggy limestone texture		DW1-004-02 Full suite of analysis
2						CL	CLAY			
3	14" total	2.5-3.7'		Ø				2.5-3.7 Clay, same as 1.0-2.5' interval above		DW1-004-03 Full suite of analysis VOA in jar
4						CM	LS	Refusal at 3.7 against limestone		
5										
6										
7										
8										

498 647

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-005

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainage way west of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5
Date/Time Drilling Started	9/02/97 0905	Date/Time Total Depth Reached	9/02/97 0910		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	22"/24"	0.5-2.5		ϕ				0.5-2.5' 2.5Y 7/6 (yellow) to 2.5Y 8/2 (pale yellow) to light gray clay, becomes lighter with depth, clay is dry, non-plastic to mod. plastic, up to 50% of material is $CaCO_3$ concretions near 0.5', then steadily decreases		DW1-005-02 full suite of analyses
				HS ϕ		CL	CLAY			
2	12%									
3						CM	LS	Refusal at 2.5' against bedrock		
4										
5										
6										
7										
8										

498 648

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-006

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainage way west of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	2.5
Date/Time Drilling Started	9/02/97 0853	Date/Time Total Depth Reached	9/02/97 0857		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	22"/24"	0.5-2.5		Ø HS Ø		DL	STCL	0.5-1.5 Clay + silt, dark brown, some roots, small $CaCO_3$ concretions, trace very fine gravel 1.5-2.5 2.5Y 8/2 (pale yellow) Clay, non-plastic to med. plastic, dry, some $CaCO_3$ concretions		DW1-006-S2 DW1-006-S5 Full suite of analyses
2						CL	CLAY			
3						CM	LS	Refusal at 2.5 against bedrock * Redrilled to get enough material for sample		
4										
5										
6										
7										
8										

498 649

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-007

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Drainageway west of Building 8503		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	10		
Date/Time Drilling Started	9/02/97 0715	Date/Time Total Depth Reached	9/02/97 0945

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1	24" 100%	0.5-2.5'		Ø HS Ø				0.5-2.5' 2.5Y 6/4 (light yellowish brown) Clay with some silt, nonplastic to mod. plastic, $CaCO_3$ concretions (up to 50% of the material), dry		DW1-007-02 Full suite of analysis
2										
3	16"/24"			Ø HS				2.5-4.5 2.5Y 7/3 (pale yellow) Clay, mod. plastic to plastic, moist, $CaCO_3$ concretions, some quite large, up to 30% of the material		
4	67%			Ø		CL	CLAY			
5	24" 100%			Ø HS				4.5-6.5 same as above, becoming lighter in color, more plastic, amount of $CaCO_3$ concretions increases		
6				Ø						
7	24" 100%			Ø HS Ø				6.5-10 Clay 2.5Y 6/6 (olive yellow) to light gray, moist, plastic, few concretions		
8										

GEOLOGIC BOREHOLE LOG

198 659

Borehole (Location) ID: DWI-007

Site ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainage way west of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	10
Date/Time Drilling Started	9/02/97 0915	Date/Time Total Depth Reached	9/02/97 0945		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
		8-10'								DWI-007-03 Full suite of analysis
9	18"/18"			Ø HS Ø		CL	CLAY			
10						CM	LS	Refusal at 10' against micritic, fossil limestone		
11										
12										
13										
14										
15										
16										

498 651

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1 - 008

AFID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Drainage way west of Building 8503		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 8.5
Date/Time Drilling Started	9/02/97 0950	Date/Time Total Depth Reached	9/02/97 1020

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description (SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing)	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface Sample Collected		
1	21" / 24" 72%	0.5-2.5		Ø		OL	STCL	0.5-2.2' 2.5Y6/4 (light yellowish brown) clay + silt, dry, non plastic to mod. plastic, trace fine gravel, many $CaCO_3$ concretions, root material		DW1-008-C2 Full suite of analyses
2								2.2-2.5' 2.5Y 8/4 (pale yellow) Clay + silt; higher % of $CaCO_3$ concretions than above, concretions larger, dry, non plastic to mod. plastic		
3	24" 100%	2.5-4.5'		Ø HS Ø		CLML	STCL	2.5-4.5 same as 2.2-2.5' interval, clay content increasing with depth, amount of $CaCO_3$ concretions very high (up to 50% of material)		
4										
5	24" 100%	4.5-6.5		Ø				4.5-5.3 Color change to mix of pale yellow with dark brown -- probably material from higher in the hole		
6				HS Ø		CL	CLAY	5.3-6.5' - 2.5Y 7/4 Clay, moist, mod. plastic to plastic, full of $CaCO_3$ concretions (up to 30% of material)		
7	24" 100%	6.5-8.5		Ø		CH	CLAY	6.5-8.5 Clay, Plastic, 2.5Y 7/4 to 2.5Y 7/1 (light gray), contains some $CaCO_3$ concretions, a few fossils, moist, stiff, no odor		DW1-008-03 Full suite of analyses
8										

GEOLOGIC BOREHOLE LOG

198 652

Borehole (Location) ID: DW1-008

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Drainageway west of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Martin
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	8.5
Date/Time Drilling Started	9/02/97 0950	Date/Time Total Depth Reached	9/02/97 1020		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
						CH	CLAY			
9						CM	LS	Refusal at 8.5' against limestone		
10										
11										
12										
13										
14										
15										
16										

498 653

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-009

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Drainageway 1, south of Building 8503		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	8.5		
Date/Time Drilling Started	9/02/97 1030	Date/Time Total Depth Reached	9/02/97 1055

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1, 2	100%	0.5-2.5'		Ø		OL	STCL	0.5-2.2 2.5Y 4/2 (dark grayish brown) Clay & silt, dry, nonplastic to mod. plastic, contains up to 40% $CaCO_3$ concretions, trace fine gravel, some root material. 2.2-2.5 2.5Y 6/6 (olive yellow) Clay, moist, mod. plastic, $CaCO_3$ concretions		DW1-009-02 Full suite of analyses
3, 4	22"/24" 92%	2.5-4.5		Ø		CL	CLAY	2.5-4.5 2.5Y 5/3 (light olive brown) Clay, moist, mod. plastic to plastic, stiff, small $CaCO_3$ concretions		
5, 6	21"/24" 88%	4.5-6.5		Ø				4.5-5.4' Same as above. 5.4-6.5' Clay, 2.5Y 8/2 (pale yellow), moist, plastic, $CaCO_3$ concretions, some quite large		
7, 8	24" 100%	6.5-8.5'				CH		6.5-8.5 Same as above, grades into light gray clay with some limestone textures, still $CaCO_3$ concretions; below water table, have calcite crystals		DW1-009-03 6.5-8.5' Full suite of analyses. Hit water at 8.0 ft

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-009

FID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Drainageway 1, South of Building 8503		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 8.5
Date/Time Drilling Started	9/02/97 1030	Date/Time Total Depth Reached	9/02/97 1055

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								Drilling stopped at 8.5' after hitting water		
9										
10										
11										
12										
13										
14										
15										
16										

498 655

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: DW1-010

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Drainage way 1, south of building 2503			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 3.5'	
Date/Time Drilling Started 9/02/97 11:00		Date/Time Total Depth Reached 9/02/97 11:15	

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	20"/24"	0.5-2.5		Ø		OH	STCL	0.5-1.7 2.5Y 4/3 (Olive brown) Clay & silt, dry, non-plastic, small $CaCO_3$ concretions 1.7-2.5 2.5Y 8/3 (pale yellow) clay, mod. plastic, moist, some layering & texture		DW1-010-02 Full suite of analyses
2										
3	12"/12"	2.5-3.5		Ø		CL	CLAY	2.5-3.5 2.5Y 6/4 (light yellowish brown) clay, moist, moderately plastic, lots of $CaCO_3$ concretions, some fossils, large chunks of limestone		DW1-010-03 Full suite of analyses
4						CM	LS	* Driller moved several inches & re-drilled entire hole to get enough material for DW1-010-03 Refusal at 3.5' against limestone		
5										
6										
7										
8										

498 656

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-001

FIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	EOD Range, westernmost hole, west of bunker		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/05/97 1015	Date/Time Total Depth Reached	9/05/97 1020

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 surface soil sample collected		
1	18" total	0.5-2.0				GC	LS	0.5-2.0 mix of pale gray to white limy sand & silt w/chunks of limestone -- rubble zone on top of more competent bedrock.		EOD-001-02 Explosives, Hg T-metals
2						CM	LS	Refusal at 2.0 against limestone		
3										
4										
5										
6										
7										
8										

498 657

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-002

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5
Date/Time Drilling Started	9/05/97 0950	Date/Time Total Depth Reached	9/05/97 0955		

Depth (feet)	Sampling: % Recov	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	21" / 24" 88%	0.5-2.5				OL	STCL	0.5-2.0 2.5y 3/2 (very dark grayish brown) Clay & silt w/ organic material, esp. roots, scattered CaCO3 concretions, dry, nonplastic		EOD-002-02 T-metals, Hg, Explosives
2						GC	LS	2.0-2.5 mix of clay/silt with limestone chunks -- limestone rubble zone		
3						CM	LS	Refusal at 2.5 against limestone		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198658

Borehole (Location) ID: EOD-003

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	8.5
Date/Time Drilling Started	9/05/97 0910	Date/Time Total Depth Reached	9/05/97 0940		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	22"/24"	0.5-2.5		∅		OH	CLAY	0.5-3.5 2.5Y 6/3 (light yellowish brown) to 2.5Y 5/2 (grayish brown) clay, firm, mod. plastic w/ $CaCO_3$ concretions up to 30% of the material, lots of root material		EOD-003-02 T-metals, Hg, Explosives
2	92%									
3	19"/24"	2.5-4.5								
4	79%							3.5-8.5 2.5Y 7/6 (yellow) Clay, moist, plastic, firm, minor small $CaCO_3$ concretions; with depth, color becomes lighter, to pale gray or white; still have minor root material; have zones of abundant $CaCO_3$ concretions		
5	100%	4.5-6.5'				CH	CLAY			
6										
7	21"/24"	6.5-8.5'		HS ∅						EOD-003-03 E/A for all analyses listed above
8	88%									

498 659

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-003

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	8.5
Date/Time Drilling Started	9/05/97 0910	Date/Time Total Depth Reached	9/05/97 0940		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification; moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
9						CM	LS	Refusal at 8.5' against limestone		
10										
11										
12										
13										
14										
15										
16										

498 660

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-004

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	5.5
Date/Time Drilling Started	9/05/97 0805	Date/Time Total Depth Reached	9/05/97 0825		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	15"/24" 62%	0.5-2.5		HS 2.0		OL	STCL	0.5-0.9 2.5y 4/3 (olive brown) Clay & silt with limestone concretions also limestone chips (rubble zone) 0.9-5.5 2.5y 6/6 (olive yellow) Clay, moist, plastic, firm, contains scattered $CaCO_3$ concretions, some root material		EOD-004-02 Explosives, Hg T-metals
2						CH	CLAY			
3	20"/24" 83%	2.5-4.5								
4										
5	12" total	4.5-5.5		HS 1.3				Becomes mottled with pale gray, dusky red & flaggy limestone textures		EOD-004-03 Extract/Archive for above analyses
6						CM	LS	Refusal at 5.5' against limestone		
7										
8										

498 661

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-005

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	6.0
Date/Time Drilling Started	9/05/97 0745	Date/Time Total Depth Reached	9/05/97 0800		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		0.5		OL	STCL	0.5-6.0 2.5Y 7/2 (yellow) clay, moist, plastic, mottled with light gray, [illegible] fractured [illegible]; [illegible]; upper 0.5' has a rubble zone of silty material mixed with limestone chips ([illegible]-up weathered limestone), some root material		EOD-005-02 Explosives, H T-metals
2										
3	100%	2.5-4.5		HS Ø		CH	CLAY			
4										
5	18" total	4.5-6.0		HS Ø				Develops blocky limestone textures		EOD-005-03 Extract/Arch for above analyses
6						CM	LS	Refusal at 6.0' on extract [illegible] limestone		
7										
8										

GEOLOGIC BOREHOLE LOG

498 662

Borehole (Location) ID: EOD-006

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	2.5
Date/Time Drilling Started	9/05/97 0835	Date/Time Total Depth Reached	9/05/97 0840		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	20"/24"	0.5-2.5		HS 20*		CH	CLAY	0.5-2.5 2.5Y7/6 (yellow) clay, moist, plastic, firm, root material, $CaCO_3$ concretions (generally small), trace fine gravel		EOD-006-02 Explosives, Hg, T-metal
2	83%									
3						CM	LS	Refusal at 2.5' against limestone		
								* Headspace reading is most likely due to moisture		
4										
5										
6										
7										
8										

498 663

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD - 007

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description EOD Range			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.5'	
Date/Time Drilling Started 9/05/97 0855	Date/Time Total Depth Reached 9/05/97 0900		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	21" / 24" 88%	0.5-2.5		HS Ø		OH	CLAY	0.5-2.0 2.5y 5/2 (grayish brown) clay w/ $CaCO_3$ concretions, root material & organic material, concretions up to 30% of the material.		EOD-007-02 Explosives, Hg T-metals
2										
3						CM	LS	Refusal at 2.5' against limestone		
4										
5										
6										
7										
8										

198.664

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-008

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/05/97 0725	Date/Time Total Depth Reached	9/05/97 0735		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS 1				0.5-4.5 2.5Y 7/6 (yellow) mottled with light gray clay, moist, moderately plastic; $CaCO_3$ concretions & some chunks of limestone; contains some "rubble zones" near the top, with broken pieces of limestone mixed with silty material		EOD-008-02 T-metals, explosives
2										
3	100%	2.5-4.5		10 HS Ø		CL	CLAY			EOD-008-03 S/A for [illegible] 03 [illegible]
4										
5						CM	LS	Refusal at 4.5' against limestone		
6										
7										
8										

498 665

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-009

AFID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range near bunker				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.0
Date/Time Drilling Started	9/04/97 1415	Date/Time Total Depth Reached	9/04/97 1420		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	18" total	0.5-2.0		Ø HS Ø		CLML	STCL	0.5-2.0 Chunks of chalky white weathered limestone mixed in with 2.5Y 4/3 (olive brown) Clay & silt, dry, nonplastic		EOD-009-02 Explosives, Hg T-metals
2						CM	LS	Refusal at 2.0' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198 666

Borehole (Location) ID: EOD-010

Page 1 of 1

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range near bunker				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	6.5
Date/Time Drilling Started	9/04/97 1510	Date/Time Total Depth Reached	9/04/97 1535		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	24" 100%	0.5-2.5		Ø		CLML	STCL	0.5-1.7' Mix $CaCO_3$ concretions and limestone chips and 2.5Y 5/3 (light olive brown) clay and silt, root material; concretions & limestone chips make up over 70% of the material		EOD-010-02 EOD-010-05 Explosives, Hg, T-metals
2								1.7-6.5 2.5Y 5/6 (light olive brown) clay, plastic, soft, moist, no odor, minor concretions; becomes mottled in color, with light gray patches, below 5.5'		
3	21" / 24"	2.5-4.5		Ø HS 7.6		CH	CLAY			
4	88%									
								Amount & size of concretions increases		
5	24" 100%	4.5-6.5		HS 16.8						EOD-010-03 EOD-010-06 E/A for Explosives, T-metals, Hg
6										
7						CM	LS	Refusal at 6.5' against limestone		
8										

498 667

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: EOD-011

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	EOD Range near top of hill with bunker				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2	Total Depth (Feet)	7.5
Date/Time Drilling Started	9/04/97 14:30	Date/Time Total Depth Reached	9/04/97 15:05		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5' Surface sample collected		
	22"/24" 92%	0.5-2.5		Ø		OL	STCL	0.5-0.8' Dark brown organic topsoil (silt & clay) w/roots		EOD-011-02 Explosives, tig T-metals
1						CLML	STCL	0.8-2.5' 2.5Y 7/6 (yellow) Clay, w/CaCO3 concretions up to 50% of the material, dry, nonplastic *Lots of dry sand & silt-sized limy material		
2										
	21"/24" 88%	2.5-4.5		5.9 HS 9.5				2.5-7.5' Clay, 2.5Y 6/6 (olive yellow) to light gray; moist, plastic, mott., stiff, abundant large rounded CaCO3 concretions		
3										
4						CH	CLAY			
5	24" 100%	4.5-6.5		Ø HS 6.4						EOD-011-03 T-metals, tig, Explosives TOC, Grain Size → E/A
6										
7	12" total	6.5-7.5		Ø						
						CM	LS	Refusal at 7.5' against limestone		
8										

198 668

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-003

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	West of power substation next to Building 8505, under pole with transform		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 5.5
Date/Time Drilling Started	9/03/97 1030	Date/Time Total Depth Reached	9/03/97 1045

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
1, 2	100%	0.5-2.5		Ø HS 26		OL	STCL	0.5-3.5 2.5Y 3/2 (very dark grayish brown) Clay w/some silt, high organic content (at least for 0.5-1.5') w/ lots of roots, trace fine gravel & coarse sand, minor small $CaCO_3$ concretions, dry, stiff, mod. plastic * Abundance of $CaCO_3$ concretions increasing to 3.5'		TRF-003-02 Pest/PCB's -TOC, Grain size
3	16"/24" 67%	2.5-4.5		Ø HS 29.8		CL	CLAY	3.5-5.5 2.5Y 7/6 (yellow) inorganic clay, moist, nonplastic to moderately plastic, up to 50% $CaCO_3$ concretions		
5	12" total	4.5-5.5		Ø HS 0						TRF-003-03 Pest/PCB's (extract/archive)
6, 7, 8						CM	LS	Refusal at 5.5' against bedrock		

4986669

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-004

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer pole outside Building 2504				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.5
Date/Time Drilling Started	9/03/97 1050	Date/Time Total Depth Reached	9/03/97 1055		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	20"/24" 83%	0.5-2.5		Ø		OL	STCL	0.5-2.5 (very dark grayish brown) Clay w/some silt 2.5Y 3/2 root material, minor $CaCO_3$ concretions & fine gravel, very stiff, dry, mod. plastic		TRF-004-02 Pest/PCB's
2										
3						CM	LS	Refusal at 2.5' against bedrock		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-005

Project	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Beneath set of three transformers on north side of Building 2503		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Splitspoon	Borehole Diameter (Inches) 2	Total Depth (Feet) 2.5
Date/Time Drilling Started	9/03/97 0950	Date/Time Total Depth Reached	9/03/97 0955

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	24" 100%	0.5-2.5		1.9 HS* 120		OL	STCL	0.5-0.8 light brown organic topsoil (clay & silt) with roots		TRF-005-02 Pest/PCB's TOC & Grain Size also
2						CL	CLAY	0.8-2.5 2.5Y 7/4 (pale yellow) to N7 (light gray) clay, dry, non-plastic, stiff, some limestone texture		
3						CM	LS	Refusal at 2.5' against limestone		
4								*Collected TOC & grain size because this material is similar to much of the stuff at A1 & A3		
5								*Headspace reading was 1st reading taken w/HNU after a long break, so probably just represents moisture.		
6										
7										
8										

498 671

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF - 006

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer pole to southwest of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Marvin
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/03/97 10:05	Date/Time Total Depth Reached	9/03/97 10:15		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS 18.1		OL	STCL	0.5-3.5 2.5Y 4/3 (olive brown) clay w/some silt, dry, mod. plastic, stiff, contains roots & organic matter, also contains $CaCO_3$ concretions -- small ones in small amounts, also contains minor coarse sand/fine gravel * Amount of concretions increases with depth; color changes & grades into material below		TRF-006-[illegible] Pest/PCB's
2										
3	22"/24"	2.5-4.5		Ø HS 16.7				3.5-4.5 2.5Y 7/6 (pale yellow) Clay, moist, stiff, mod. plastic, mixed with $CaCO_3$ concretions & pieces of more indurated limestone & even some fossils, has limestone textures Saprolite		TRF-006-E/A Pest/PCB's
4	92%					CL	CLAY			
5						CM	LS	Refusal at 4.5' against limestone		
6										
7										
8										

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-007

Site CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Beneath transformer pole to northeast of Building 8500			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 3.5	
Date/Time Drilling Started 9/03/97 1017	Date/Time Total Depth Reached 9/03/97 1025		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1, 2	20"/24"	0.5-2.5		Ø HS Ø [HNU PID]		OL	STCL	0.5-2.5 2.5Y 3/2 (very dark grayish brown) Clay & silt, high organic content (lots of roots), trace fine gravel and coarse sand, trace $CaCO_3$ concretions, dry, stiff, nonplastic		TRF-007-02 PEST/PCB's
3	10"/12"	2.5-3.5		Ø				3.2 Large $CaCO_3$ concretions, up to 30% of the material 3.5 Chunks of light gray limestone		TR-007-03 Pest/PCB's (Extract/Archive)
4						CM	LS	Refusal at 3.5' against limestone * HS Reading of 523 ppm was the first collected after bench break & undoubtedly represents moisture. (Microtip PID)		
5, 6, 7, 8										

498 673

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF - 008

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Beneath transformer pole southwest of Building 8508			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 2.7	
Date/Time Drilling Started 9/03/97 1057		Date/Time Total Depth Reached 9/03/97 1105	

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	100%	0.5-2.5		Ø HS* 208		OL	STCL	0.5-2.7 2.5 y 3/2 (very dark grayish brown) Clay w/some silt, organic content (lots of roots), minor small $CaCO_3$ concretions & trace fine gravel, moist, very stiff, mod. plastic		TRF-008-02 Pest/PCB's
2										
3	2"	2.5-2.7		Ø		CM	LS	Refusal at ± 2.7' against pale gray limestone * HS reading reflects moisture		
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 674

Borehole (Location) ID: TRF-009

Page 1 of 1

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer at southeastern corner of Building 9514				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.7
Date/Time Drilling Started	9/03/97 12:20	Date/Time Total Depth Reached	9/03/97 12:25		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	15" total	0.5-1.7		2.9 HS 27.2		CL	CLAY	0.5-1.7' 2.5Y 5/4 (light olive brown) Clay, minor silt, mod. plastic, dry, mod. stiff, root material, minor $CaCO_3$ concretions and trace rounded fine gravel		TRF-009-02 TRF-009-05 Pest/PCB's
2						CM	LS	Refusal at 1.7' against flaggy limestone. HS reading probably due to moisture		
3										
4										
5										
6										
7										
8										

4986751

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-010

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Beneath transformer pole to northwest of Building 8514		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/03/97 12:27	Date/Time Total Depth Reached	9/03/97 12:30

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	18" total	0.5-2.0		8.0 HS 31.8		CL	CLAY	0.5-1.7' 2.5Y 5/4 (light olive brown) Clay, minor silt, mod. plastic, dry, mod. stiff, root material, minor $CaCO_3$ concretions, increasing in number & size to 1.7' 1.7-2.0' 2.5Y 6/6 (olive yellow) clay plus pieces of limestone & $CaCO_3$ concretions		TRF-010-02 Pest/PCB's
2						CM	LS	Refusal at 2.0' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

498 676

Borehole (Location) ID: TRF - 011

Page 1 of 1

ID	CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)
Location Description	Beneath transformer pole southwest of Bunker 8533		
Establishing Company	The Environmental Co	Geologist L. Myers	Drilling Company Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation	Datum
Sampling Device	Split spoon	Borehole Diameter (inches) 2	Total Depth (Feet) 1.5
Date/Time Drilling Started	9/03/97 1235	Date/Time Total Depth Reached	9/03/97 1238

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	12"	0.5-1.5'		2.4 HS 16.1		CL	CLAY	0.5-1.5 2.5y 8/3 (pale yellow) clay, non-plastic, with $CaCO_3$ concretions and pieces of more indurated limestone, some limestone textures		TRF-011-C2 Pest/PCB's
2						CM	LS	Refusal at 1.5' against flaggy limestone		
3										
4										
5										
6										
7										
8										

498 677

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF - 012

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer pole southeast of Bunker 8537				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	3.5
Date/Time Drilling Started	9/03/97 12:40	Date/Time Total Depth Reached	9/03/97 12:55		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
						OL	STCL	0.5-0.8 Moderate brown organic topsoil with organic matter (root material)		TRF-012-02 Pest/PCB's
1	15" 24"	0.5-2.5		Ø		GM	FILL	0.8-1.3 Limestone rubble & sand		
	62%			HS 9.7		CL	CLAY	1.3-3.5 2.5Y 3/2 (very dark grayish brown) Clay, mod. plastic, dry, stiff, minor $CaCO_3$ concretions; number of concretions & their size increases with depth		
2										
3	12" total	2.5-3.5		7.0 HS 2.4						TRF-012-03 Pest/PC (Extract/Acid
						CM	LS	Refusal at 3.5' against limestone		
4										
5										
6										
7										
8										

498-678

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-013

ID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Beneath transformer pole east of Bunker 8541		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/03/97 12:57	Date/Time Total Depth Reached	9/03/97 13:00

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
	18" total	0.5-2.0		3.8 HS ø		OL	STCL	0.5-0.8 Moderate brown organic topsoil w/ roots		TRF-013-L2 Pest/PCB's
1						GM	FILL	0.8-2.0 Sand, coarse grained, 2.5Y 8/6 (yellow) mixed with chunks of limestone; some brown clay/silt mixed in the limestone chunks at the base		
2						CM	LS	2.0 Refusal against limestone		
3										
4										
5										
6										
7										
8										

498 679

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-014

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer pole north of Bunker 8560				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.3
Date/Time Drilling Started	9/03/97 1305	Date/Time Total Depth Reached	9/03/97 1307		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	8" total	0.5-1.3		Ø HS 5.9		CL	CLAY	0.5-1.3 Mix of 2.5Y 3/2 (very dark grayish brown) Clay w/ $CaCO_3$ concretions and large chunks of indurated & partially weathered limestone		TRF-014-02 Pest/PCB's
						Cm	LS	Refusal at 1.3' against limestone		-
2										
3										
4										
5										
6										
7										
8										

498 680

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF-015

SiteID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer pole northeast of Bunker 8554				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.3
Date/Time Drilling Started	9/03/97 13:18			Date/Time Total Depth Reached	9/03/97 13:22

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface sample collected		
	8" total	0.5-1.3				OL	STCL	0.5-0.7 Medium brown organic topsoil		TRF-015-02 MS/MSD also Pest/PCB's
1						GM	SDGR	0.7-1.3 Limy sand and pieces of flaggy limestone bedrock		
						CM	LS	Refusal at 1.3' against flaggy limestone		
2								* Drillers put in a second hole at this site to get enough material for MS/MSD		
3										
4										
5										
6										
7										
8										

498 681

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: TRF - 016

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Beneath transformer pole north of Building 8503 and west of bunkers				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	4.5
Date/Time Drilling Started	9/03/97 13:25	Date/Time Total Depth Reached	9/03/97 13:35		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
								0-0.5 Surface soil sample collected		
1	18"/24" 75%	0.5-2.5'		Ø HS 0.5		CL	CLAY	0.5-4.5 2.5Y 6/6 (olive yellow) Clay, moist, plastic, mod. stiff, $CaCO_3$ concretions (small size & mod. abundant); color changes to zones of pale gray mixed with the olive yellow as depth increases		TRF-016-02 Pest/PCB's
2										
3	22"/24" 92%	2.5-4.5'		Ø HS Ø						TRF-016-03 Extract/Archive for Pest/PCB's
4										
5						CM	LS	Refusal at 4.5' against flaggy limestone		
6										
7										
8										

8[illegible] 88[illegible]

GEOLOGIC BOREHOLE LOG

498 682

Borehole (Location) ID: UST-001

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Tank north of Building 8503				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.8'
Date/Time Drilling Started	9/04/97 13:50	Date/Time Total Depth Reached	9/04/97 14:00		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
	22"/24"	0-2'		18		OL	STCL	0-0.7' Dark brown organic topsoil (silt & clay), nonplastic, roots 0.7-2.8' 2.5Y 6/6 (olive yellow) to 2.5Y 7/2 (light gray) clay, non-plastic to mod. plastic, stiff, no $CaCO_3$ concretions; the closer you get to the base of the interval, the more the texture resembles that of a flaggy limestone		UST-001-C1 BTEX, TPH, PAH
1				HS 6.0						
	92%					CL	CLAY			
2										
	10"	2-2.83								No sample
3						CM	LS	Refusal at 2.8' against limestone		
4										
5										
6										
7										
8										

498 6831

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: UST-002

AFIID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Tank southwest of Building 8514				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	7.0
Date/Time Drilling Started	9/04/97 0925			Date/Time Total Depth Reached	9/04/97 0945

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1	100%	0-2'		1 HS 100		MLCL	FILL	0-2' 10YR 4/6 (dark yellowish brown) silt & clay with $CaCO_3$ concretions; [illegible] to cobbles; [illegible] up to 20% of material; [illegible] plastic, root material		UST-002-01 BTEX, TPH, PAH
2	20"/24" 83%	2-4		2 HS 10.2				2-4 same as above, wet		
3										
4	20"/24" 83%	4-6		8 HS 14.7		SP	SD	4-5.5 10YR 7/8 (yellow) coarse sand, obviously [illegible] wet		Water at approx. 4' depth.
5										UST-002-02 5-7' BTEX, TPH, & PAH
6	12"/60"	6-7		3 HS 44.8		MLCL	STCL	5.5-6.0 [illegible] olive brown silt & clay, [illegible] plastic		
7						SP	SD	6.0-7.0 coarse sand, as in 4-5.5' interval, fill, obviously wet		
8						MACM	LS	7.0' [illegible] refusal against dark gray [illegible] limestone		

GEOLOGIC BOREHOLE LOG

198 684

Borehole (Location) ID: UST-003

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Tank near Building 8500				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	1.0
Date/Time Drilling Started	9/04/97 13:20	Date/Time Total Depth Reached	9/04/97 13:25		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
	12" total	0-1'		17.5 HS 5.4		OL	STCL	0-0.4' Dark brown organic topsoil (silt & clay) with roots		UST-003-02 TPH, BTEX, PAH
						ML	SILT	0.4-1.0' Mix of lime silt and fragments of limestone		
1						CM	LS	Refusal at 1.0' against limestone		
2										
3										
4										
5										
6										
7										
8										

198 685

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: UST-004

AFIID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Piping near Building 8500			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 7.0	

Date/Time Drilling Started 9/04/97 12:25 Date/Time Total Depth Reached 12:45

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1	23"/24" 96%	0-2		12.5 HS 8.5		CLML		0-4' 2.5Y 5/3 (light olive brown) Clay & silt, dry, nonplastic, roots, small $CaCO_3$ concretions, minor fine rounded gravel to moderately plastic		
2										
3	22"/24" 92%	2-4		9.8 HS 9.7						
4							STCL	4-7' 2.5Y 2.5/1 (black) to dark gray silt & clay mix w/ $CaCO_3$ concretions similar to above, but wet, darker in color, more silt		Water level at 4'
5	20"/24" 83%	4-6		HS 30		MLCL				UST-004-01 5-7' TPH, BTEX, PAH
6										
7	8"/12" 67%	6-7		HS 19.1		CM	LS	* Distinct petroleum odor in last spoon. Refusal at ≈ 7 feet. * Drillers had to re-drill hole → somehow lost a spoon!		
8										

GEOLOGIC BOREHOLE LOG

498 686

Borehole (Location) ID: UST-005

ID CRSWL	Site ID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Piping near Building 8500			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 7.0	
Date/Time Drilling Started 9/04/97 12:10	Date/Time Total Depth Reached 12:20 9/04/97		

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1	24" 100%	0-2		HS 6.3				0-6 2.5Y 5/2 (light olive brown) Clay & silt, minor $CaCO_3$ concretions, dry, nonplastic to mod. plastic, some roots, increasing sand content with depth. Zones of clay-rich material interspersed with zones of sandy material		
2										
3	22"/24" 92%	2-4		6 HS 5.6		CLML	FILL			
4										
5	21"/24" 88%	4-6		7 HS 3.9						Water at approx. 5'. UST-005-02 5-7' BTEX, TPH PAH
6	12" total	6-7		12 HS 7.8		SC	FILL	6-7 2.5Y 3/3 (dark olive brown) wet, mix of clay, silt, & sand, minor $CaCO_3$ concretions, odor of petroleum		
7						CM	LS	Refusal at 7'		
8										

498 687

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: UST-006

AFID CRSWL	SiteID 18 (WSA)	Location Type BOREHOLE (BH)	
Location Description Tank near Building 8505			
Establishing Company The Environmental Co	Geologist L. Myers	Drilling Company Maxim	
Drilling Foreman F. Robinson	Ground Surface Elevation	Datum	
Sampling Device Splitspoon	Borehole Diameter (inches) 2	Total Depth (Feet) 8.0	
Date/Time Drilling Started 9/04/97 10:	Date/Time Total Depth Reached 9/04/97		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1	19"/24" 79%	0-2'		HS 16.2				0-4 2.5YR 5/6 (red) Clay & silt, moist, mod. plastic, up to 30% $CaCO_3$ concretions & gravel, root material * Chunks of black asphalt-like material, but no odor * Amount of sand increases with depth		-
2						CLML	FILL			
3	18"/24" 75%	2-4'		HS 8.5						
4										
5	20"/24" 83%	4-6'		HS 5.8		SM	FILL	4-5 2.5YR 5/6 (red) sand & silt, minor fine gravel, still have root material		Water at ~4'
6								5-8 2.5Y 6/1 (gray) sand & silt, trace fine gravel, some fossils, still some root material, no odor		
7	18"/24" 75%	6-8'		HS 4.4		SM	FILL			UST-006-C BTEX, TPH PAH
8								* Chunks of limestone at base of spoon		
						CM	LS	Hit refusal at 8.0 feet		

498 688

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: UST-007

Page 1 of 1

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Piping near Building 8505				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Split spoon	Borehole Diameter (inches)	2	Total Depth (Feet)	2.0
Date/Time Drilling Started	9/04/97 10:25	Date/Time Total Depth Reached	9/04/97 10:35		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
	20" / 24"	0-2'		HS 10.2		OL	STCL	0-0.5' Medium brown organic topsoil with roots		UST-007-01 UST-007-[illegible] BTEX (sieved) TPH, [illegible]
1	83%					CLML	STCL	0.5-2.0' 2.5Y 7/4 (pale yellow) Clay & silt, moist, non plastic, up to 50% $CaCO_3$ concretions and gravel.		
2						CM	LS	2' refusal against limestone		
3								* Drillers put in 2 holes here to get enough material for duplicate		
4										
5										
6										
7										
8										

198 689

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: UST-008

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Piping near Building 8505		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	F. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Splitspoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/04/97 0950	Date/Time Total Depth Reached	9/04/97 0955

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
	100%	0-2'		8		OL	STCL	0-0.3 Organic clay & silt, dark brown, roots		UST-008-01
				HS 5.7		SM	FILL	0.3-1.3 FILL? Sand, limy sand, chunks of limestone		BTEX, TPH, PAH
1						CL	CLAY	1.3-2.0 2.5Y 5/3 light olive brown, clay, mod. plastic, dry, with chunks of limestone		
2						CM	LS	Refusal at 2.0' against limestone		
3										
4										
5										
6										
7										
8										

GEOLOGIC BOREHOLE LOG

198 690

Borehole (Location) ID: UST-009

ID	CRSWL	SiteID	18 (WSA)	Location Type	BOREHOLE (BH)
Location Description	Tank near Building 8507				
Establishing Company	The Environmental Co	Geologist	L. Myers	Drilling Company	Maxim
Drilling Foreman	F. Robinson	Ground Surface Elevation		Datum	
Sampling Device	Splitspoon	Borehole Diameter (inches)	2	Total Depth (Feet)	6.0
Date/Time Drilling Started	9/04/97 10:00	Date/Time Total Depth Reached	9/04/97 10:20		

Depth (feet)	Sampling: % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat-order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
1	100%	0-2		HS 33.8				0-5.5' 10YR 5/6 (yellowish brown) clay & silt, much gravel, some possible [illegible] concretions, but mostly chunks of gravel & possibly some brick [illegible] * percentage of sand increases with depth		
2	20" / 24"	2-4		HS 41.3		GC	FILL			UST-009-0 BTEX, TPH, PAH
3										
4										
5	20" / 24"	4-6		HS 20.7						Water at [illegible] UST-009-[illegible] BTEX, TPH, PAH
6						SM	FILL	5.5-6.0 Black sandy material with a strong odor of old petroleum		
7						CM	LS	Refusal at 6.0'		
8										

498 690A

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: UST-010

AFIID	CRSWL	SiteID	18 (WSA)
Location Type	BOREHOLE (BH)		
Location Description	Piping near Building 8503		
Establishing Company	The Environmental Co	Geologist	L. Myers
Drilling Company	Maxim		
Drilling Foreman	E. Robinson	Ground Surface Elevation	
Datum			
Sampling Device	Split spoon	Borehole Diameter (Inches)	2
Total Depth (Feet)	2.0		
Date/Time Drilling Started	9/04/97 1335	Date/Time Total Depth Reached	9/04/97 1345

Depth (feet)	Sampling % Recov	Sample Depth	Blow Counts	PID	USCS	ASTM CODE	Lithologic Codes	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/lithification, moisture content, porosity, permeability/fracturing	Strat. order	Remarks: Drilling Problems, Equipment, Water levels, Samples, Weather, Time
	24" 100%	0-2.0	68	34.5 HS 5.6		OL	STCL	0-0.5 Dark brown organic topsoil grades into 0.5-1.0 2.5Y 5/3 (light olive brown) Clay w/some silt, non plastic, med. stiff, $CaCO_3$ concretions, dry		UST-010-01 MS/MSD also BTEX, TPH, PAH
1						CL	CLAY	1.0-2.0 2.5Y 7/6 (yellow) to pale gray clay, stiff, moist, texture of flagge limestone		
2						CL	CLAY			
						CM	LS	Refusal at 2.0 against limestone		
3								* Drilled 4 wire to get material for MS/MSD		
4										
5										
6										
7										
8										

498 691

TAB

E

APPENDIX E

LIST OF ANALYTICAL PARAMETERS

Table E-1. List of Analytical Parameters for the Offsite Weapon Storage Area RFI

Aromatic Volatile Organics - Method SW5030A/SW8020A	Semivolatile Organics - Method SW8270B
Benzene	1,2,4-Trichlorobenzene
Ethylbenzene	1,2-DCB
Toluene	1,3-DCB
Xylenes, total	1,4-DCB
	2,4-DNT
Volatile Organic Compounds - Method SW8260A	2,6-DNT
1,1,1,2-Tetrachloroethane	2-Chloronaphthalene
1,1,1-TCA	2-Methylnaphthalene
1,1,2,2-Tetrachloroethane	2-Nitroaniline
1,1,2-TCA	3-Nitroaniline
1,1-DCA	3,3'-Dichlorobenzidine
1,1-DCE	4-Bromophenyl phenyl ether
1,1-Dichloropropene	4-Chloroaniline
1,2,3-Trichlorobenzene	4-Chlorophenyl phenyl ether
1,2,3-Trichloropropane	4-Nitroaniline
1,2,4-Trichlorobenzene	Acenaphthylene
1,2,4-Trimethylbenzene	Acenapthene
1,2-DCA	Anthracene
1,2-DCB	Benz (a) anthracene
1,2-Dibromo-3-chloropropane	Benzo (a) pyrene
1,2-Dichloropropane	Benzo (b) fluoranthene
1,2-EDB	Benzo (g,h,i) perylene
1,3,5-Trimethylbenzene	Benzyl alcohol
1,3-DCB	Bis (2-chloroethoxy) methane
1,3-Dichloropropane	Bis (2-chlorethyl) ether
1,4-DCB	Bis (2-chloroisopropyl) ether
1-Chlorohexane	Bis (2-ethylhexyl) phthalate
2,2-Dichloropropane	Butyl benzylphthalate
2-Chlorotoluene	Chrysene
4-Chlorotoluene	Di-n-butylphthalate
Benzene	Di-n-octylphthalate
Bromobenzene	**Polynuclear Aromatic Hydrocarbons- Method SW8310**
Bromochloromethane	Acenaphthene
Bromodichloromethane	Acenaphthylene
Bromoform	Anthracene
Bromomethane	Benzo (a) anthracene
Carbon tetrachloride	Benzo (a) pyrene
Chlorobenzene	Benzo (b) fluoranthene
Chloroethane	Benzo (g,h,i) perylene
Chloroform	Benzo (k) fluoranthene
Chloromethane	Chrysene
Cis-1,2-DCE	Dibenzo (a,h) anthracene
Cis-1,3-Dichloropropene	Fluoranthrene
Dibromochloromethane	Fluorene
Dibromomethane	Indeno (1,2,3-c,d) pyrene
Dichlorodifluoromethane	Naphthalene
Ethylbenzene	Phenanthrene
Hexachlorobutadiene	Pyrene

Table E-1. List of Analytical Parameters for the Offsite Weapon Storage Area RFI

Volatile Organic Compounds - Method SW8260A (cont.)		Explosive Residues - Method SW8330
Isopropylbenzene		1,3,5- TNB
m-Xylene		1,3- DNB
Methylene chloride		2,4,6- TNT
n-Butylbenzene		2,4-DNT
n-Propylbenzene		2,6-DNT
Naphthalene		HMX
o-Xylene		m-Nitrotoluene
p-Isopropyltoluene		Methyl-2,4,6-trinitrophenylnitramine
p-Xylene		Nitrobenzene
Sec-Butylbenzene		o-Nitrotoluene
Styrene		p-Nitrotoluene
TCE		RDX
Tert-Butylbenzene		
Tetrachloroethene		
Toluene		
Trans-1,2-DCE		
Trans-1,3-Dichloropropene		
Trichlorofluoromethane		
Vinyl chloride		
Trace Elements (Metals) by Inductively Coupled Plasma Atomic Emission Spectroscopy - Method SW6010A (groundwater samples only)		**Mercury Manual Cold-Vapor Technique - Method SW7470A/SW7471A**
Aluminum	Magnesium	Mercury
Antimony	Manganese	
Arsenic	Molybdenum	
Barium	Nickel	
Beryllium	Potassium	
Cadmium	Selenium	
Calcium	Silver	
Chromium	Sodium	
Cobalt	Thallium	
Copper	Vanadium	
Iron	Zinc	
Lead		

498 693A

FINAL PAGE

PART I

ADMINISTRATIVE RECORD

PART I

FINAL PAGE