(6)

7 SWMUs: 3, 5, 16, 48a, 48b, 83, 108

VOLUME 1A
FINAL RFI REPORT

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RCRA FACILITY INVESTIGATION

APPENDIX II
SWMUS - PHASE II

CANNON AIR FORCE BASE, NEW MEXICO

W-C

Prepared for
Cannon Air Force Base
27 CES/CEVR
Environmental Flight

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GLOSSARY OF TERMS

ACC	Air Combat Command
AFB	Air Force Base
ARAS	Applicable or Relevant and Appropriate Standard
bgs	below ground surface
B.P.	Before Present
BRA	Baseline Risk Assessment
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CEC	Cation Exchange Capacities
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measures Study
CO_2	Carbon dioxide
COC	Chemicals of concern **or** chain of custody
CRQL	Contract Required Quantitation Limit
DMP	Data Management Plan
DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
FS	Feasibility Study
HQ	Hazard Quotient
HSA	Hollow-stem auger
HSWA	Hazardous and Solid Waste Management Act
IRP	Installation Restoration Program
LNAPL	Light Nonaqueous-Phase Liquids
MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
MS	Matrix spike
MSD	Matrix spike duplicate
MSL	Mean sea level
NMED	New Mexico Environment Department
NWR	National Wildlife Refuge

OWS	Oil/water separator
PAH	Polycyclic aromatic hydrocarbons
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SCEM	Site Conceptual Exposure Model
SDWA	Safe Drinking Water Act
SMCLs	Secondary Maximum Contaminant Levels
SOP	Standard Operating Procedure
SVOC	Semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TBC	To Be Considered
TCL	Target Compound List
T/E	Threatened/endangered
TFW	Tactical Fighter Wing
TPH	Total petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers
USAF	United States Air Force
UST	Underground storage tank
UTL	Upper tolerance limit
VOC	Volatile organic compound
VSI	Visual Site Inspection
W-C	Woodward-Clyde

UNITARY ABBREVIATIONS

cm	centimeter
cm/sec	centimeters per second
cm/yr	centimeters per year
ft	feet
gpm	gallons per minute
hr	hour
km/hr	kilometers per hour
kg	kilogram
L/min	liters per minute
m/yr	meters per year
mg	milligram
mg/kg	milligrams per kilograms
mg/L	milligrams per liter
m^3/m	cubic meters per meter
mph	miles per hour
ppm	parts per million
%R	percent recoveries
RFD	reference dose
μg/kg	micrograms per kilogram
yr or y	year

EXECUTIVE SUMMARY

Cannon Air Force Base has been in operation for more than 50 years as a military air base. Through the course of these operations, numerous aircraft and equipment processes have been conducted, and the Air Force is currently investigating the potential that some of these operations may have contaminated the environment. Cannon AFB operates in compliance with the terms of a RCRA permit issued jointly by the United States EPA and the State of New Mexico. This permit includes a listing of three groups of Solid Waste Management Units (SWMUs) that have been identified as Appendix I, II, and III SWMUs. This Phase II RCRA Facility Investigation (RFI) is directed at seven of the group of SWMUs listed in Appendix II of the permit and is being completed as required by the terms of the permit.

Woodward-Clyde (W-C) has completed the RFI under contract with the U.S. Army Corps of Engineers (USACE), Omaha District. The RFI was designed to fulfill specific requirements under RCRA, and in so doing, also meets basic requirements under CERCLA. Prior to initiating the field sampling activities, W-C submitted work plans covering the description of work. These work plans were reviewed by the USACE and Cannon AFB Environmental Flight and approved with revisions as complying with the terms and scope of the EPA-approved documents.

The Phase II RFI field investigation was completed during December of 1994, and it consisted of sampling surface and subsurface soils at six of the Appendix II SWMUs. The fieldwork also included a field survey of the sampling points. The samples were transported to QUANTERRA Analytical Laboratories for chemical testing, which was completed in January and February of 1995.

The sampling rationale was developed to collect samples in the locations and depths to further assess the horizontal and vertical extent of SWMU soil contamination.

This Phase II RFI includes a screening-level Risk Evaluation using Region III EPA Risk-Based Concentrations (RBCs). These RBCs are very conservative (generally comparable to an added cancer risk of one in ten million). The highest detected concentrations of

chemicals of concern have been compared to the RBCs, or background, for each SWMU in accordance with the decision process outlined in the work plans.

It is anticipated that the conservative determination of RBCs for the risk screening in this RFI will be protective of the ecology as well as human health.

The SWMUs in the Appendix II list investigated under this Phase II RFI are as follows:

Site	SWMU No.
Oil/Water Separator No. 108	3
Oil/Water Separator No. 121	5
Oil/Water Separator No. 680	16
Underground Storage Tank	48A
Aboveground Storage Tank	48B
Sump Site No. 120	83
EOD Training Area	108

The USACE Scope of Services outlined the required chemical tests in accordance with the EPA-approved work plan. Testing was in accordance with EPA SW-846 methodology, and the analyte list at each SWMU was selected from the following groups on the basis of the potential contamination indicated by the past and current operations at each SWMU.

- Target Compound List (TCL) volatile organic compounds (VOCs)
- Semivolatile organic compounds (SVOCs)
- Target Analyte List (TAL) metals
- Total recoverable petroleum hydrocarbons (TRPH)
- Explosives

Laboratory analytical data was validated in accordance with USACE and EPA guidance as outlined in the Quality Assurance Project Plan, and the validated data is the basis for the recommendations.

The following sections discuss for each SWMU the contamination found (if any), the results of the screening-level risk evaluation, and the recommendations resulting from the evaluation.

SWMU NO. 3 - OIL/WATER SEPARATOR NO. 108

SWMU No. 3 was either an oil/water separator or a grease trap located on the west side of former Hangar 125. The oil/water separator was removed in 1990. The SWMU location is presently covered with asphalt pavement. Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

Surface and subsurface soil samples were collected from three Phase II RFI soil borings to a total depth of 20 feet. The borings were drilled and sampled in the immediate area surrounding the presumed location of the former oil/water separator. Target analytes for samples collected included VOCs, SVOCs, TAL metals, and TRPH.

Site contaminants were found mostly in surface soil samples. Only one compound, benzo(a)pyrene, exceeded the RBC for residential soil. However, the estimated risk from this chemical is within the EPA's target risk range of 10^{-4} to 10^{-6}. This chemical did not exceed RBCs for industrial soils. Additionally, the SWMU is paved with asphalt, indicating that this compound (a PAH) is not site-related. Since no unacceptable health risk is posed by any of the chemicals detected at this SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 5 - OIL/WATER SEPARATOR NO. 121

SWMU No. 5 was either an oil/water separator or a grease trap and was located on the west side of Hangar 121. Hangar 121 and the unit were removed in about 1990. The area is presently covered with asphalt pavement. Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

Surface and subsurface soil samples were collected from three Phase II RFI soil borings to a total depth of 25 feet. The borings were drilled and sampled in the immediate area surrounding the presumed location of the former oil/water separator. Target analytes for samples collected included VOCs, SVOCs, TAL metals, and TRPH.

Toluene and TRPH were the only contaminants detected in site soil samples. The concentrations were low and, except for TRPH, were confined to surface soils. Increasing concentrations of TRPH were found in one soil boring with depth; however, no chemicals of concern were detected at depth in this boring. Because there is no threat to human health from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 16 - OIL/WATER SEPARATOR NO. 680

SWMU No. 16 was an oil/water separator located near the southwest corner of Building 680. The separator was removed in 1991 during building renovations and was replaced with a unit located about 15 feet east of this SWMU. The site of the former separator is presently inside of a garage and is covered with concrete pavement.

Due to the fact that the location of the former separator is inaccessible, and the area also contains a high density of underground utilities, no soil borings and soil sampling could be done for this SWMU during the Phase II RFI investigation. The results of the Phase I RFI Baseline Risk Assessment indicated that no health risk exists at the SWMU. It is recommended that the Phase I results be retained and that no further investigation of the SWMU is necessary.

SWMU NO. 48A - UNDERGROUND STORAGE TANK

SWMU No. 48A was a 20,000-gallon underground storage tank located about 125 feet east of the intersection of Argentia Avenue and Torch Boulevard. The tank and associated piping were removed in 1988. The area is presently paved and used as a parking lot. Potential contaminants include waste oils, spent solvents, paint thinners, and recovered fuels.

Surface and subsurface soil samples were collected from three Phase II RFI soil borings to a total depth of 40 feet. The borings were drilled and sampled in the immediate area surrounding the presumed location of the former underground storage tank. Target analytes for samples collected included VOCs, SVOCs, TAL metals, and TRPH.

Compounds including toluene, ethylbenzene, total xylenes, several SVOCs, and TRPH were detected in several surface and subsurface samples at the SWMU. However, no contaminants were found below a depth of 30 feet, and concentrations to this depth showed decreasing trends. None of the chemicals detected exceeded RBCs during the risk-screening process. Because there is no threat to human health from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 48B - ABOVEGROUND STORAGE TANK

SWMU No. 48B was a 2,000-gallon aboveground steel storage tank located about 125 feet east of the intersection of Argentia Avenue and Torch Boulevard. This SWMU and SWMU No. 48A were located adjacent to each other within a fenced area measuring about 20 feet by 40 feet in plan. The aboveground tank and associated piping were removed in 1992. Potential contaminants include waste oils, spent solvents, paint thinners, and recovered fuels.

Surface and subsurface soil samples were collected from two Phase II RFI soil borings to a total depth of 40 feet. The borings were drilled and sampled in the immediate area surrounding the presumed location of the former aboveground storage tank. Target analytes for samples collected included VOCs, SVOCs, TAL metals, and TRPH.

Low levels of compounds including toluene, bis(2-ethylhexyl)phthalate, fluorene, and TRPH were detected in several of the SWMU soil samples. No high concentrations at depth or increasing concentrations with depth were found. None of the chemicals detected exceeded RBCs during the risk-screening process. Because there is no threat to human health from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 83 - SUMP-SITE NO. 120

SWMU No. 83 was a sump located about 90 feet northwest of Building 120. The sump was removed in 1993. A portion of the site of the former sump is presently paved. Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

Surface and subsurface soil samples were collected from three Phase II RFI soil borings to a total depth of 25 feet. The borings were drilled and sampled in the immediate area surrounding the presumed location of the former sump. Target analytes for samples collected included VOCs, SVOCs, TAL metals, and TRPH.

Several compounds including toluene, 2-butanone, several SVOCs, and TRPH were detected in low concentrations in several site surface and subsurface soil samples. All soil samples below 15 feet of depth showed no detected concentrations of any analytes. Only one compound, benzo(a)pyrene, slightly exceeded the RBC. However, the estimated health risk due to this compound is between the EPA's target risk range of 10^{-4} to 10^{-6}. Because there is no unacceptable risk to human health from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 108 - EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING AREA

SWMU No. 108 is the Explosive Ordnance Disposal (EOD) Training Area located on the southeast corner of the Base directly west of the Fire Department Training Area. The area is circular in plan with a circumference of about 200 feet, is surrounded by a 1-foot-high earthen berm, and slopes downward in the center to about 2 or 3 feet below the surrounding grade. The area has been active since the early 1970s and is used to train Base personnel in the safe use of smoke bombs and large firecrackers used to simulate fires and explosions during military exercises. Potential contaminants include organic compounds, explosives, and metals.

Surface and subsurface soil samples were collected from five Phase II RFI soil borings to a total depth of 20 feet. The borings were drilled and sampled inside the bermed area at the SWMU. Target analytes for samples collected included VOCs, SVOCs, TAL metals, explosives, and TRPH.

Only two VOCs, toluene and 2-butanone, were reported in the SWMU soil samples, in very low concentrations. No explosives, SVOCs, or TRPH were detected in any of the site soil samples. The results of the Phase II RFI at SWMU 108 show no evidence of a chemical release. Because there is no threat to human health from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

SUMMARY OF RECOMMENDATIONS

SWMU No.	Recommendation
3	NFA
5	NFA
16	NFA[1]
83	NFA
48A	NFA
48B	NFA
108	NFA

NOTE: The key to Column 2 above is as follows:

NFA = No Further Action
[1] No Further Action based on the Phase I BRA.

1.0
INTRODUCTION

1.1 BACKGROUND AND AUTHORITY

Cannon Air Force Base (AFB) is a permitted RCRA facility operating in accordance with the terms of a permit issued jointly by the United States Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) effective October 3, 1989. This permit sets forth the conditions within which Cannon AFB can be operated as a hazardous waste facility. The authority for regulation of hazardous waste activities at Cannon AFB through this permit is derived from the Federal Resource Conservation and Recovery Act (RCRA) and its reauthorization in the form of the Hazardous and Solid Waste Amendments of 1984 (HSWA) as well as the New Mexico Hazardous Waste Management Act.

A portion of this permit governs the investigation and, where required, the implementation of corrective measures to mitigate the effects on the environment of releases of petroleum products and other chemicals that may have been released from various Solid Waste Management Units (SWMUs) at the Base. One hundred twenty-eight SWMUs were identified at Cannon AFB during the RCRA Facility Assessment completed in 1988 for the EPA by A. T. Kearney. Seventy-three of the SWMUs were identified for further investigation and were divided into three groups (Appendix I through III). Appendixes I, II, and III SWMUs have been investigated under other programs, and seven of the Appendix II SWMUs are the subject of this Phase II RCRA Facility Investigation (RFI) report.

These regulatory considerations notwithstanding, the United States Air Force (USAF) has in place an independent program to manage its waste generation and disposal activities. Compliance with the terms of the RCRA Permit is a portion of the overall environmental management program at Cannon AFB.

This Phase II RFI was authorized and funded by the USAF through the United States Army Corps of Engineers (USACE).

1.2 PURPOSE AND SCOPE OF REPORT

The purpose of the RFI is to obtain the data necessary to characterize the nature and extent of contamination to the degree necessary to support recommendations for further studies, to identify corrective measures alternatives for each SWMU or to recommend "no further action," if warranted. The data collected during the RFI is used to determine whether a significant release has occurred at a SWMU and to evaluate human health and ecologic risks. The data quality objective process is used to ensure that data of sufficient quantity and quality are collected to achieve this purpose.

The scope of this Phase II RFI has been specified by the USACE on behalf of the USAF to require the contractor to address 7 of the 16 SWMUs listed in Appendix II of the RCRA Permit at Cannon AFB. The field investigation has been limited to soil sampling in the areas of potential releases from each SWMU. No background samples were collected, since the previous work involved an extensive Basewide collection of background data for inorganic materials. Soil borings were advanced at appropriate locations adjacent to each SWMU and soil samples were collected for the purpose of determining the degree of contamination, if any, that existed in the soil.

The scope includes identification of significant exposure pathways and chemicals of concern and a risk screening to determine whether a significant risk to human health is posed by contaminants at each site.

A listing of the Appendix II SWMUs is shown in Table 1-1. This table lists the SWMU number and description along with the investigative phase status of each of the Appendix II SWMUs.

1.3 CANNON AFB OPERATIONAL HISTORY

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the city of Clovis. The Base is situated on approximately 4,320 acres of land. The vicinity map of Cannon AFB is shown on Figure 1-1 and the site map of Cannon AFB is shown on Figure 1-2. Off-Base facilities include the Melrose Bombing Range.

Cannon AFB dates to 1929, when Portair Field was established on the site. Portair Field was a civilian passenger terminal for early commercial transcontinental flights. In 1942, the Army Air Corps took control of the civilian airfield and it became known as the Clovis Army Air Base. In early 1945, the Base was renamed Clovis Army Air Field. Flying, bombing, and gunnery classes continued through the end of World War II. By mid-1946, however, the airfield was placed on a reduced operational status and flying activities decreased. The installation was deactivated in May 1947. The types of aircraft stationed at Cannon AFB from 1942 to 1947 included B-17, B-24, and B-29 heavy bombers.

The Base was reassigned to the Tactical Air Command in July 1951. The first unit, the 140th Fighter-Bomber Wing, arrived in October of that year. The airfield was formally reactivated in November 1951 as Clovis Air Force Base. Between 1952 and 1957, the 50th and 388th Fighter-Bomber Wings were activated, and, upon their transfer, were replaced by the 312th and 474th Groups. Predominant aircraft stationed at Cannon AFB from 1951 to 1957 included the P-51 "Mustang" fighter and the F-86 "Sabre" fighter jet.

In June 1957, the Base became a permanent installation and was renamed Cannon Air Force Base in honor of the late General John K. Cannon, a former commander of the Tactical Air Command. In October 1957, the 312th and 474th Fighter-Bomber Groups were redesignated tactical fighter wings and the 832nd Air Division was activated to oversee their activities.

In 1959, the 312th Tactical Fighter Wing (TFW) was deactivated and replaced at Cannon AFB by the 27th TFW. In December 1965, the Base's mission changed to that of a replacement training unit, and the 27th TFW became the largest such unit in the Tactical Air Command. The predominant aircraft stationed at Cannon AFB from 1957 to 1965 was the F-100 "Super Sabre" fighter jet.

The 832nd Air Division was deactivated in July 1975, leaving the 27th TFW the principal Air Force unit at Cannon AFB. In early 1981, the 27th TFW was designated a Rapid Deployment Joint Task Force member.

The primary mission of Cannon AFB has remained relatively unchanged since 1965; i.e., to develop and maintain an F-111 tactical fighter wing capable of day, night, and all-weather combat operations and to provide replacement training of combat aircrews for tactical

organizations worldwide. Aircraft stationed at Cannon AFB since 1965 include the F-100 "Super Sabre" fighter jet (1957-1969), the F-111A (1969), the F-111E (1969-1971) and the F-111D (1971-present). There are approximately 70 F-111D aircraft assigned to Cannon AFB. The total work force on Cannon AFB numbers approximately 4,000, which includes 3,500 military and 450 civil service.

In 1992, Cannon AFB became part of the Air Combat Command (ACC) as the result of the overall realignment of Air Force Commands and the ongoing downsizing of the U. S. Military.

1.4 PREVIOUS INVESTIGATIONS

Prior to this Phase II RFI, investigative activities completed at Cannon AFB include the following:

- IRP Records Search - CH2M Hill - 1983
- Preliminary Review/VSI Report - RCRA Facility Assessment - A.T. Kearney - 1987
- RCRA Facility Investigation Work Plan for 27 SWMUs - Lee Wan and Associates, Inc. - 1990
- Remedial Investigation (RI) - Appendix I SWMUs - W-C - 1991-1992 (18 SWMUs called "First Third")
- RFI - Landfills 1 and 2 - W-C - 1992-1993
- RFI - Appendix II SWMUs - through USACE, Albuquerque, NM - 1993

Concurrently with the RFI on Appendix II SWMUs, W-C is completing Phase II RFI activities on Appendix III SWMUs, at the Old Entomology Rinse Area and at Landfill 5, under separate task orders. Investigations are also being completed at Landfills 3 and 4 and at Landfill 25.

1.5 ORGANIZATION OF REPORT

The report is organized as shown in the table of contents, reporting activities and recommendations essentially in the order they were completed. The discussion of results and recommendations for each individual SWMU are presented (one site per section) in Sections 6.0 through 12.0, and the recommendations are recapped in summary form in Section 13.0.

TABLE 1-1

RFI STATUS OF APPENDIX II SWMUs
CANNON AFB, NEW MEXICO

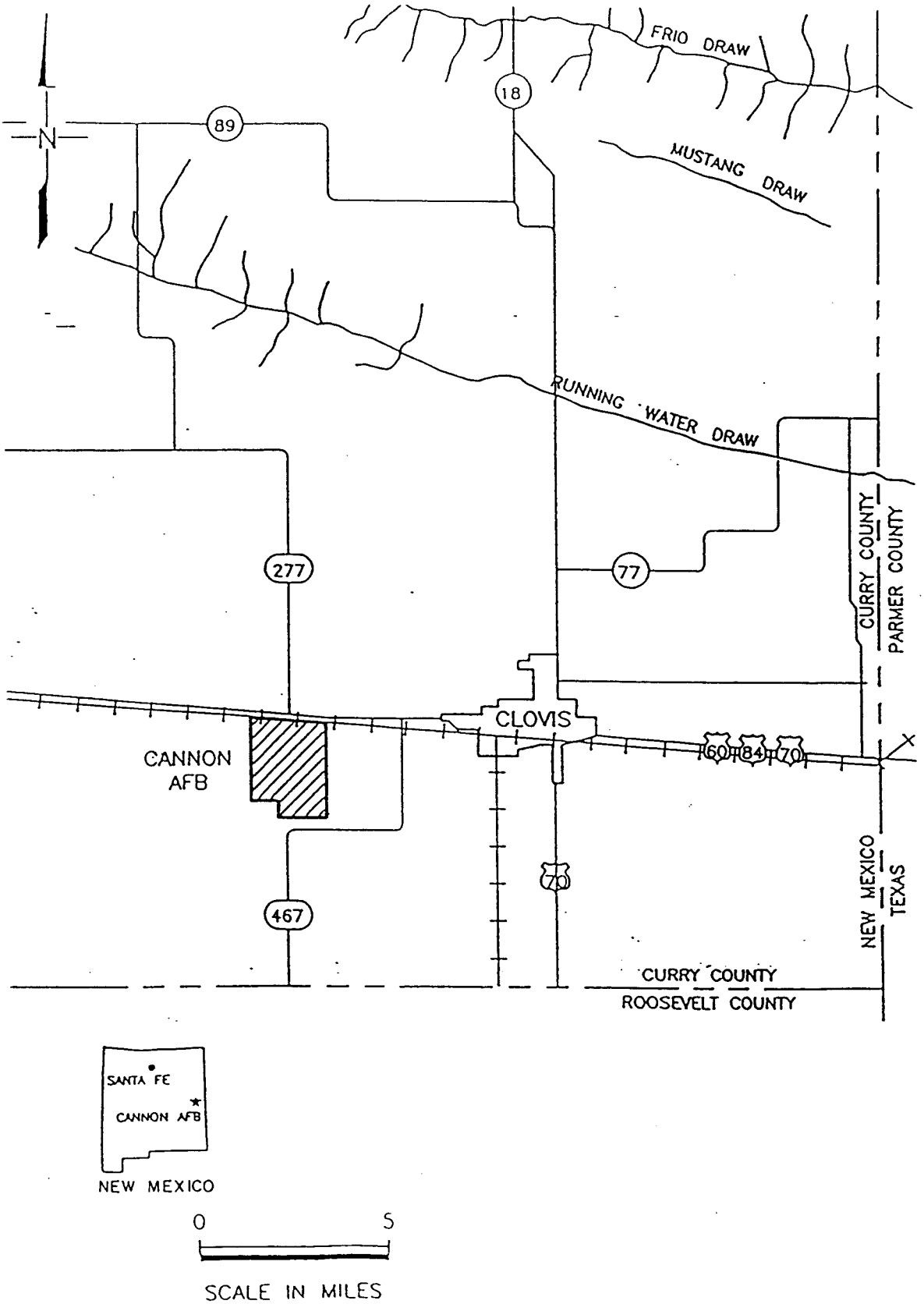
SWMU No.	SWMU Description	Status*	
		Phase I	Phase II
1	O/WS Site 119	Yes	REP95
2	Recovered Diesel Tank No. 108[1]	No	No
3	O/WS Site 108	Yes	NFA
4	Recovered Diesel Tank No. 121[3]	No	No
5	O/WS Site 121	Yes	NFA
6	POL Tank No. 129[4,2]	No	No
7	O/WS Site 129	Yes	REM95
8	O/WS Site 165	Yes	REM95
9	Aircraft Washrack Drain System	Yes	REP95
10	POL Tank No. 170[5,2]	No	No
11	O/WS Site 170	Yes	REM95
16	O/WS Site 680	Yes	NFA*
32A	O/WS Site 186	Yes	REM95
33B	O/WS Site 186	Yes	REM95
38	O/WS Site 194	Yes	REP95
39	O/WS Site 195	Yes	REP95
48A	Underground Storage Tank	Yes	NFA
48B	Aboveground Storage Tank	Yes	NFA
49	Inactive POL Storage Tank No. 4028a[6,2]	No	No
50	Inactive POL Storage Tank No. 4028b[7,2]	No	No
71	Recovered JP-4 Fuel Tank No. 390[8,2]	No	No
79	Underground Storage Tank[9]	No	No
83	O/WS Site 120	Yes	NFA
108	EOD Training Area	Yes	NFA
110	Underground Waste Oil Tank No. 2336[10]	No	No
124	Inactive POL Storage Tank No. 1[11]	No	No
125	Inactive POL Storage Tank No. 2[12]	No	No
126	Inactive POL Storage Tank No. 3[13]	No	No

O/WS - Oil/Water Separator
EOD - Explosives and Ordnance Demolition
NFA - Phase II RFI completed; No Further Action
NFA* - No Further Action based on Phase I studies. Phase II could not be completed.
REP95 - No Phase II RFI was completed; however, the O/WS is to be removed, inspected, and replaced in 1995.
REM95 - No Phase II RFI was completed; however, the O/WS is to be removed and inspected but not replaced in 1995.
* Indicates whether or not a Phase I and/or Phase II RFI was completed.
[1] 2,000-gal. heating oil UST at demolished Building 108. Tank was removed during MILCON project for new hangars during FY88 which replaced Building 108 with Building 125.
[2] Based on records from this project, recommend NFA.
[3] 2,000-gal. heating oil UST at demolished Building 121. Tank was removed during MILCON project for new hangars during FY88 which replaced Building 121 with Building 126.

TABLE 1-1

RFI STATUS OF APPENDIX II SWMUs
CANNON AFB, NEW MEXICO

[4] 2,000-gal. heating oil UST at Building 129. Tank was removed October 1992 under Project 92-9001.
[5] 2,000-gal. heating oil UST at Building 170. Tank was removed October 1992 under Project 92-9001.
[6] 20,000-gal. used oil UST located off of Cannon AFB. Tank was removed December 1988 under Project 86-0071. No soil samples taken according to records.
[7] 500-gal. diesel AST located off of Cannon AFB. Tank was removed December 1988 under Project 86-0071.
[8] 2,000-gal. JP-4 UST. Removed January 14, 1991 under Project 86-0045.
[9] 2,000-gal. recovered JP-4 UST near SWMU 78. The IRP Phase I study places the tank in the northern area of the fire training area. Visible excavation was evident during the RFA in the area believed to have been the location of the tank. Actual removal is not verifiable.
[10] Unknown volume UST located near Fire Training Area No. 4 (SWMU 109). Tank removed in 1988.
[11] Inactive UST discovered 1987. Location of tank believed to be near SWMU No. 48a UST. According to the RFA, the tank was used to store diesel fuel and, upon closure, was drained and filled with sand.
[12] Inactive diesel oil UST. Located near Building No. 357 according to the RFA. The tank has been drained and filled with sand.
[13] Inactive heating oil UST discovered. Location of tank adjacent to Building 163 (prior location of the photo lab) according to the RFA. Tank was either removed or drained and filled with sand.



DRN BY SCR	DATE 06/21/94	REGIONAL MAP CANNON AIR FORCE BASE NEW MEXICO		PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0			C3M11QQ	1-1

CAD FILE: DY8 REPORT TE: LF3 & 4 RFI
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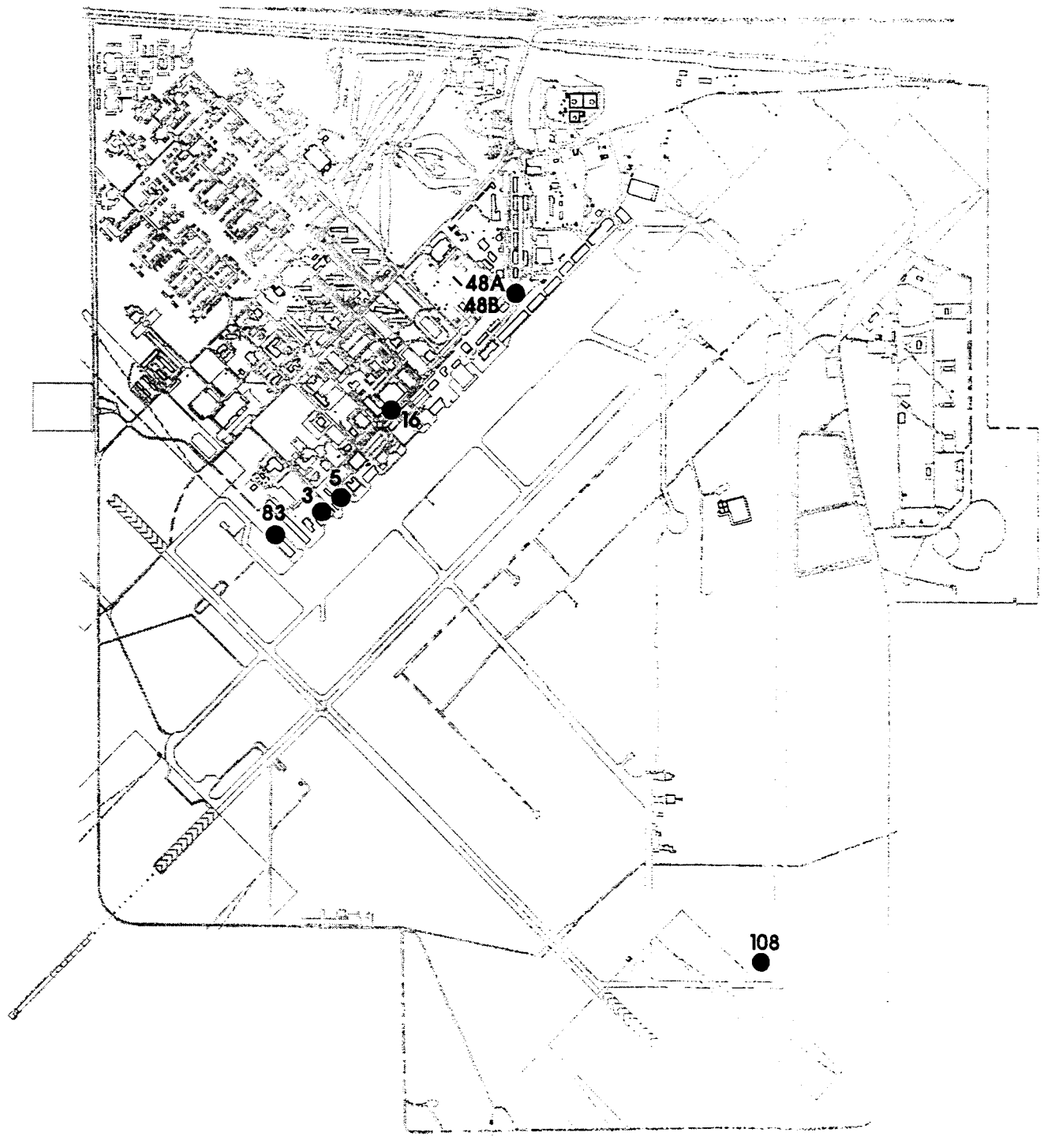
REPORT PHASE: PHASE II



LEGEND

3 ●	SOILD WASTE MANAGEMENT UNIT (SWMU) LOCATION AND NUMBER

SWMU No.	DESIGNATED AREA
3	OIL/WATER SEPARATOR No. 108
5	OIL/WATER SEPARATOR No. 121
16	OIL/WATER SEPARATOR No. 680
48A	UNDERGROUND STORAGE TANK
48B	ABOVEGROUND STORAGE TANK
83	SUMP
108	EXPLOSIVE ORDNANCE DISPOSOAL (EOD) TRAINING AREA

N

2000 1000 0 2000

SCALE IN FEET

DRN. BY: CJG	DATE: 08/16/93	SITE PLAN AND LOCATION OF INVESTIGATED SWMU SITES CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 1-2
CHK'D. BY:	REVISION: 0			

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C3M11M17.DWG

2.0
CANNON AFB FACILITY DESCRIPTION

2.1 SETTING - PHYSICAL GEOGRAPHY

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince. The Llano Estacado is a nearly flat plain sloping gently (10 to 15 feet per mile) to the east and southeast. Elevations in the eastern New Mexico portion of the Llano Estacado exceed 4,000 feet above mean sea level (msl). In the vicinity of Cannon AFB, elevations range from 4,250 feet to 4,350 feet above msl.

The most prominent geomorphic features in the vicinity of Cannon AFB are blowouts and broad, widely spaced valleys. Less common landforms are relict sand dunes located along the northern side of the Portales Valley south of the Base. Relict dunes are not found on or near Cannon AFB.

Blowouts are broad shallow depressions which form as the result of soil erosion by wind. Blowouts commonly collect surface runoff from small to moderate sized drainage areas. During periods of rainfall, runoff collects in blowouts to form ephemeral playa lakes. Playas have no external surface drainage. Water is lost by infiltration to the soil and evaporation; without recharge, playa lakes persist for only a few days or weeks. Three playas are located within the Base, and several more are found to the north and east of the Base.

Stream valleys tend to be fairly broad and widely spaced. Streams are ephemeral and drainages are poorly developed. No streams exist on or near Cannon AFB. Running Water Draw and Frio Draw, located about 10 and 20 miles, respectively, north of Cannon AFB, are the nearest streams. These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals (W-C 1991).

2.2 DEMOGRAPHICS AND LAND USE NEAR CANNON AFB

Cannon AFB is located just south of U.S. Highway 60-84 in a farming and ranching area (Figure 1-1). The majority of the land surrounding Cannon AFB is productive, irrigated farmland or grassland. The major crops are wheat, sorghum, sugar beets, corn, cotton, alfalfa, barley, and peanuts. The land is also used for cattle grazing, both beef and dairy, and Clovis is considered the "Cattle Capital of the Southwest." There were 32,767 people living in Clovis in 1990, while the Cannon AFB population was estimated to be 4,650 in 1990 (W-C 1991).

2.3 CLIMATOLOGY

The climate of east-central New Mexico is classified as tropical semi-arid, with summer temperature and precipitation maxima. Average monthly temperatures range from a January low of 12°C (39°F) to a July high of 26°C (78°F). Extreme daily temperatures range from -24°C (-11°F) to 41°C (106°F) (Lee Wan and Associates 1990). Average monthly precipitation ranges from 1 cm (0.4 inches) in winter to 6.9 cm (2.7 inches) in July (AWS 1986). The maximum recorded 24-hour rainfall is 12.2 cm (4.8 inches), which occurred in August. Rainfall occurs on eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 41 cm (16 inches). The mean annual evapotranspiration rate is 181.4 cm/yr (71.4 inches/yr) (Lee Wan and Associates 1990). Prevailing winds are from the west at an average of 5 km/hr (3.1 mph) during fall, winter, and spring. During the summer, winds are from the south at an average of 3.7 km/hr (2.3 mph).

The atmosphere around the area of Cannon AFB is generally well mixed. The seasonal and annual average mixing heights can vary from 400 meters in the morning to 4,000 meters in the afternoon. The afternoon mixing heights are typically greater during the spring and fall seasons. The morning mixing heights are usually low, due to nighttime heat loss from the ground, producing surface-based temperature inversions. After sunrise, these inversions break up, and solar heating of the earth's surface causes vertical mixing in the atmosphere.

Dust is frequently entrained into the atmosphere in this region of the country because of gusty winds and the semiarid climate. The Texas Panhandle-eastern New Mexico area is considered

the worst area in the United States for windblown dust. Occasionally, this windblown dust is of sufficient quantity to restrict visibility. Most of the seasonal dust storms occur in March and April, when the wind speeds are typically high (average 5 km/hr) (W-C 1991).

2.4 GEOLOGY

The near-surface stratigraphic units of interest at Cannon AFB are the Late Miocene-Late Pliocene-age Ogallala Formation and the Early Triassic Dockum Group as shown in Figure 2-1.

The Dockum Group consists of three formations. The stratigraphically lowest unit is the Santa Rosa Sandstone. Overlying the Santa Rosa Sandstone are the Chinle and Redonda Formations. The Chinle and Redonda Formations are composed mainly of red shales with lesser interbedded sands, and are known locally as "redbeds." The top of the Dockum Group is marked by an erosional nonconformity having relief of up to several hundred TRPH (Lee Wan and Associates 1990).

Overlying the Dockum Group redbeds is the Ogallala Formation. The Ogallala Formation extends from eastern New Mexico and Colorado into Texas, Oklahoma, Kansas, Nebraska, and South Dakota. Drillers' logs from Cannon AFB indicate that the Ogallala Formation varies from 360 TRPH to 415 TRPH in thickness. The incised upper surface of Triassic redbeds strongly influences Ogallala thickness. Stream valleys in the post-Triassic nonconformity are deep and trend dominantly east-west. Ogallala thickness may thus vary significantly over short north-south distances.

The Ogallala is erosionally truncated to the south along the abandoned Portales Valley, to the west along the Pecos River Valley, and to the north in a series of ephemeral stream valleys. The Ogallala Formation extends more than 125 miles to the east before terminating as an escarpment in Briscoe County, Texas. Springs and seeps are common along the erosional margins of the Ogallala.

The Ogallala dips gently and monoclinally to the southeast in the vicinity of Cannon AFB. As reported in Lee Wan and Associates (1990), data suggest that some Quaternary warping may have occurred; however, most of the structures are well to the northwest and southwest

of Cannon AFB. No faults or buried structural lineaments are known in the vicinity of Cannon AFB.

The Ogallala Formation is composed of unconsolidated poorly sorted gravel, sand, silts, and clays. The base of the Ogallala is generally marked by a gravel, cobble, and boulder deposit. This basal member contains sediments derived from igneous and sedimentary rocks transported from the mountains to the west. The Ogallala Formation was laid down as stream and overbank deposits formed within coalescing alluvial fans. These fans form a broad pediment along the eastern flank of the Rocky Mountains. As is typical of alluvial deposits, Ogallala internal stratigraphy varies vertically and horizontally over short distances.

Except where strongly cemented by calcium carbonate (caliche), the sediments of the Ogallala are loose and friable. Authigenic and allogenic clays are found as a trace to abundant matrix mineral (Lee Wan and Associates 1990). As reported by Lee Wan and Associates (1990), five zones have been distinguished within the Ogallala of east central New Mexico on the basis of clay minerals. Smectites (montmorillonites) and attapulgite (with sepeotite) are the dominant clays throughout the Ogallala. Illite is a lesser, but persistent clay, as is kaolinite. Smectite is a swelling clay, causing deep cracks to form in dry surface soils. Smectite in particular and, to a lesser extent, attapulgite and illite, are clays with moderate to high cation exchange capacities (CEC). The formation as a whole should therefore have a relatively high CEC, which should inhibit the migration of charged contaminants, and especially ionic forms of metals.

Caliche is a major feature of the Ogallala Formation, occurring as nearly continuous to discontinuous layers throughout. A generalized geologic section at Cannon AFB is shown in Figure 2-1. Caliche is hard, white to pale tan on fresh surfaces, weathering to gray, and has a chalky appearance. Caliche forms as calcium carbonate, leached from overlying sediments, and precipitates in the pore space of the host sediments. Precipitation is caused by the evaporation of downward percolating water. The caliche may thus mark the position of ancient vadose zones. As reported in Lee Wan and Associates (1990) radiocarbon dates for the upper "climax" caliche range from ~27,000 yrs. Before Present (B.P.) to ~42,000 yrs. B.P.

Caliche is relatively soluble in acidic water (pH < 7) or in waters containing dissolved CO_2. The top surface of the upper "climax" caliche in fresh outcrop shows solution etching.

The Ogallala has numerous continuous to discontinuous caliche layers throughout its thickness. The uppermost caliche, termed the "climax" caliche, is pisolitic (consisting of spherical concentrically laminated aggregates 1 to 10 mm in diameter, Lee Wan and Associates 1990). The pisolites are thought to have formed as the caliche was repeatedly chemically-weathered and brecciated during Pleistocene pluvials (wet climate episodes) and later recemented during drier intervals. This upper caliche crops out around playas and the bounding escarpments of the Ogallala, and is locally termed "caprock." The "climax" caliche is typically 3 to 5 TRPH thick. Caliches which occur lower in the Ogallala are platy and harder. Caliche may be thin or absent below playas (W-C 1991).

2.5 HYDROGEOLOGY

The lower portion of the Ogallala Formation is the primary regional aquifer for both potable and irrigation water. No deeper aquifers are utilized in the vicinity of Cannon AFB. The Ogallala aquifer is part of the High Plains Aquifer which extends continuously from Wyoming and South Dakota into New Mexico and Texas. In east central New Mexico, the Ogallala aquifer rests on Dockum Group redbeds, which serve as the basal confining layer. The Ogallala is a water table, or unconfined, aquifer (Lee Wan and Associates 1990). The Ogallala aquifer has a southeasterly regional gradient of about 13 TRPH/mile. Well yields vary from less than one gallon per minute (gpm) in thin silts and sands, and up to 1,600 gpm in thick sands and gravels (Lee Wan and Associates 1990). Water quality is generally good, with hardness and fluorides being somewhat high (Lee Wan and Associates 1990).

At Cannon AFB, the depth to groundwater is greater than 200 TRPH, and the Ogallala aquifer has an average saturated thickness of 120 TRPH based on mid-1960s data. Saturated thickness ranges from 93 to 143 TRPH, and is influenced by the configuration of the erosional nonconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7.5 TRPH/mile (Lee Wan and Associates 1990). Figure 2-2 shows water table elevation contours for 1984. Flow within the saturated zone may be influenced by the configuration of the top of the Dockum Group. Yields in tests of Cannon AFB water wells have ranged from 776 l/min (205 gpm) to 4,353 l/min (1150 gpm).

Specific capacities range from 0.14 m^3/m (11.4 gal/TRPH) to 0.35 m^3/m (27.9 gal/TRPH) (Lee Wan and Associates 1990).

Very rough estimates of hydraulic conductivity were made from well pump tests in water wells 5 and 9 (Figure 2-3) using the Theis equation. An estimate of hydraulic conductivity for water well 8 was based on water level recovery data using the Bouwer and Rice approach (Lee Wan and Associates 1990). The data used in these calculations were obtained to evaluate pump rates, efficiency, and well yield, and were not intended for use in calculating aquifer properties. The results of these calculations should therefore be considered as first approximations.

Hydraulic conductivity values for water wells 5 and 9 were found to be approximately 2.0×10^{-3} cm/sec. Calculations for water well 8 result in a hydraulic conductivity of 2.0×10^{-2} cm/sec. In addition, slug testing of two monitoring wells (MW-O and MW-N) was done by Woodward-Clyde in February 1995 (W-C 1995). The estimated hydraulic conductivities from these slug tests were both 3×10^{-3}. These estimates appear to be low when compared to published hydraulic conductivity data for sands and gravels. As reported in Lee Wan and Associates (1990) a groundwater flow velocity of about 45 m/yr (150 TRPH/yr) has been estimated. This calculates out to a hydraulic conductivity of approximately 1.0×10^{-1} cm/sec. Again, this appears to be low when compared with published data (Freeze and Cherry 1979).

The presence of interstitial clays may account for both the variability and low values of hydraulic conductivities. Boring logs from Cannon AFB IRP projects and published reports (Lee Wan and Associates 1990) indicated that interstitial and interstratified clays are abundant in the Ogallala Formation.

Recharge to the Ogallala is primarily through precipitation. As reported in Lee Wan and Associates (1990), a recharge rate of 0.5 inches/year as calculated using the Theis equation. Lee Wan and Associates (1990) reported that the recharge rate may be as much as 1.0 inches/yr. Due to the high evapotranspiration rate and low precipitation, recharge probably occurs only during heavy rainfall events in which the infiltration capacity of the soil is exceeded and runoff occurs, or during cool months when precipitation exceeds evapotranspiration. Excess runoff flows to playas, and the presence of water in playas may

allow deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and thin or nonexistent caliche layers directly below, playas. Caliche is soluble in acidic rain waters, and is leached over time to form percolation pathways.

Discharge from the Ogallala occurs through well pumping and springs along the eroded margins of the formation. Spring discharge does not occur on or near Cannon AFB. Domestic and irrigation water wells are common on and around the Base, however. The rate of discharge exceeds the rate of recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. A decline of 50 to 100 TRPH has been observed in the area around Clovis, New Mexico for the period from the 1930s to 1980. Lee Wan and Associates (1990), states "the largest area of water level decline exceeding 100 TRPH occurs south of the Canadian River extending from Curry Co., New Mexico to Crosby Co., Texas."

The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water. Numerous wells are found in the Cannon AFB area, most of which provide only irrigation water (Figure 2-3).

The Ogallala will continue to be used as the primary source of potable and irrigation water for eastern New Mexico. The New Mexico State Engineer designated Curry County as a Water Basin in 1989. This designation allows for regulation of water rights, usage, and well drilling (W-C 1991).

2.6 SOILS

Soils in the vicinity of Cannon AFB are classified as SM to SC under the Unified Classification Systems, and as aridisols (calciorthids) under the Soil Conservation Service Comprehensive Soil Classification System. The following summary is based on the Soil Conservation Service Curry County Soil Survey as reported in Lee Wan and Associates (1990).

The most common soil type on the Base is the Amarillo fine sandy loam, 0- to 2-percent slope phase (map symbol Ab Figure 2-4). This soil consists of a thin sandy A horizon, well-defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths below 40 inches. The calcic

B_3 horizon lies on a calcic C horizon, or on caliche. The Amarillo fine sandy loam is present on all relatively flat surfaces at the Base, but is also found on slopes associated with playas (map symbol Ac).

Clovis fine sandy loams, 0- to 2-percent slope phase (map symbol Cb) and 2- to 5-percent slope phase (map symbol Cc), are very similar to Amarillo fine sandy loams. In the Clovis soils, the depth to the calcic C horizon ranges from 28 to 56 inches. The depth to caliche exceeds 56 inches. Clovis and Amarillo fine sandy loams occur in close association.

In a few limited areas, particularly along the steeper slopes around playas, Mausker fine sandy loam, 0- to 2-percent slope phase (map symbol Ma), and 2- to 5-percent phase (map symbol M6) are found. Mausker fine sandy loams have no B horizons and are very calcareous. The calcic C horizon is within 2 TRPH of the surface.

The A and B horizons of Amarillo and Clovis fine sandy loams are rapidly to moderately permeable. Mausker fine sandy loam A and Ac horizons are rapidly permeable. Permeabilities in calcic B and C horizons are moderate (Lee Wan and Associates 1990).

2.7 BACKGROUND METALS CONCENTRATIONS IN SOIL AND WATER QUALITY

The natural soils in the vicinity of Cannon AFB are alkaline and rich in metals in general. Typically high concentrations of aluminum, iron, magnesium, manganese, and potassium combine with elevated levels of many other metals in the natural soils. Calcium is naturally present in the soils at levels up to nearly 200,000 mg/kg. Tightly cemented layers of "caliche" are present in several horizons in the natural soils and the Ogallala aquifer below.

The background levels of inorganic compounds in soil at Cannon AFB are presented in Table 2-2 in the form of a mean value and statistical information on the ranges encountered for each element. The groundwater quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985).

The general water quality from the Ogallala aquifer over a broad region is presented in Table 2-3, and water quality data for samples from production wells and monitoring wells within the bounds of Cannon AFB are presented in Table 2-4.

These tables of background data have been adapted from a final report by Woodward-Clyde dated March 1994 entitled "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon Air Force Base, Clovis, New Mexico". This report summarizes background data for soil and groundwater from numerous past investigations in the vicinity.

The mean values and upper tolerance limits (UTLs) presented in Table 2-2 are the background levels used in the screening of soil chemical results for this RFI. In addition to comparison to the UTL of the Basewide background data (which is necessarily from a limited data set), other sources of naturally-occurring metals concentrations, such as USGS (1984), were considered when determining whether metals concentrations are within background levels.

2.8 BIOLOGICAL RESOURCES

Land adjacent to Cannon AFB is primarily used for agriculture, and there is little natural vegetation remaining in the area. The wildlife species that are common to agricultural areas throughout the region include bobwhite quail and pheasant. There are a few playa lakes in the area; these are used by upland game for cover, by waterfowl for resting and feeding, and by wildlife in general for drinking. Nearby riverbeds also provide water sources during rainy seasons. During periods of low rainfall, the riverbeds are dry (W-C 1991).

2.8.1 Plant Resources

The climate of the Base area is considered to be semiarid. The thin layer of topsoil in the vicinity of Cannon AFB is sandy loam, which is highly susceptible to wind erosion. The undisturbed natural vegetation is mostly shortgrass prairie, including blue grama grassland and mixed grama grassland vegetation types, which have moderately fast recovery rates.

Much of the study area has been previously cleared for agricultural crops. The predominant land use of the region is rangeland, primarily for cattle grazing. In general, moderately grazed rangeland areas of the types occurring in the project area are highly productive in terms of both forage quality and quantity. The rangeland in the vicinity may support up to 15 to 20 head of cattle per section, depending on the rainfall. Large trees do not uniformly exist in the vicinity of the range except where planted around buildings and other structures on the Base. Woodlands composed of large shrubs and small trees are confined to riparian areas and playa lakes in the vicinity (W-C 1991).

The following plants are candidate species for the Federal List of Endangered and Threatened Wildlife and Plants and are found within a 50-mile radius of Cannon AFB: chatterbox orchid (*Epipactus gigantea*), spiny aster (*Aster harridus*), Whittmans milkvetch (*Asragalus witmanil*), dune unicorn plant (*Proboscidea sabulosa*), and the tall plains spruce (*Eupjorbia strictior*). The dune unicorn plant is also on the state endangered plant species list. No federally protected endangered plants are known to be present on the Base (Lee Wan and Associates 1990).

2.8.2 Wildlife Resources

The eastern New Mexico area contains many nongame wildlife species that are typical of the High Plains. Most of these species are distributed widely throughout the western United States. Species diversity is low in most habitats because of the low vegetation diversity. Most amphibian species are associated with riparian habitats and playa lakes. Reptiles are found in all terrestrial habitat types, but are most abundant in scrub/grasslands. Nocturnal rodents are the most abundant members of the small mammal community.

Grasslands on the High Plains support a variety of seed-eating sparrows and other ground-dwelling birds, both as residents and migrants. Raptors (hawks and owls) are relatively abundant in all habitats in the region. Insectivorous and tree-nesting species are most abundant in riparian areas. Shorebirds and waterbirds and migratory waterfowl in general utilize the rivers, playa lakes, and reservoirs of the region.

Two National Wildlife Refuges (NWRs) are located on the periphery of the Base area. The Grulla and Muleshoe NWRs are within 30 miles of Cannon AFB. These areas provide high-quality habitat for migratory and breeding waterfowl.

Big-game species in the area include mule deer, white-tailed deer, pronghorn, and barbary sheep. Pronghorn are the most abundant game animal in the area. Several species of upland game, such as quail, ring-necked pheasant, and turkey are common in the area. Reservoirs (Ute Lake, Conchas Lake, and Clayton Lake) and playa lakes are important waterfowl habitats in the region. Numerous species of native and introduced fish inhabit the rivers and perennial streams, and the reservoirs support recreational fishing of warm-water species such as walleye, crappie, channel catfish, largemouth bass, and bluegill.

As determined by the regional office of the U.S. Fish and Wildlife Service, two federally listed endangered animal species, the bald eagle and peregrine falcon, are known to inhabit the area within a 50-mile radius of Cannon AFB. The New Mexico Department of Game and Fish also indicated that the state endangered Mississippi Kite, Baird's Sparrow, and the Black-Footed Ferret may also occur in the vicinity of the Base. The federal- and state-protected species are listed in Table 2-1.

Within Curry County, the only state-protected bird that is expected to occur is the Mississippi Kite. In New Mexico, since the early 1960s, this kite summers regularly and breeds in the Clovis region. The birds frequent the golf course at Cannon AFB. Two other state-protected birds that may occur within Curry County are the McCown's Longspur and Baird's Sparrow. These two species have not been sighted regularly in recent years. No information is available on the McCown's Longspur in New Mexico; however, Baird's Sparrow occurs mainly in autumn during migration in the eastern plains and southern lowlands. Migrants appear as early as the first week of August and move further south by November. The species seems to have declined in abundance throughout its range in the Southwest due to the loss of shrubby shortgrass habitats.

State-protected birds known to occur infrequently are the bald eagle and the peregrine falcon. The bald eagle migrates and winters from the northern border of New Mexico to the Gila, lower Rio Grande, middle Pecos, and Canadian valleys. It is seen occasionally in summer and as a breeding bird, with nests reported in the extreme northern and western parts of the

state. Winter and migrant populations appear to have increased with reservoir construction. The peregrine falcon is widely distributed but population numbers are low. The American subspecies breeds statewide in New Mexico, but mainly west of the eastern plains (Source: Draft Environmental Impact Statement - Cannon AFB 1990).

TABLE 2-1

FEDERAL- AND STATE-PROTECTED ANIMALS POTENTIALLY OCCURRING IN THE VICINITY OF CANNON AFB (CURRY COUNTY)

Common Name	Scientific Name	Federal Status	State Status
Birds			
Mississippi kite	Ictinia mississippiensis		Endangered (Group 2)
Barid's sparrow	Ammodramus baridii		Endangered (Group 2)
Bald eagle	Haliaeetus leucocephalus	Endangered	Endangered (Group 2)
Peregrine falcon	Falco perigrinus	Endangered	Endangered (Group 1)
Mammals			
Black-footed ferret	Mustela nigripes	Endangered	Possibly Extinct

Endangered (Group 1): Species whose prospects of survival or recruitment within the state are in jeopardy.

Endangered (Group 2): Species whose prospects of survival or recruitment within the state are likely to become jeopardized in the foreseeable future.

Possibly Extinct: Potentially no longer in existence in the state.

Source: Lee Wan and Associates 1990

TABLE 2-2

SUMMARY OF BACKGROUND ELEMENTAL CONCENTRATIONS[1] IN SOIL SAMPLES[2] CANNON AFB, NEW MEXICO

Element	Mean ($\bar{x}$)	Standard Deviation (SD)	95% Tolerance Limits of Background Concentrations[4] ($\bar{x}$)±2SD
Aluminum	5,700	2,420	860 - 10,540
Antimony	6.75[3]	-	-
Arsenic	3.5	6.0	0 - 15.5
Barium	166	238	0 - 642
Beryllium	0.41	0.16	0.09 - 0.73
Cadmium	1.1[3]	-	-
Calcium	69,200	58,600	0 - 186,400
Chromium	6.98	2.78	1.42 - 12.5
Cobalt	2.5	1.0	0.5 - 4.5
Copper	5.40[3]	-	-
Iron	4,780	1,970	840 - 8,720
Lead	7.12	9.35	0 - 25.8
Magnesium	4,650	3,570	0 - 11,790
Manganese	72.0	46.0	0 - 164
Mercury	0.11[3]	-	-
Nickel	5.0	2.0	1.0 - 9.0
Potassium	1,360	606	148 - 2,572
Selenium	8.23[3]	-	-
Silver	1.2[3]	-	-
Sodium	514[3]	-	-
Thallium	0.50[3]	-	-
Vanadium	14.9	5.20	4.50 - 25.3
Zinc	11.3	5.29	0.72 - 21.9

[1] All concentrations are in milligrams per kilogram (mg/kg).
[2] Compiled from data collected by W-C for the RFI and RI (W-C 1992 and W-C 1993) and Walk, Haydel & Associates for the IRP (Walk, Haydel & Associates 1990).
[3] These mean values are determined from a set of numbers including some reporting limits for nondetect results. The actual mean background concentrations are likely less than these values.
[4] Values are equivalent to 95% upper and lower tolerance limits of background concentrations.

TABLE 2-3

REGIONAL WATER QUALITY[1] - OGALLALA AQUIFER[2]

	Sherman Co. Nebraska	Laramie Co. Wyoming	Red Willow Co. Nebraska	Kit Carson Co. Colorado	Kiowa Co. Colorado	Stanton Co. Kansas	Meade Co. Kansas	Union Co. New Mexico	Roberts Co. Texas	Gaines Co. Texas	Gaines Co. Texas	Mean ($\bar{x}$)
Silica	63	28	58	36	22	20	23	38	27	58	64	40
Calcium	94	45	56	30	228	51	63	56	46	72	231	88
Magnesium	14	5.5	15	10	114	20	19	34	18	20	225	45
Sodium and Potassium	21	6.4	19	27	226	35	245	17	37	44	845	138
Bicarbonate	336	157	200	181	184	180	210	215	243	221	282	219
Sulfate	18	6.5	13	10	1,170[5]	8.1	94	49	32	104	1,351[5]	260
Chloride	18	2.8	3.9	3.0	143	30	350[5]	46	28	43	1,109[5]	162
Fluoride	---	0.4	0.8	1.8	4.0[5]	1.4	1.0	1.6	0.8	1.5	4.0[5]	1.6
Nitrate	7.6	7.0	---	7.6	3.9	12[5]	1.7	24[5]	3.9	5.6	4.2	7.0
Dissolved Solids	403	191	273	214	2,140[5]	339	900[5]	372	312	507[5]	3,970[5]	875
pH[3]	7.7	7.4	7.7	8.0	7.7	7.6	7.7	7.4	8.0	7.3	7.4	7.6
Specific Conductance[4]	605	281	420	325	2,630	555	1,650	628	507	675	5,350	1,240

1) Concentrations are in milligrams per liter (mg/L) unless otherwise indicated
2) Source: Krothe, et al. 1982
3) pH units
4) Micro mhos (µmhos)
5) Exceed U.S. Environmental Protection Agency Regulations (1976, 1977)

TABLE 2-4

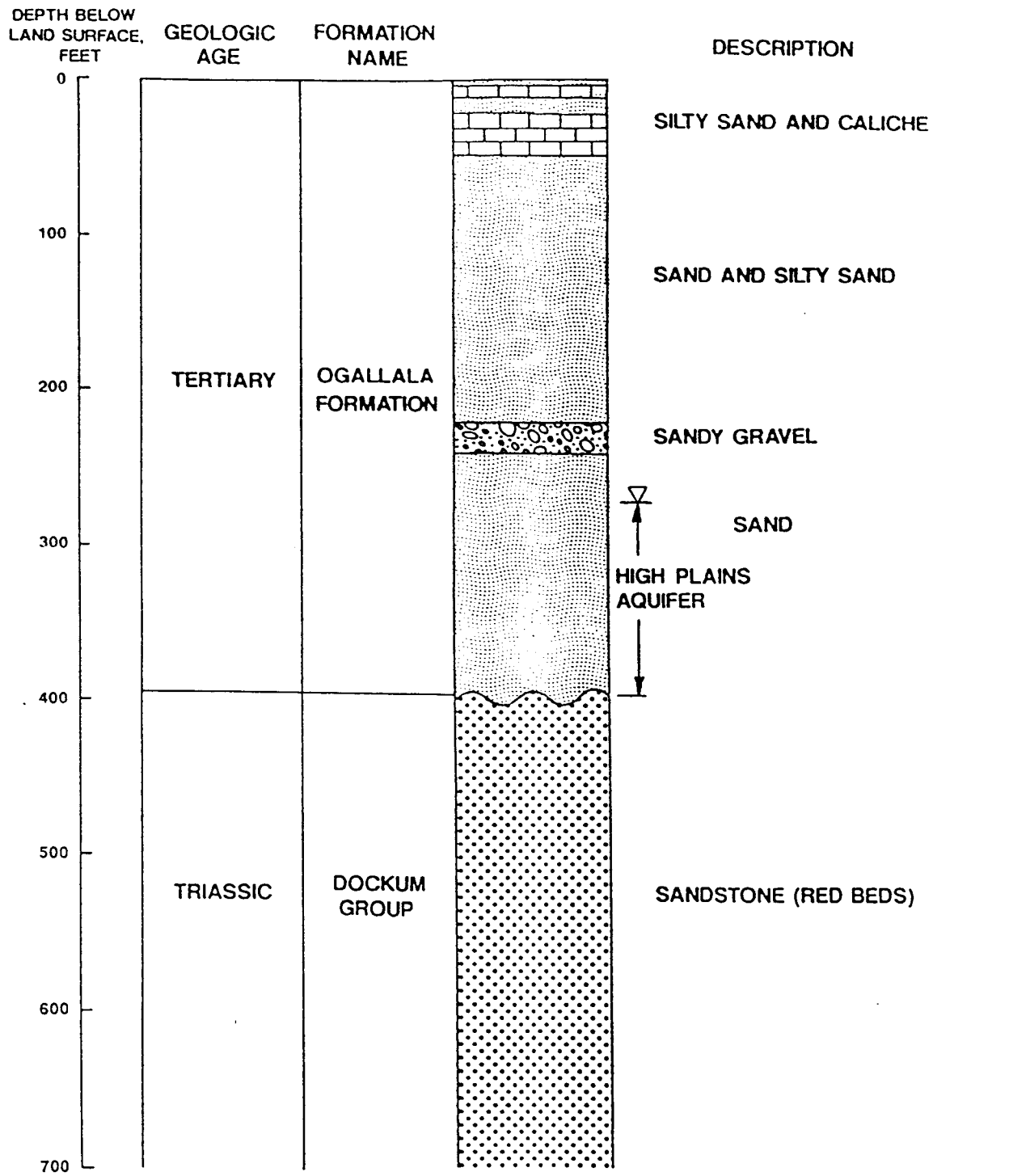
WATER QUALITY SUMMARY[1] FOR CANNON AFB PRODUCTION WELLS AND MONITORING WELLS

	Minimum	Maximum	Mean	MCL[2]
Antimony	0.06U	0.06U	0.06[5]	0.01/0.005[3]
Arsenic	0.005U	0.05U	0.02[5]	0.051
Barium	0.022	0.2	0.50[5]	1.0
Beryllium	0.002U	0.002U	0.002[5]	0.01[3]
Cadmium	0.005U	0.01U	0.0008[5]	0.005[3]
Chloride	42	63.5	52.2	250
Chromium	0.01U	0.001	0.04[5]	0.01
Cobalt	0.01U	0.01U	0.01[5]	*
Copper	0.01U	0.02U	0.012[5]	1.0[4]
Cyanide	0.005U	0.005U	0.005[5]	0.2
Fluoride	1.8	2.6	2.3	2
Lead	0.005U	0.05U	0.015[5]	0.05
Manganese	0.00	0.01U	0.0075[5]	0.05
Mercury	0.0002U	0.003	0.001[5]	0.002
Nickel	0.04U	0.032	0.04[5]	1.0[3]
Nitrate	0.9	6.6	1.8	10.0
Selenium	0.01UJ	0.0049J	0.01[5]	0.05
Silver	0.01U	0.05U	0.02[5]	1.0[4]
Sulfate	115	132	125	250
Thallium	0.01U	0.01U	0.01[5]	0.022/0.001[3]
Tin	0.1U	0.1U	0.1[5]	*
Uranium	0.0036	0.0062	0.0046	5.0
Vanadium	0.02	0.031	0.026	*
Zinc	0.0041J	0.09	0.05	5.0
TDS	385	479	451	500
pH (units)	7.5	7.95	7.78	6.5 - 8.5

MCL = Maximum contaminant level
UJ = Estimated as nondetect at the CRQL
J = Estimated value
U = Not detected
CRQL = Contract Required Quantitation Limit

* No primary or secondary MCL or proposed MCL as of March 1992

[1] All concentrations are in milligrams per liter (mg/L). Values calculated from historical data for Cannon AFB wells 1, 2, 3, 4, 7, 8, 113A, and 101E for period from 1966 through 1991.
[2] Primary MCL in effect as of July 30, 1992
[3] Proposed primary MCL
[4] Secondary MCL in effect as of July 30, 1992
[5] Detection limits (using one times the value) were also used to calculate means.



LEGEND

LITHOLOGIC CONTACT

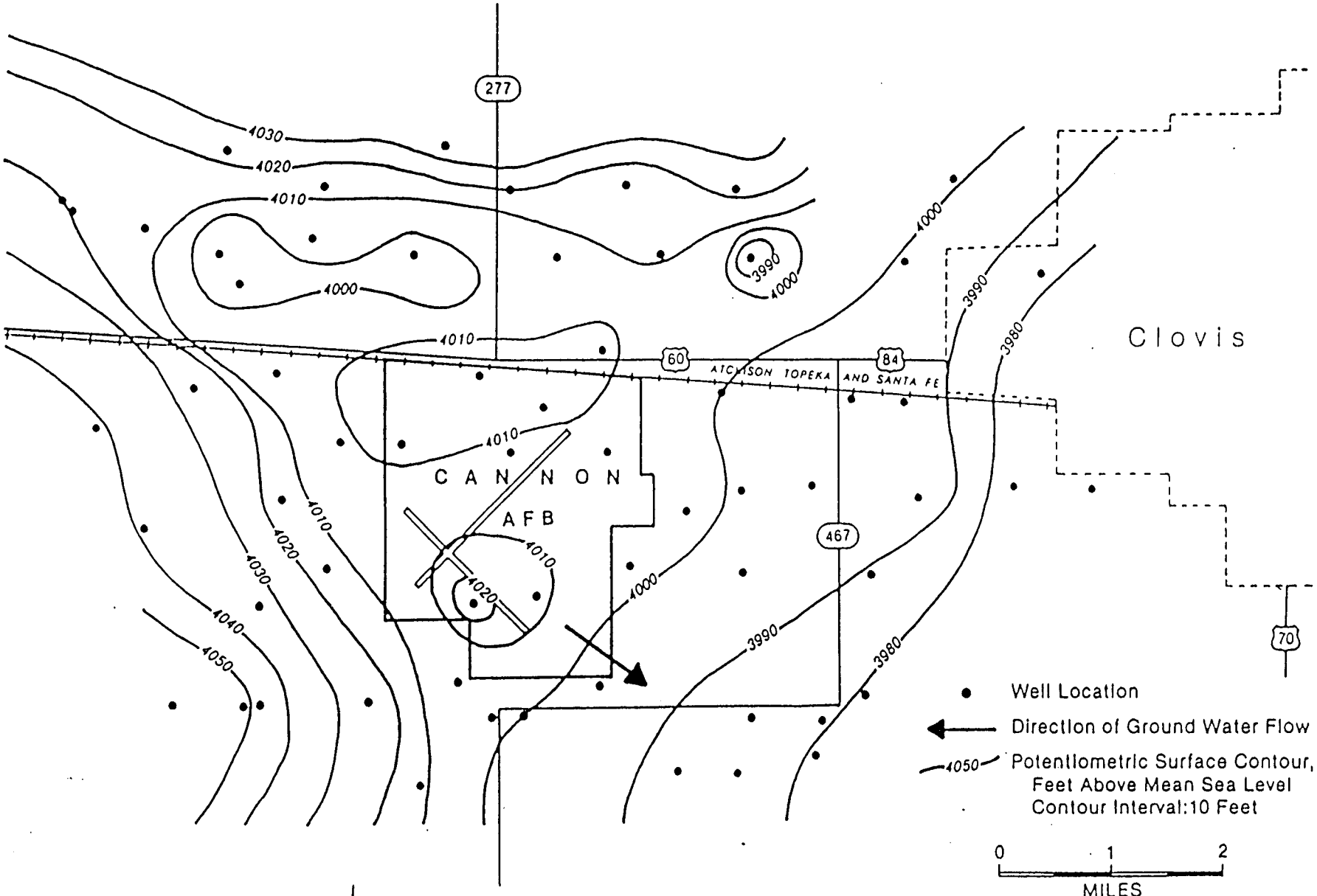
UNCONFORMITY

WATER LEVEL

SOURCE: MODIFIED FROM GUTENTAG ET.AL., 1984

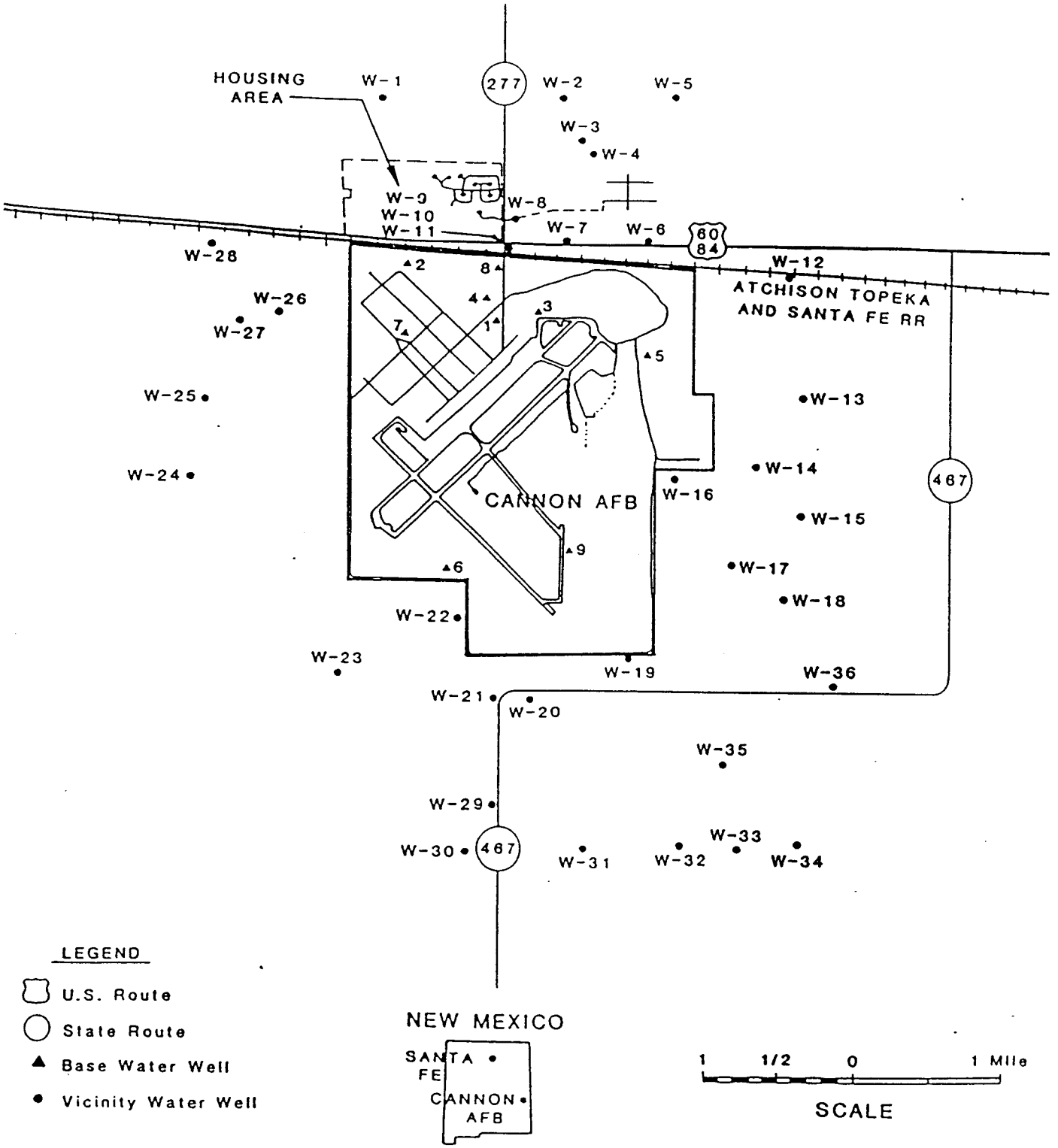
DRN BY SCR	DATE 08/18/93	GENERALIZED GEOLOGIC STRATA AT CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	2-1

REPORT PHASE: PHASE II APX. II R & I
03/21/1995 11:27
FS8x11A.DWG



SOURCE: FINAL REPORT, IRP PHASE II

DRN BY SCR	DATE 08/18/93	POTENTIOMETRIC SURFACE CONTOUR MAP, VICINITY OF CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	2-2



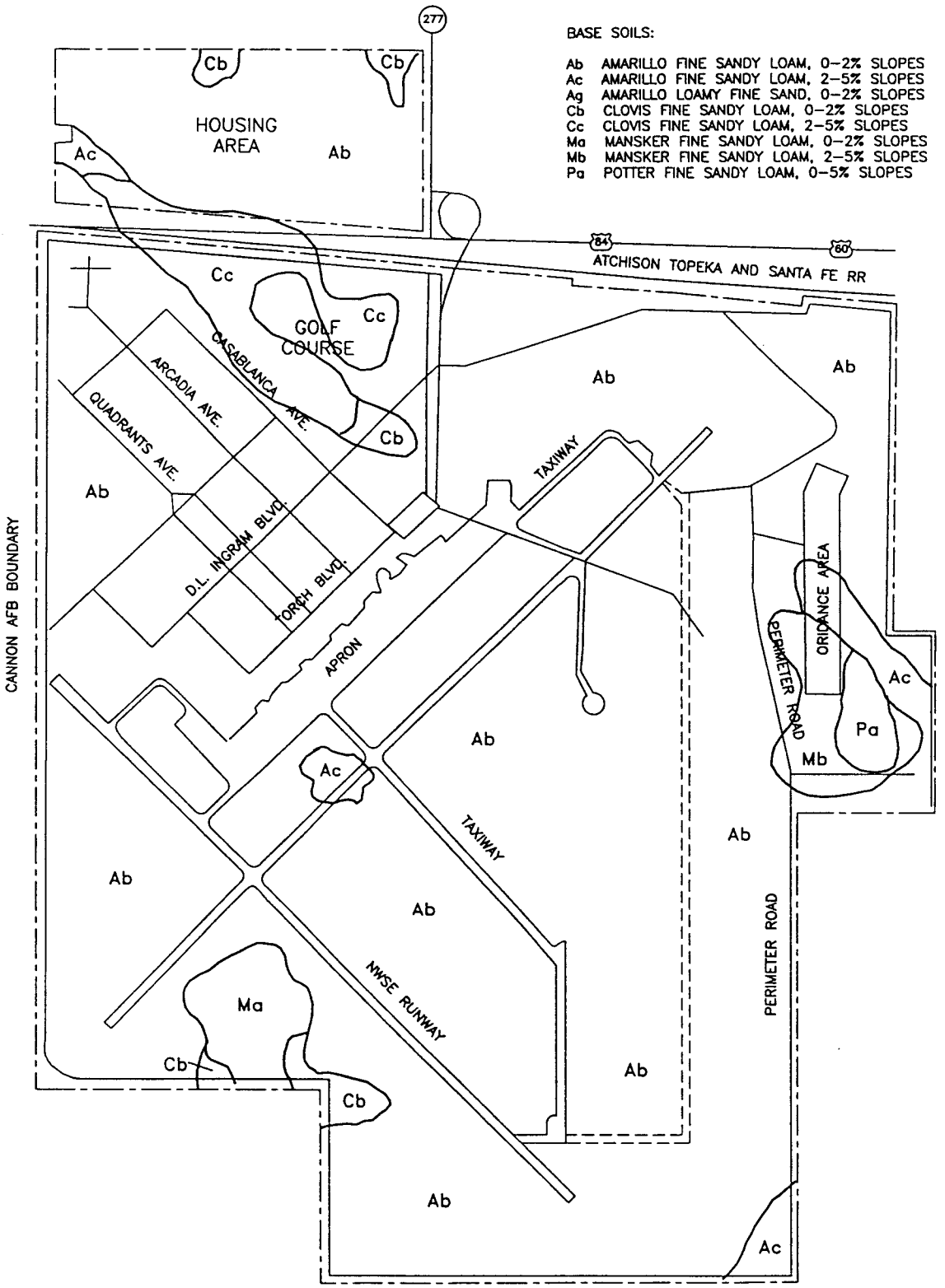
BASE MAP ADAPTED FROM: FINAL REPORT, IRP PHASE II

DRN BY SCR	DATE 08/18/93	WATER WELL LOCATIONS ON AND NEAR CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	2-3

REPORT PHASE: PHASE II APPX. II R & I

03/21/1995 11:22

FS8x11A.DWG



SOURCE: USDA–S.C.S., SOIL SURVEY OF CURRY COUNTY N.M., 1958

DRN BY: SCR	DATE: 08/18/93	DISTRIBUTION OF SOILS, BY TYPE CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 2–4
CHK'D BY:	REVISION: 0			

3.0
RCRA FACILITY INVESTIGATION APPROACH

3.1 RFI OBJECTIVES AND APPROACH

The specific objectives of the RFI at Cannon AFB are to:

- Characterize the physical setting and nature and extent of potential hazardous wastes associated with each SWMU

- Evaluate the data collected to identify potential migration pathways and feasible potential corrective measures

- Perform a Screening-Level Risk Assessment to evaluate human health risks associated with chemicals found at each SWMU (Note: A Baseline Risk Assessment will be required to support final recommendations on sites not eliminated by the screening-level assessment)

- Develop recommendations for each SWMU regarding further investigation through corrective measures studies or, where supported by the findings of the RFI, no further action

The RFI has been completed in accordance with EPA Guidance outlined in "RCRA Facility Investigation (RFI) Guidance, Volumes 1-4, EPA 530/SW-89-031, May 1989." The RFI also meets the basic requirements under CERCLA. The investigation incorporated the use of the Data Quality Objectives (DQO) Process to establish data quality requirements appropriate for the intended use of the data (EPA 1987a,b).

The program approach for the Phase II RFI for the 7 Appendix II SWMUs at Cannon AFB is to review known information including results of past investigations, become familiar with past and present operations and the physical setting at each SWMU, identify data needs, and formulate a sampling plan to collect the necessary data for each SWMU. The rationale for sampling locations, number of samples and analytical parameters are presented in the Work

Plan and in the Field Sampling Plan. Samples taken are listed in tables in sections 6.0 thru 12.0.

3.2 BEHAVIOR OF CONTAMINANT PLUMES

The "pendant plume" model of contaminant migration in a semi-arid region with a deep unconfined water table forms the conceptual basis for soil and groundwater sampling at Cannon AFB (Kearney 1987). Site-specific sampling plans are designed to account for the presence of clays, caliche, and for release quantities. The pendant plume model for subsurface contaminant mitigation is discussed below in more detail.

The behavior of contaminants in unsaturated clay-rich sediments and soils is a complex physicochemical process. Due to the depth to the water table (>200 ft) and lack of precipitation and water infiltration as a contaminant carrier, only large or continuous releases of liquid contaminants may be expected to reach the water table. The presence of low permeability (but not impermeable) caliche layers, as well as chemically active (i.e., high Cation Exchange Capacity [CEC]) clays, will also act to impede contaminant migration. Capillarity will also have a role in attenuating contaminant migration. As illustrated in Figure 3-1, a relatively small contaminant release will tend to form a "pendant plume." A pendant plume extends downward from the release site with little lateral spread. Downward migration will continue until capillarity and clay adsorption eliminates free liquids (i.e., liquids which can be drained rapidly by gravity. Pendant plumes may spread laterally if low permeability layers are encountered during downward movement (Figure 3-1) . However, in the absence of a carrier fluid such as water, lateral spread will be severely limited.

Relatively large plumes may not be fully attenuated by caliche or clays and may reach the water table. Figure 3-1 illustrates this situation. In this instance, a water table with a low gradient could limit the rate of migration in groundwater.

Caliche, as a low-permeability barrier, will act to retard downward movement of the contaminant plume. However, lateral spreading immediately above the caliche layer may occur. As a rule of thumb, a difference of permeability of two orders of magnitude or more will provide an effective barrier in the absence of significant head differences. While the vertical migration pathway provides a significant change in head, if generally small quantities

of liquids are involved it is unlikely that the liquids would migrate to a great depth through competent caliche given the complex nature of flow in the unsaturated zone. However, migration along fractures in the caliche, where present, may allow deeper migration in some locations.

Clays, zeolites (e.g., heulandite), metal oxides, and humus are chemically active soil/sediment constituents which can impede or trap migrating contaminants. These particulates have large surface areas and slight to moderate electronegative surface and interlayer charges. Cationic contaminants in water may partition and adsorb to clay or humus. The degree of partitioning depends on clay CEC; amount of humus; types and concentrations of natural and contaminant ions; ionic valency; and the presence of dissolved organic co-contaminants (Matthess 1984). Multivalent cationic metals will tend to strongly sorb to clays. Semivolatile organics may also be sorbed to clays and humus. However, volatile organics such as xylene will not sorb and may actually increase permeability relative to organics. Areas in which fuel releases have occurred will, therefore, typically have been sampled to greater depths than areas in which only metals or heavy petroleum are of concern.

3.3 DESCRIPTION OF THE DECISION PROCESS

The following decision process has been used to assess the SWMU data needs and investigative approach for the SWMUs. The DQO evaluation process is designed to provide data of sufficient quality and quantity to evaluate whether a release has occurred from a SWMU that could pose a risk to human health or the environment and to evaluate the need for further evaluation such as collection of additional data, completion of a Baseline Risk Assessment (BRA), or possibly completion of a Corrective Measure Study (CMS). The procedures to assess the data needs and investigative approach at each SWMU included:

- Collect soil data to characterize the nature and extent of contamination that has been released from the SWMU, including an evaluation of the potential for chemicals of concern to be transported to the groundwater at concentrations that may pose a human health threat.

- Evaluate analytical results and determine chemicals of concern.

- Evaluate potential impact to groundwater by determining if the vertical distribution of contamination decreases with depth. If it does not significantly decrease, it may not be possible to evaluate the impact to groundwater; so further investigation may be required.

- At the Appendix II SWMUs, compare maximum detected soil concentrations of chemicals of concern to conservative risk-based concentrations (RBCs) to evaluate whether a release has occurred that may pose an unacceptable risk to human health or the environment in the present or future.

- If the concentration of any Appendix II SWMU-related chemicals of concern exceeds RBCs, the potential for adverse health effects (including potential cumulative risks based on RBCs) is evaluated, and further evaluation may be required, which may include a BRA.

- If the vertical extent has been defined and concentrations of SWMU-related chemicals of concern do not exceed RBCs, the concentration of contaminants are considered insignificant and, therefore, no further investigation is recommended.

A decision diagram (Figure 3-2) was developed for the Cannon AFB RFI Appendix II SWMUs to present a logical decision process that was used to evaluate the data resulting from the investigation at each SWMU to assure that project objectives are met.

3.3.1 SWMU Decision Process

The RFI soils investigation decision process is designed to identify appropriate actions for disposition of each SWMU investigated based on three alternative actions for any given SWMU: no further action, interim action, and further investigation or evaluation. The recommendation for the selection of alternative action for each SWMU depended upon whether chemicals of concern were detected in soils at levels that may pose an unacceptable risk to human health or the environment. This section provides a summary of the decision-making process that was used to evaluate each SWMU.

The decision process was implemented by first evaluating and summarizing existing historical information and analytical data collected for each of the SWMUs. Historical information was used to identify potential chemicals of concern and to identify potential sites of chemical release at a SWMU.

Environmental media were sampled and analyzed for potential chemicals of concern. The analyte lists from which chemicals of concern were selected are discussed in the Quality Assurance Project Plan (QAPP) (W-C 1994). SWMU-related chemicals of concern were selected based on the results of the sampling program. Metals that do not exceed background levels, and chemicals which are attributable to field or laboratory contamination, were not included as chemicals of concern. Organic chemicals that do not have EPA-established toxicity factors were not evaluated quantitatively, but their potential contribution to site risks was evaluated qualitatively.

The potential for site-related contaminants to impact groundwater was assessed by evaluating the vertical distribution of contaminants in the soil column. If the concentrations of chemicals of concern decrease significantly with depth, and the concentrations are below levels that are likely to migrate to groundwater (based on fate and transport properties of the contaminant and the vadose zone), the potential for transport to groundwater is considered to be insignificant. If the concentrations do not decrease with depth, further investigation of the groundwater pathway is recommended. If the concentrations are at levels that could potentially migrate to groundwater at concentrations of concern, fate and transport modeling was done to evaluate the potential for contaminant transport to groundwater.

Concentrations of chemicals of concern detected at each Appendix II SWMU were evaluated for potential human health and environmental risks by comparing maximum detected concentrations (which are higher than concentrations to which people or ecological receptors would routinely be exposed) to highly conservative (protective) health risk-based concentrations. This conservative approach permits identifying SWMUs that pose no unacceptable risk under highly conservative exposure assumptions and that, therefore, warrant no further evaluation or action. The approach also permits identification of SWMUs that may warrant further evaluation based on exceedance of stringent risk-based concentrations. The methods used in the screening-level human health risk evaluations are presented in Section 3.5.

The results of this evaluation were used to make recommendations regarding the three alternatives stated above. The recommendations were made on the following basis:

- If the vertical extent of contamination has been defined, no threat to human health exists based on comparison of maximum concentrations to RBCs, and no potential threat to the environment is apparent, then no further action is recommended.

- If an unacceptable threat to human health or the environment is imminent, a source is well defined, and a source control is readily identified, an interim action to control the source is recommended.

- If there is a potential significant threat to human health or the environment, further investigation is recommended for the SWMU. Further investigation may include additional field investigation and/or a BRA.

Figure 3-2 presents the decision diagram that was followed for the SWMU investigations.

3.4 SITE CONCEPTUAL EXPOSURE MODELS

Information concerning waste sources, waste constituent release and transport mechanisms, and locations of potentially exposed individuals (receptors) was used to develop a conceptual understanding of the SWMUs in terms of potential human exposure pathways. The site conceptual exposure model (SCEM) is a schematic representation of the contaminant source areas, chemical release mechanisms, environmental transport media, potential human intake routes, and potential human receptors. The SCEM provides a framework for problem definition, identifying exposure pathways that may result in human health risks, identifying potential data needed to evaluate those pathways, and identifying potential measures that could be used to reduce exposure and risk.

An exposure pathway includes four necessary elements:

- A source of chemicals and a mechanism of chemical release
- An environmental transport medium (air, soil, groundwater)

- A exposure point for a receptor or receptor population
- An intake route (inhalation, ingestion, etc.) for a receptor or receptor population

Each of these elements must be present for an exposure pathway to be complete. Exposure pathways are considered to be potentially complete and significant if there are potential chemical release and transport mechanisms and identified receptors for that exposure pathway. An incomplete pathway means that no human exposure can occur. An exposure pathway is considered to be insignificant if potential receptors can be identified, but potential transport and exposure are clearly inconsequential (i.e., relative to other pathways). In the SCEM, potentially complete and significant exposure pathways are indicated with solid lines; incomplete and insignificant pathways are indicated with broken lines.

General conceptual site models for human exposures at the Appendix II SWMUs are shown in Figures 3-3 through 3-5. The primary potential sources of contaminant release at these SWMUs are waste fuels and liquids that could have potentially leaked or been spilled at the oil/water separators or the EOD pad or that may have leaked from the underground or aboveground storage tanks. Once mixed with surface or subsurface soil, the chemicals may then be released to other media (e.g., air or groundwater). There are three potentially complete and significant exposure pathways at these sites: direct contact (i.e., ingestion and dermal contact) with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the Base and at the Base boundary.

Potential receptors at these sites include Base workers (e.g., military and Base personnel, Base contractors), hypothetical future construction workers, occasional Base visitors (e.g., families of military personnel, visitors at those sites without restricted access), and residential receptors at the Base boundary who may use the groundwater downgradient of the SWMUs and Base residents who may use groundwater from Base wells located downgradient of the SWMUs.

The soil exposure pathways (including soil ingestion, dermal contact, and inhalation of airborne contaminants) are potentially complete and significant pathways for SWMU workers and hypothetical future construction workers. Potential exposures to occasional Base visitors to contaminants in soil at these SWMUs is considered to be insignificant because these sites

are located in active areas of the Base where visitors are not likely to be present on a regular basis.

Groundwater beneath Cannon AFB is potable and is used for domestic purposes both on and off the Base. Therefore, potential exposures to groundwater by current and future residents is possible.

Surface water runoff is considered to be an insignificant pathway at these SWMUs because the SWMUs cover only small areas, most of the SWMUs are no longer active and have been covered by pavement, and the areas are flat with no developed drainageways. Therefore, transport of significant quantities of contaminants in surface soil by surface water runoff from these SWMUs is not likely. In addition, concentrations in surface soil at the site are expected to be higher than those in transported soils; therefore, evaluation of surface soil at the sites is expected to be protective of the runoff pathway.

3.5 SCREENING-LEVEL HEALTH RISK EVALUATION METHODOLOGY

To evaluate whether significant chemical releases (i.e., resulting in concentrations that could pose a risk to human health) have occurred at the SWMUs evaluated in this study, the maximum detected concentrations of chemicals in soil at the SWMUs were compared to EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994). All detected organic compounds with EPA-established toxicity factors were compared to RBCs and potentially SWMU-related metals that have EPA-established toxicity factors and that were determined to be above background were also compared to RBCs.

If the maximum SWMU concentrations of all chemicals were below RBCs, it was concluded that no significant release (i.e., that could pose a significant health risk) has occurred, and it was concluded that no further evaluation is warranted at the SWMU. If the maximum SWMU concentration of any chemical exceeded its RBC, the SWMU was evaluated further to evaluate whether the exceedance indicated the potential for significant risk. If the potential for significant risk was indicated, the SWMU was recommended for further evaluation (i.e., in a risk assessment or feasibility study). EPA Region III RBCs (EPA 1994) were used for the comparison because they are a comprehensive and up-to-date list of RBCs that are derived using accepted risk assessment methodology. Since the SWMUs are located in the industrial

portion of the Base, using RBCs for residential soil (rather than industrial soil) was a conservative approach which should prevent underestimation of potential risks at a SWMU.

For a noncarcinogen, an RBC is the concentration of the chemical in environmental media (e.g., soil or drinking water) that is estimated to result in a hazard quotient (HQ) of 1.0 based on the assumed exposure conditions (e.g., residential exposures). An HQ is the ratio of the estimated average lifetime daily dose, based on the assumed exposure conditions, to a reference dose (RfD). The RfD, established by EPA, is the upper limit of the average lifetime daily exposure that is considered safe for a chemical. An HQ of 1.0 (or less) means that the expected dose is below the safe dose and that no toxic effects are likely to occur, even to sensitive individuals. An HQ above 1.0 does not mean that toxic effects will necessarily occur, but that further evaluation of exposures and chemical toxicity may be warranted.

For a carcinogen, an RBC is the concentration of a chemical in environmental media that is estimated to result in an excess cancer risk of 1×10^{-6} (1 in 1,000,000) based on the assumed exposure conditions (e.g., residential exposures). A range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) is EPA's target excess cancer risk range for cleanup under CERCLA (EPA 1990, 1991). Therefore, RBCs based on a target risk of 1×10^{-6} are conservative values, and slight exceedances of these RBCs do not necessarily mean that a significant health risk is present. Exceedance of the RBCs may mean, however, that further evaluation of the SWMU is warranted.

RBCs were calculated using conservative long-term exposure assumptions, conservative EPA-established estimates of chemical toxicity or carcinogenicity, and health-protective target risk levels for carcinogenic and noncarcinogenic effects. The assumptions used in developing the RBCs do not necessarily reflect, and they likely significantly overestimate, current or potential future exposures at the SWMUs. EPA Region III RBCs for residential soils were calculated based on residential exposure assumptions for combined childhood and adult exposure for carcinogens and on childhood exposure only for noncarcinogens. The EPA Region III RBCs and the methodology used for their calculation are presented in Appendix D.

It is important to note that RBCs are not cleanup goals. Cleanup goals are determined on a SWMU-specific basis. Rather, comparing SWMU concentrations to RBCs is a means of

evaluating whether there has been a significant chemical release at a SWMU and whether the chemicals could pose a threat to human health. If the RBCs are not exceeded, it can be concluded that no chemical release has occurred at the SWMU that poses a significant health risk. If the RBCs are exceeded, further evaluation of the SWMU may be warranted.

The results of the SWMU-specific RBC comparisons are presented in the SWMU-specific sections (Sections 6.0 through 12.0) of this report.

3.6 IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE STANDARDS (ARASs)

Both RCRA and CERCLA requirements for evaluating the nature and extent of hazardous wastes potentially occurring at Appendix II Solid Waste Management Units (SWMUs) will be addressed in the investigations at Cannon AFB.

Cannon AFB must evaluate the SWMUs identified by the EPA during the RCRA Facility Assessment (RFA) as a condition of their RCRA Part B permit. The investigations conducted by W-C are designed to satisfy RCRA Facility Investigation (RFI) guidance for characterizing the SWMUs and developing and implementing corrective action measures, if necessary.

Cannon AFB is conducting this investigation under the conditions of their RCRA Part B permit and the Air Force's Installation Restoration Program (IRP). Cannon AFB's RCRA Part B permit requires that Cannon AFB identify all applicable or relevant and appropriate standards for the protection of human health and the environment. The IRP requires that the investigation follow the regulatory requirements of CERCLA and is the basis for assessment and response actions on USAF installations under the provisions of CERCLA. SARA augmented the scope and requirements of CERCLA and gave specific directives to federal facilities regarding investigation of waste disposal sites. Under SARA, determination of ARARs is required, and potential remediation alternatives should be considered at the initiation of a RI/FS (EPA 1988, 1989b).

As part of future Corrective Measure Studies (CMS) (Feasibility Studies [FSs] under CERCLA), alternative remedial or corrective action measures will be evaluated to assess the degree to which they attain or exceed applicable or relevant and appropriate standards federal

and state public health and environmental standards. A preliminary identification and discussion of ARASs for the RFI at Cannon AFB is presented below. Review of these will highlight any site-specific regulatory conditions that might either limit the choice of alternatives or place limits on contaminant concentrations at the site.

The ARASs presented herein are chemical-specific and location-specific. Identification of action-specific ARASs can only be addressed once detailed remedial alternatives are developed.

3.6.1 Definition of ARASs

Cleanup standards for remedial actions must attain a general standard of cleanup that assures protection of human health and the environment, is cost-effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, SARA requires that any hazardous substance or pollutant remaining on site meet the level or standard of control established by standards, requirements, criteria, or limitations that have been established under any federal environmental law, or any more stringent standards, requirements, criteria, or limitations promulgated in accordance with a state environmental statute.

A requirement may be applicable or relevant and appropriate to remedial activities at a site, but not necessarily both. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a site.

If a regulation is not applicable, it may still be relevant and appropriate. The basic considerations are whether the requirement (1) regulates or addresses problems or situations sufficiently similar to those encountered at the subject site (i.e., relevance), and (2) is appropriate to the circumstances of the release or threatened release, such that its use is well suited to the particular site. Determining whether a requirement is relevant and appropriate is site-specific and must be based on best professional judgment. This judgment is based on a number of factors, including the characteristics of the remedial action, the hazardous substances present at the site, and the physical circumstances of the site and of the release,

as compared to the statutory or regulatory requirement. Compliance with all requirements found to be applicable or relevant and appropriate is mandatory under SARA unless a waiver is obtained from EPA.

"To be considered" materials (TBCs) are nonpromulgated advisories, proposed rules, criteria, or guidance documents issued by federal or state governments that do not have the status of potential ARASs. However, these advisories and guidance are to be considered when determining protective cleanup levels where no ARASs exists, or where ARASs are not sufficiently protective of human health and the environment. In these circumstances, TBC values are used to establish cleanup targets.

3.6.2 Chemical-Specific ARASs

The chemical-specific ARASs and other criteria or guidelines to be considered are presented in Tables 3-1 and 3-2. This information is based on standards, guidelines, and criteria found in relevant literature, discussions with appropriate state regulatory agency personnel, and past project experience.

Chemical-specific requirements are based on health or risk-based concentration limits of discharge limitations in environmental media (i.e., water, soil) for specific hazardous chemicals. These requirements may be used to set cleanup levels for the chemicals of concern in the designated media, or to set a safe level of discharge (e.g., water, air, etc.) that may occur as part of the remedial activity.

Sources for potential target cleanup levels included selected standards, criteria, and guidelines that are typically considered as ARASs for remedial actions conducted under CERCLA, as well as some recently published guidance and proposed action levels developed under RCRA that should be regarded as TBCs. In addition, New Mexico has developed cleanup levels for special wastes and underground storage tank-related remediation, as well as standards for groundwater. New Mexico has also defined toxic pollutants in its Water Quality Standards. Any contaminant or combination of contaminants from the list in WQCCR, Part 1, Section 101.UU found at detectable levels may have to be evaluated for risk to human health and the environment. A summary of these federal and state regulations, standards, and guidance is presented in Table 3-1.

For groundwater, MCLs established under the Safe Drinking Water Act (SDWA) are often accepted by regulatory agencies as cleanup levels for groundwater remedial activities, especially if the groundwater is or could be a drinking water source. Nonzero maximum Contaminant Level Goals (MCLGs) are also established under the SDWA. However, MCLGs are not federally enforceable and should only be used if site-specific health risk conditions warrant their use.

Since groundwater in the vicinity of Cannon AFB is classified as a current source of drinking water (Class IIA Groundwaters), the identification of potential target cleanup levels for groundwater samples from Cannon AFB focused on standards, criteria, and guidelines primarily for drinking water. These standards include MCLs and MCLGs, as well as the New Mexico drinking water standards, and are presented in Table 3-2. Also included are hazardous constituent concentration limits under RCRA Subpart F, which are applicable to releases from RCRA-regulated units. Secondary maximum contamination levels (SMCLs) established under SDWA are also presented in Table 3-2 although they are not federally enforceable and should be regarded as TBCs. In addition, the MCLs for several chemicals (footnoted by [d] in Table 3-2) are not yet in effect and should be considered TBCs. If no value is shown for a possible contaminant in Table 3-2, there are currently no standards for that contaminant. Repeated nondetect analytical results for any constituent during routine groundwater monitoring may allow the constituent to be dropped from the list of analytes, subject to the approval of NMED and EPA.

State and federal standards and criteria for surface water quality are not considered applicable or relevant and appropriate as long as there is no possibility of remedial activities impacting surface water bodies. There are two playa lakes located on Cannon AFB. One playa is located in the southwest section of the Base, south of the runway area, and a second playa is located east of the wastewater sewage lagoons. The southwest playa receives storm water runoff from the western sections of the Base, and the playa lake located east of the wastewater sewage lagoons receives treated effluent. No remedial activities at the Appendix II SWMUs will impact either playa on the Base or any off-site surface waters. However, should any activity at these SWMUs impact surface waters, compliance with both state and federal surface water quality standards and criteria would be required.

3.6.3 TBCs

In general, very few cleanup standards exist for soil contamination. Often cleanup levels are based on guidance developed from Underground Storage Tank (UST) investigations or, if nonpetroleum wastes are involved, levels are based on site-specific risk assessment, hazardous waste definition, or background levels. Recently some human health-based criteria for soil and water contaminant levels have been published as guidance for RFIs (hereinafter referred to as the RFI Guidance), and RCRA-related action levels have been proposed (Tables 3-3 and 3-4). However, these figures were developed specifically for application in RCRA-related activities, although it appears they are being used as proposed ARASs, where no other standards exist. These guidelines are presented, therefore, as TBCs rather than as chemical-specific ARASs and represent "potential" cleanup levels only. Actual cleanup levels that may be applied to a particular area will depend on site-specific requirements based in part on the RCRA Facility Investigation and are subject to final approval by the appropriate regulatory agency or agencies. The RCRA levels are presented and used for the purposes of this ARASs analysis because there are no other sources of standards or guidance for contaminated soils cleanup levels.

The RFI guidance levels presented in Tables 3-3 and 3-4 for cleanup of contaminated soils are based on EPA-derived chronic exposure assumptions and are intended as screening levels at RCRA facilities to determine if a more detailed health-risk evaluation (CMS) is warranted. As previously discussed, they do not necessarily represent a target cleanup level. The proposed RCRA Subpart S action levels, also presented in Tables 3-3 and 3-4, if exceeded, would also trigger a CMS. However, because these levels are only proposed, at this time they are not enforceable under RCRA (55 FR 30798, July 27, 1990). The equations used to derive the action levels/criteria use essentially identical parameters.

Other regulations or requirements that may need "to be considered" included the New Mexico UST Regulations and the New Mexico Special Waste Requirements Regulations. Those regulations set cleanup standards for soils contaminated with petroleum hydrocarbons associated with underground storage tanks (so called BTEX compounds and total petroleum hydrocarbons).

3.6.4 Location-Specific ARASs

Although the universe of location-specific ARASs is identified in Table 3-5, only those regulations that are deemed ARASs for the Cannon site are discussed below. Location-specific ARASs are restrictions placed on the types of activities that may occur in particular locations. Potential location-specific ARASs for Cannon AFB are presented in Table 3-5 with an explanation as to whether the regulation is applicable or relevant and appropriate and why. The location of a site may be an important characteristic in determining its impact on human health and the environment; thus, individual states may establish location-specific ARASs. These ARASs may restrict or preclude certain remedial actions or may apply only to certain portions of a site. Examples of location-specific ARASs include federal and state requirements for preservation of historic landmarks, endangered species and wetlands protection, and the restrictions on management of hazardous waste in floodplain areas.

Due to the possible presence of both federal- and state-listed threatened/endangered (T/E) species at the site, the federal and state Endangered Species Acts are both considered "potentially" applicable. If T/E species are found at the site, these acts would be applicable. In addition, there are bald eagles, peregrine falcons, other raptors and waterfowl, and their habitat within a 50-mile radius of Cannon AFB (Lee Wan and Associates 1990). Both the Migratory Bird Treaty Act and the Bald Eagle Protection Act are considered applicable if any of the species protected by these two Acts or their habitats are impacted by remedial actions.

Section 106 of the National Historic Preservation Act, the Historic and Archaeological Data Preservation Act, and the Archaeological Resource Protection Act are also considered "potentially" applicable due to a federal agency having authority over any actions that could impact on historically significant objects, buildings, or structures at the site. Although no buildings, objects, or structures at Cannon AFB have yet been placed on the National Register of Historic Places, the evaluation process is still ongoing at the Base. Due to both architectural and archaeological surveys being conducted on Cannon AFB, the State Cultural Properties Act is also considered "potentially" applicable and negotiations with the State Historic Preservation Office should be renewed prior to any remedial activity.

While there is uncertainty concerning the future definition of wetlands, it is the opinion of the U.S. Fish and Wildlife Service that the playas at the Base fall under the current definition

of wetland areas under federal wetland delineation guidance (Hagenbuck 1991). The federal regulations governing wetlands, however, are not considered ARASs as long as the project does not impact the wetland areas. If the playa lakes on Base continue to be considered wetlands and if the remedial activities should impact these wetland areas, then the regulations concerning protection and preservation of wetlands would be considered applicable or relevant and appropriate and coordination with the U.S. Fish and Wildlife Service would need to be initiated prior to any remedial activity. The State of New Mexico does not have its own wetlands regulations at this time.

TABLE 3-1

SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARASs/TBCs CANNON AFB - Appendix II SWMUs

Standard, Requirement, or Criteria	Description	Comment
FEDERAL		
Safe Drinking Water Act (40 USC Sect. 300)		
National Primary Drinking Water Standards [40 CFR Parts 141, 142, (1990, 1991)	Establishes maximum contaminant levels (MCLs) for specific contaminants which are health-based standards for public drinking water systems.	MCLs are applicable for drinking water at the tap. MCLs are relevant and appropriate for organic and inorganic contamination of groundwater that is or may be used for drinking.
National Secondary Drinking Water Standards (40 CFR Part 143)	Establishes secondary maximum contaminant levels (SMCLs) which are nonenforceable guidelines for public drinking water systems to protect the aesthetic quality of the water.	SMCLs may be "to be considered" if groundwater is used as a drinking water source.
Maximum Contaminants Level Goals (MCLGs) [PL No. 99-339, 100 Stat. 642 (1986), (1990, 1991); 40 CFR 141,142]	Establishes drinking water quality goals at a level at which no adverse health effects may occur with an adequate margin of safety.	MCLGs set above zero levels are relevant and appropriate for existing or potential sources of drinking water. MCLGs may be relevant and appropriate if the risk posed by multiple contaminants or pathways is in excess of 10^{-4}.
Resource, Conservation, and Recovery Act (RCRA)		
Releases from Solid Waste Management Units (40 CFR Part 264)	Subpart F (264.94) gives concentration limits in groundwater for hazardous constituents from a regulated unit.	Applicable if organic and inorganic contamination of groundwater is found at a RCRA regulated unit.
RCRA Facility Investigation Guidance (EPA, 1989)	Guidance levels for cleanup of contaminated soils based on EPA-derived chronic exposure assumptions; intended as screening levels at RCRA facilities to determine if a more detailed health-risk evaluation is warranted.	To be considered if contaminated soils are found.
Proposed RCRA Action Levels (55 FR 30798, 27 July 1990)	Risk-based action levels for contaminants in soil which, if exceeded, would trigger the need for a Corrective Measures Study.	To be considered if contaminated soils are found.

TABLE 3-1

SUMMARY OF
POTENTIAL CHEMICAL-SPECIFIC ARASs/TBCs
CANNON AFB - Appendix II SWMUs

Standard, Requirement, or Criteria	Description	Comment
STATE		
New Mexico Water Quality Act, 1978		
New Mexico Drinking Water Regulations (4/16/91)(New Mexico Water Supply Regulations, Sections 202 to 203)	Establishes MCLs and standards for sources of drinking water.	State MCLs are applicable or relevant and appropriate to contaminated water if the state MCL is more stringent than federal requirements.
New Mexico Water Quality Regulations, amended through August 17, 1991 (WQCCR Part 3, Sections 100 through 103)	Establishes human health, domestic water supply, and irrigation use standards for ground water protection.	Applicable if remedial activities include discharges onto or below the surface of the ground.
New Mexico Water Quality Regulations, amended through August, 1991 (WQCCR Part1, Section 101.UU)	Establishes definition of toxic pollutant based on effects to human health and the environment. Requires a determination of health and environmental risk due to the presence of the contaminant.	Applicable if groundwater related to the source area contains any of the contaminants listed in the definition of toxic pollutants.
New Mexico Hazardous Waste Act 1978		
New Mexico Underground Storage Tank Regulations, amended through July 18, 1991, Section 1209	Sets cleanup levels for soils contaminated with benzene, aromatic hydrocarbons, or petroleum products.	May be "to be considered" if soils are contaminated with benzene, aromatic hydrocarbons, or petroleum products.
New Mexico Solid Waste Regulations		
New Mexico Special Waste Requirements Regulations, adopted effective January 30, 1992, Part VII	Sets disposal levels for soils contaminated with BTEX compounds and total petroleum hydrocarbons.	May be "to be considered" if soils are contaminated with petroleum hydrocarbons.

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
pH	Field Parameter	6.5-8.5*					6.0-9.0	6.0-9.0
Total Dissolved Solids	Indicator	500,000 µg/l*					1,000,000 µg/l	1,000,000 µg/l
Carbonate	Anion							
Chloride	Anion	250,000 µg/l*					250,000 µg/l	250,000 µg/l
Fluoride	Anion	4,000 µg/l, 2,000 µg/l*	4,000 µg/l		4,000 µg/l	1,600 µg/l		1,600 µg/l
N as Nitrate	Anion	10,000 µg/l	10,000 µg/l(c)		10,000 µg/l	10,000 µg/l		10,000 µg/l
N as Nitrate+Nitrite	Anion	10,000 µg/l(c)	10,000 µg/l(c)					
N as Nitrite	Anion	1,000 µg/l(c)	1,000 µg/l(c)					
Potassium	Anion							
Sulfate	Anion	250,000 µg/l*					600,000 µg/l	600,000 µg/l
Aluminum	Metal	0.5 to 200 µg/l*(c)						5,000 µg/l
Antimony	Metal	6 µg/l(d)	6 µg/l(d)					
Arsenic	Metal	50 µg/l		50 µg/l	50 µg/l	100 µg/l		100 µg/l
Barium	Metal	2,000 µg/l(e)	2,000 µg/l(e)	1,000 µg/l	1,000 µg/l	1,000 µg/l		1,000 µg/l
Beryllium	Metal	4.0 µg/l(d)	4 µg/l(d)					
Boron	Metal							750 µg/l
Cadmium	Metal	5 µg/l(c)	5 µg/l(c)	10 µg/l	10 µg/l	10 µg/l		10 µg/l
Calcium	Metal							
Chromium	Metal	100 µg/l(c)	100 µg/l(c)	50 µg/l	50 µg/l	50 µg/l		50 µg/l
Cobalt	Metal							50 µg/l
Copper	Metal	1,000 µg/l*	1,300 µg/l(f)				1,000 µg/l	1,000 µg/l

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
		1,300 µg/l***						
Cyanide	Metal	200 µg/l(d)	200 µg/l(d)			200 µg/l		200 µg/l
Iron	Metal	300 µg/l*					1,000 µg/l	1,000 µg/l
Lead	Metal	50 µg/l	0(f)	50 µg/l	50 µg/l	50 µg/l		50 µg/l
		15 µg/l***						
Magnesium	Metal							
Manganese	Metal	50 µg/l*					200 µg/l	200 µg/l
Mercury	Metal	2 µg/l	2 µg/l(c)	2 µg/l	2 µg/l	2 µg/l		2 µg/l
Molybdenum	Metal							1,000 µg/l
Nickel	Metal	100 µg/l(d)	100 µg/l(d)					200 µg/l
Selenium	Metal	50 µg/l(c)	50 µg/l(c)	10 µg/l	10 µg/l	50 µg/l		50 µg/l
Silver	Metal	100 µg/l*(c)		50 µg/l	50 µg/l	50 µg/l		50 µg/l
Sodium	Metal							
Thallium	Metal	2 µg/l(d)	0.5 µg/l(d)					
Tin	Metal							
Titanium	Metal							
Tungsten	Metal							
Vanadium	Metal							
Zinc	Metal	5,000 µg/l*					10,000 µg/l	10,000 µg/l
Gross Alpha	Radionuclide	15 pCi/l			15 pCi/l			

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Gross Beta	Radionuclide	4 mrem/yr						
Radium 226+228	Radionuclide	5 pCi/l			5 pCi/l	30 pCi/l		30 pCi/l
Strontium 90	Radionuclide	8 pCi/l			8 pCi/l			
Tritium	Radionuclide	20,000 pCi/l			20,000 pCi/l			
Uranium (total)	Radionuclide					5,000 µg/l		5,000 µg/l
1,1-Dichloroethane	Volatile					25 µg/l		25 µg/l
1,1-Dichloroethene	Volatile	7 µg/l	7 µg/l		7 µg/l	5 µg/l		5 µg/l
1,1,1-Trichloroethane	Volatile	200 µg/l	200 µg/l		200 µg/l	60 µg/l		60 µg/l
1,1,2,2-Tetrachloroethane	Volatile					10 µg/l		10 µg/l
1,1,2,2-Tetrachloroethene	Volatile					20 µg/l		20 µg/l
1,1,2-Trichloroethane	Volatile	5 µg/l(d)	3 µg/l(d)			10 µg/l		10 µg/l
1,1,2-Trichloroethene	Volatile					100 µg/l		100 µg/l
1,2-Dichloroethane	Volatile	5 µg/l	0 µg/l		5 µg/l	10 µg/l		10 µg/l
1,2-Dichloroethene	Volatile							
1,2-Dichloropropane	Volatile	5 µg/l(c)	0 µg/l(c)					
4-Methyl-2-pentanone	Volatile							
Acetone	Volatile							
Benzene	Volatile	5 µg/l	0 µg/l		5 µg/l	10 µg/l		10 µg/l
Bromodichloromethane	Volatile							
Bromoform	Volatile	Tot THM* <100 µg/l						

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Bromomethane	Volatile							
Carbon Tetrachloride	Volatile	5 µg/l	0 µg/l		5 µg/l	10 µg/l		10 µg/l
Chlorobenzene (mono)	Volatile	100 µg/l(c)	100 µg/l(c)					
Chlorobenzilate	Volatile							
Chloroethane	Volatile							
Chloroform	Volatile	Tot THM** <100 µg/l			Tot THM** 100 µg/l	100 µg/l		100 µg/l
Chloroprene	Volatile							
Chloromethane	Volatile							
Cis-1,2-Dichloroethene	Volatile	70 µg/l(c)	70 µg/l(c)					
Cis-1,3-Dichloropropene	Volatile							
Dibromochloromethane	Volatile	Tot THM** <100 µg/l						
Ethyl Benzene	Volatile	700 µg/l(c)	700 µg/l(c)			750 µg/l		750 µg/l
Methylene Chloride	Volatile	5 µg/l(d)	0 µg/l(d)			100 µg/l		100 µg/l
Styrene	Volatile	100 µg/l(c)	100 µg/l(c)					
Tetrachloroethanes	Volatile							
Tetrachloroethene	Volatile	5 µg/l(c)	0 µg/l(c)					
Toluene	Volatile	1,000 µg/l(c)	1,000 µg/l(c)			750 µg/l		
Total Trihalomethanes	Volatile	100 µg/l						
Total Xylenes	Volatile	10,000 µg/l(c)	10,000 µg/l(c)			620 µg/l		620 µg/l

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Trans-1,2-Dichloroethene	Volatile	100 µg/l(c)	100 µg/l(c)					
Trans-1,3-Dichloropropene	Volatile							
Trichloroethanes	Volatile							
Trichloroethene	Volatile	5 µg/l	0 µg/l		5 µg/l			
Vinyl Acetate	Volatile							
Vinyl Chloride	Volatile	2 µg/l	0 µg/l		2 µg/l	1µg/l		1 µg/l
1,2-Dichlorobenzene (ortho)	Semivolatile	600 µg/l(c)	600 µg/l(c)					
1,3-Dichlorobenzene (meta)	Semivolatile	600 µg/l	600 µg/l					
1,4-Dichlorobenzene (para)	Semivolatile	75 µg/l	75 µg/l		75 µg/l			
1,2,4-Trichlorobenzene	Semivolatile	70 µg/l(d)	70 µg/l(d)					
2-Chloronaphthalene	Semivolatile							
2-Chlorophenol	Semivolatile							
2-Methylnaphthalene	Semivolatile							
2-Nitroaniline	Semivolatile							
2-Nitrophenol	Semivolatile							
2,3,7,8-Tetrachlorodibenzo-p-dioxin	Semivolatile	$3x10^{-8}$(d)	0 µg/l(d)					
2,4-Dichlorophenol	Semivolatile							
2,4-Dichlorophenoxyacetic Acid (2,4-D)	Semivolatile (H)	70 µg/l(c)	70 µg/l(c)	100 µg/l	100 µg/l			
2,4-Dimethylphenol	Semivolatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
2,4-Dinitrophenol	Semivolatile							
2,4-Dinitrotoluene	Semivolatile							
2,4,5-TP Silvex	Semivolatile (H)	50 µg/l(c)	50 µg/l(c)	10 µg/l	10 µg/l			
2,4,6-Trichlorophenol	Semivolatile							
3-Nitroaniline	Semivolatile							
4-Bromophenyl Phenylether	Semivolatile							
4-Chloroaniline	Semivolatile							
4-Chlorophenyl Phenyl Ether	Semivolatile							
4-Chloro-3-methylphenol	Semivolatile							
4-Nitroaniline	Semivolatile							
4,6-Dinitro-2-methylphenol	Semivolatile							
Acenaphthalene	Semivolatile							
Acrylonitrile	Semivolatile							
Alachlor	Semivolatile	2 µg/l	0 µg/l					
Aldicarb	Semivolatile (P)	3 µg/l(e)	1 µg/l(e)					
Aldicarb Sulfone	Semivolatile (P)	2 µg/l	1 µg/l					
Aldicarb Sulfoxide	Semivolatile (P)	4 µg/l	1 µg/l					
Aldrin	Semivolatile (P)							
Aniline	Semivolatile							
Anthracene	Semivolatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Atrazine	Semivolatile	3 µg/l(c)	3 µg/l(c)					
Benzo(a)anthracene	Semivolatile							
Benzo(a)pyrene	Semivolatile	0.2 µg/l(d)	0 µg/l(d)			0.7 µg/l		0.7 µg/l
Benzo(b)fluoranthene	Semivolatile							
Benzo(g,h,i)perylene	Semivolatile							
Benzo(k)fluoranthene	Semivolatile							
Benzyl Alcohol	Semivolatile							
Bis(2-Chloroethoxy)methane	Semivolatile							
Bis(2-Chloroethyl)ether	Semivolatile							
Bis(2-Chloroisopropyl)ether	Semivolatile							
Bis(2-Ethylhexyl)phthalate	Semivolatile							
Butylbenzylphthalate	Semivolatile							
Carbofuran	Semivolatile (P)	40 µg/l(c)	40 µg/l(c)					
Carbon Disulfide	Semivolatile							
Chlordane	Semivolatile (P)	2 µg/l(c)	0 µg/l(c)					
Chlorophenol	Semivolatile							
DDT	Semivolatile (P)							
DDT metabolite (DDE)	Semivolatile (P)							
DDT metabolite (DDD)	Semivolatile (P)							
Dalapon	Semivolatile (P)	200 µg/l(d)	200 µg/l(d)					

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Diallite	Semivolatile							
Dibenzofuran	Semivolatile							
Dibenz(a,h)anthracene	Semivolatile							
Dibromochloropropane	Semivolatile (P)	0.2 µg/l	0 µg/l					
Dichlorobenzene	Semivolatile							
Dichlorobenzidine	Semivolatile							
Dieldrin	Semivolatile (P)							
Di(2-ethylhexyl)adipate	Semivolatile (P)	400 µg/l(d)	400 µg/l(d)					
Diethylphthalate	Semivolatile							
Di(2-ethylhexyl)phthalate	Semivolatile	6.0 µg/l(d)	0 µg/l(d)					
Dimethoate	Semivolatile							
Dimethylphthalate	Semivolatile							
Dinitrotoluene	Semivolatile							
Dinoseb	Semivolatile(H)	7 µg/l(d)	7 µg/l(d)					
Di-n-octylphthalate	Semivolatile							
Diquat	Semivolatile(P)	20 µg/l(d)	20 µg/l(d)					
Endosulfan I	Semivolatile (P)							
Endosulfan II	Semivolatile (P)							
Endosulfan Sulfate	Semivolatile (P)							
Endothall	Semivolatile (P)	100 µg/l	100 µg/l					

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Endrin	Semivolatile (P)	2.0 µg/l(d)	2.0 µg/l(d)	0.2 µg/l	0.2 µg/l			
Ethylene Dibromide	Semivolatile	0.05 µg/l(c)	0 µg/l(c)			0.1 µg/l		0.1 µg/l
Fluoranthene	Semivolatile							
Fluorene	Semivolatile							
Glyphosate	Semivolatile(P)	700 µg/l(d)	700 µg/l(d)					
Heptachlor	Semivolatile (P)	0.4 µg/l(c)	0 µg/l(c)					
Heptachlor Epoxide	Semivolatile (P)	0.2 µg/l(c)	0 µg/l(c)					
Hexachlorobenzene	Semivolatile	1.0 µg/l(d)	0 µg/l(d)					
Hexachlorobutadiene	Semivolatile							
Hexachlorocyclohexane, Alpha	Semivolatile (P)							
Hexachlorocyclohexane, Beta	Semivolatile (P)							
Hexachlorocyclohexane, (Lindane)	Semivolatile (P)	0.2 µg/l(c)	0.2 µg/l(c)	4 µg/l	4 µg/l			
Hexachlorocyclohexane, Technical	Semivolatile (P)							
Hexachlorocyclopentadiene	Semivolatile	50 µg/l(d)	50 µg/l(d)					
Hexachloroethane	Semivolatile							
Indeno(1,2,3-cd)pyrene	Semivolatile							
Methoxychlor	Semivolatile (P)	40 µg/l	40 µg/l(c)	100 µg/l	100 µg/l			
Naphthalene	Semivolatile							
Nitrobenzene	Semivolatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Nitrophenols	Semivolatile							
Nitrosodibutylamine	Semivolatile							
Nitrosodiethylamine	Semivolatile							
Nitrosodimethylamine	Semivolatile							
Nitrosopyrrolidine	Semivolatile							
N-Nitrosodiphenylamine	Semivolatile							
N-Nitroso-di-n-dipropylamine	Semivolatile							
Oxamyl	Semivolatile(P)	200 µg/l(d)	200 µg/l(d)					
PCBs	PCBs	0.5 µg/l(c)	0 µg/l(c)			1 µg/l		1 µg/l
Pentachlorinated Ethanes	Semivolatile							
Pentachlorophenol	Semivolatile	1 µg/l(c)	0 µg/l(e)					
Phenanthrene	Semivolatile							
Phenol	Semivolatile				5 µg/l		5 µg/l	5 µg/l
Picloram	Semivolatile (H)	500 µg/l	500 µg/l					
Polynuclear Aromatic Hydrocarbons (total PAH)	Semivolatile				30 µg/l	30 µg/l		30 µg/l
Pyrene	Semivolatile							
Simazine	Semivolatile(P)	4 µg/l(d)	4 µg/l(d)					
Trans-1,2-Dichloroethene	Semivolatile	100 µg/l	100 µg/l					

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Toxaphene	Semivolatile (P)	3 µg/l(c)	0 µg/l(c)	5 µg/l	5 µg/l			

EXPLANATION OF TABLE

(P) Pesticide (H) Herbicide

* = secondary maximum contaminant level (TBCs)
** = total trihalomethanes: chloroform, bromoform, bromodichloromethane, dibromochloromethane
*** = action levels in no more than 10% of tap samples, 56 FR 26460, 6/7/91, effective 12/7/92

NMWQCC = New Mexico Water Quality Control Commission
RCRA = Resource Conservation and Recovery Act
SDWA = Safe Drinking Water Act
(a) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR 141 and 40 CFR 143 (as of 5/1990)
(b) NCP, 40 CFR 300; NCP Preamble 55 FR 8764; CERCLA Compliance with Other Laws Manual EPA/540/G-89/006, August 1988
(c) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, 143, Final Rule, Effective July 30, 1992 (56 Federal Register 3526; 1/30/91)
(d) EPA National Primary Drinking Water Regulations, 40 CFR 141 and 40 CFR 142, Final Rule (57FR 31776, 7/17/92); Effective date is January 17, 1994, (therefore TBCs) except for endrin, which is effective 8/17/92.
(e) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, 143, Final Rule, Effective January 1, 1993 (56 FR 30266, 7/01/91)
(f) EPA Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, 40 CFR 141 and 142; effective December 7, 1992 (56 FR 26460, 6/7/91)
(g) NM Water Quality Control Commission, NM Water Quality Regulations, Part 3, Section 3-103, 11/16/1967 amended through August 17, 1991
(h) New Mexico Drinking Water/Water Supply Regulations, adopted April 16, 1991

If no values are shown for a possible contaminant, there are no standards at this time.

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Herbicides				
2,4,5-T	200	800	800 (d)	-
2,4,5-TP (Silvex)	600	-	640 (d)	-
2,4-D	800	800	800 (d)	-
2,4-DB	-	-	640(d)	-
Dalaphon	-	-	2,400 (d)	-
Dicamba	-	-	2,400 (d)	-
Dichlorprop	-	-	-	-
Dinoseb	80	-	80 (d)	-
MCPA	-	-	40 (d)	-
MCPP	-	-	80 (d)	-
Pesticides/PCBs				
4,4'-DDD*	2.9	3	2.9 (d)	
4,4'-DDT*	2.1	2	2.1(d)	-
4,4'-DDE*	2.1	2	2.1(d)	-
Aldrin*	0.04	0.04	0.04(d)	-
alpha-BHC*	-	0.10	0.11(d)	-
alpha-Chlordane*	0.54	0.50	0.54(d)	-
Aroclor-1016*	0.09	0.09	(e)	(f)
Aroclor-1221*	0.09	0.09	(e)	(f)
Aroclor-1232*	0.09	0.09	(e)	(f)
Aroclor-1242*	0.09	0.09	(e)	(f)
Aroclor-1248*	0.09	0.09	(e)	(f)
Aroclor-1254*	0.09	0.09	(e)	(f)
Aroclor-1260*	0.09	0.09	(e)	(f)
beta-BHC*	-	4	0.39(d)	-
Chlordane*	0.54	0.50	0.54(1)	
delta-BHC	-	-	-	-
Diallate*	-	-	11.5(g)	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Pesticides/PCBs (cont'd)				
Dieldrin*	0.04	0.04	0.044(d)	-
Dimethoate	2,000	0.01	16(d)	
Disulfoton	3	3	3.2(d)	
Endosulfan I**	4	4	480(g,h)	-
Endosulfan II**	-	-	480(h)	-
Endosulfan sulfate	-	-	480(h)	
Endrin	20	20	24(d)	-
Endrin ketone	-	-	-	-
Famphur	-	-	-	
gamma-BHC	20	0.50	0.54(g)	-
gamma-Chlordane*	0.54	0.50	0.54(d)	-
Heptachlor	0.16	0.20	0.16(d)	-
Heptachlor epoxide*	0.077	0.08	0.077(d)	-
Isodrin	-	-	-	
Kepone	-	-	-	
Methoxychlor	-	-	400(d)	-
Methyl parathion	20	20	20(d)	
Parathion	20	500	480(g)	
Phorate	-	-	16(g)	
Toxaphene*	0.64	0.60	0.64(d)	-
Semivolatiles				
1,2,4,5-tetrachlorobenzene	20	20	24(d)	
1,2,4-trichlorobenzene	2,000	2,000	800(d)	-
1,2-dichlorobenzene	-	-	7,200(d)	-
1,3,5-trinitrobenzene	-	-	4(d)	
1,3-dichlorobenzene	-	-	8(d)	-
1,3-dinitrobenzene	-	8	8(d)	
1,4-dichlorobenzene*	-	-	29(g)	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
1,4-naphthoquinone	-	-	-	
1-naphthylamine	-	-	-	
2,3,4,6-tetrachlorophenol	2,000	2,000	2,400(d)	
2,4,5-trichlorophenol	8,000	8,000	8,000(d)	-
2,4,6-trichlorophenol*	35	40	6.4(d)	-
2,2'-oxybis(1-chloropropane)	-	-	-	-
2,4-dichlorophenol	200	-	240(d)	-
2,4-dimethylphenol	-	-	1,600(d)	-
2,4-dinitrophenol	200	200	160(d)	-
2,4-dinitrotoluene	2.27	-	160(d)	-
2,6-dichlorophenol	-	-	-	
2,6-dinitrotoluene*	-	1 (i)	80(g)	-
2-acetylaminefluorone	-	-	-	
2-chloronaphthalene	-	-	6,400(d)	-
2-chlorophenol	-	-	400(d)	-
2-methylnaphthalene	-	-	-	0.3-220(j)
2-methylphenol	4,000	4,000	4,000(d)	-
2-naphthylamine	-	-	-	
2-nitroaniline	-	-	-	-
2-nitrophenol	-	-	-	-
2-picoline	-	-	-	
3-3'-dichlorobenzidine*	-	2	1.6(d)	-
3,3'-dimethylbenzidine	-	-	-	
3-methyl cholanthrene	0.074	-	-	
3-methylphenol	4,000	4,000	4,000(d)	
3-nitroaniline	-	-	-	-
4,6-dinitro-2-methylphenol	-	-	-	-
4-aminobiphenyl	-	-	-	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
4-bromophenylphenyl ether	-	-	-	-
4-chloro-3-methylphenol	-	-	-	-
4-chloroaniline	-	-	320(d)	-
4-chlorophenylphenyl ether	-	-	-	-
4-methylphenol	4,000	4,000	400(g)	-
4-nitroaniline	-	-	-	-
4-nitro-1-oxide-quinoline	-	-	-	
4-nitrophenol	-	-	-	-
5-nitro-o-toluidine	-	-	-	
acenaphthene	-	-	4,800(d)	-
acenaphthylene	-	-	-	-
acetophenone	8,000	8,000	8,000(d)	
aniline	270	100	-	
anthracene	-	-	24,000(d)	-
aramite*	-	-	28(d)	
benzo(a)anthracene*	0.22	-	0.96(k)	0.3-220(j)
benzo(a)pyrene*	0.06	-	0.096(d)	0.3-220(j)
benzo(b)fluoranthene*	-	-	0.96(k)	0.3-220(j)
benzo(g,h,i)perylene	-	-	-	0.3-220(j)
benzo(k)fluoranthene*	-	-	9.6(k)	0.3-220(j)
benzoic acid	-	-	320,000(d)	-
benzyl alcohol	-	-	24,000(g)	-
bis(2-chloroethoxy)methane	-	-	-	
bis(2-chloroethyl)ether*	0.64	0.60	0.64(d)	-
bis(2-ethylhexyl)phthalate*	83	50	50(d)	0.3-220(j)
butyl benzyl phthalate	-	20,000	16,000(d)	0.3-220(j)
carbazole*	-	-	35(g)	-
chlorobenzilate*	-	-	2.6(g)	
p-chloro-m-cresol	-	-	-	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
chrysene*	-	-	96(k)	0.3-220(j)
dibenzo(a,h)anthracene	0.0143	-	0.096(k)	0.3-220(j)
dibenzofuran	-	-	-	0.3-220(j)
dichlorodifluoromethane	20,000	20,000	16,000(d)	
dichlorodiisopropyl ether	-	-	-	
diethylphthalate	60,000	60,000	64,000(d)	-
o,o-diethyl o-pyrazinyl phosphoro-thioate	-	-	-	
p-dimethylaminoazobenzene	-	-	-	
7,12-dimethylbenz(a)anthracene	-	-	-	
alpha,alpha-dimethylphenethylamine	-	-	-	
dimethylphthalate	-	-	800,000(g)	-
di-n-butylphthalate	8,000	8,000	8,000(d)	-
di-n-octylphthalate	-	-	1,600(g)	-
diphenylamine	2,000	2,000	2,000(d)	
ethyl methanesulfonate	-	-	-	
fluoranthene	-	-	3,200(d)	0.3-220(j)
fluorene	-	-	3,200(d)	0.3-220(j)
hexachlorobenzene*	0.41	-	0.44(d)	-
hexachlorobutadiene	90	90	9(d)	-
hexachlorocyclopentadiene	600	-	560(d)	-
hexachloroethane*	80	80	50(d)	-
hexachlorophene	-	20	24(d)	
hexachloropropene	-	-	-	
indeno(1,2,3-cd)pyrene*	-	-	0.96(k)	0.3-220(j)
isosafrole	-	-	-	
isophorone*	2,000	2,000	736(d)	-
methacrylonitrile	8	8	8(d)	
methapyrilene	-	-	-	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
methyl methane sulfonate	-	-	-	
n-nitrosodiethylamine*	-	0.005	0.0047(d)	
n-nitrosodimethylamine*	0.014	0.01	0.014(d)	
n-nitrosomethylethylamine*	0.032	0.03	0.032(d)	
n-nitrosomorpholine	-	-	-	
n-nitroso-di-n-butylamine*	-	0.10	0.13(d)	
n-nitroso-di-n-propylamine*	0.10	0.10	0.1(d)	-
n-nitrosodiphenylamine*	-	100	143(d)	-
n-nitrosopiperidine	-	-	-	
n-nitrosopyrrolidine*	0.33	0.30	0.33(d)	
naphthalene	-	-	-	0.3-220(j)
nitrobenzene	40	40	40(d)	-
pentachlorobenzene	60	60	64(d)	
pentachloroethane	-	-	-	
pentachloronitrobenzene*	27.3	200	2.7(g)	
pentachlorophenol*	2,000	2,000	6(d)	-
phenacetin	-	1	-	
phenanthrene	-	-	-	-
phenol	3,000	50,000	48,000(d)	-
p-phenylenediamine	-	-	15,200(g)	
pronamide	6,000	6,000	6,000(d)	
pyrene	-	-	2,400(d)	0.3-220(j)
pyridine	80	80	80(d)	
safrole	-	-	-	
tetraethyldithiopyrophosphate	-	40	40(d)	
trans-1,4-dichloro-2-butene	-	-	-	
o-toluidine	-	-	-	
o,o,o-triethyl phosphorothioate	-	-	-	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Volatiles				
1,1,1-trichloroethane	7,000	7,000	-	-
1,1,1,2-tetrachloroethane*	-	300	27(d)	
1,1,2,2-tetrachloroethane*	35	40	3.5(d)	-
Volatiles (cont'd)				
1,1,2-trichloroethane	120	100	1.2(d)	-
1,1-dichlorethane*	-	-	8,000(g)	-
1,1-dichloroethene	12	10	1.2(d)	-
1,2-dibromo-3-chloropropane*	0.032	-	0.5(g)	
1,2-dibromoethane*	-	0.008	0.0082(d)	
1,2-dichloroethane*	7.7	8	7.7(d)	
1,2-dichloroethene (total)	-	-	720(g)	-
1,2-dichloropropane	-	-	-	
1,2,3-trichloropropane	80	500	480(d)	
1,4-dioxane*	143	60	64(d)	
2-butanone (MEK)	4,000	4,000	48,000(d)	-
2-hexanone (MnBK)	-	-	-	-
4-methyl-2-pentanone (MIBK)	4,000	4,000	6,400(g)	-
acetone	8,000	8,000	8,000(d)	-
acetonitrile	500	500	480(d)	
acrolein	-	-	1,600(g)	
acrylonitrile*	1.30	1.0	1.3(d)	
allyl chloride	-	-	-	
benzene*	24	-	24(d)	<100(l)
bromodichloromethane*	2,000	0.50	11(d)	-
bromoform*	2,000	2,000	89(d)	-
bromomethane	30	100	112(d)	-
carbon disulfide	8,000	8,000	8,000(d)	-
carbon tetrachloride*	5.4	5	5.4(d)	-
chlorobenzene	2,000	2,000	1,600(d)	-

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Volatiles (cont'd)				
chloroethane	-	-	-	-
chloroform*	110	100	115(d)	-
chloromethane	-	-	54(g)	-
chloroprene	-	-	-	
cis-1,3-dichloropropene	3.9	20	3.9(g)	-
dibromochloromethane*	-	-	8.3(d)	-
ethylbenzene	8,000	8,000	8,000(d)	<500 (l)
ethyl cyanide	-	-	-	
ethyl methacrylate	-	-	7,200(g)	
isobutyl alcohol	20,000	20,000	24,000(d)	
methyl bromide	-	-	112(d)	
methylene bromide	-	-	-	
methylene chloride*	93	90	93(d)	-
methyl iodide	-	-	-	
methyl methacrylate	-	-	6,400(g)	
styrene	20,000	20,000	16,000(d)	-
tetrachloroethene*	140	10	800(d)	-
toluene	20,000	20,000	16,000(d)	<500 (l)
trans-1,2-dichloroethene	-	-	1,600(d)	
trans-1,3-dichloropropene	20	20	3.9(g)	-
trichloroethene*	64	60	-	-
trichlorofluoromethane	20,000	20,000	24,000(d)	
vinyl acetate	-	-	-	
vinyl chloride*	-	-	0.37(g)	-
xylenes (total)	200,000	200,000	160,000(d)	<500 (l)

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Hydrocarbons				
Polycyclic Aromatic Hydrocarbons (PAHs)	-	-	-	<50 ppm(m)
Total Recoverable Petroleum Hydrocarbons (TRPH)	-	-	-	<100 ppm(n)

(a) RCRA Facility Investigation Guidance (EPA 1989a); human health-based criteria for systemic toxicants representing an estimate of the daily exposure an individual can experience without appreciable risk of health effects during a lifetime.
(b) Source: Corrective Action for SWMUs at Hazardous Waste Management Facilities (55 FR 30798, 27 July 1990): these risk based levels trigger the need for a corrective measure study.
(c) Human health proposed action levels calculated using guidance in 55 FR 30798
(d) Calculated from toxicity values provided in IRIS April, 1994.
(e) 55 FR 30798. EPA has already established standards for cleanup of PCBs under TSCA. The agency has determined that the TSCA cleanup standards are relevant to RCRA corrective action.
(f) Cleanup levels for PCB spills occuring before May 4, 1987 are at the discretion of the EPA regional administrator. 40 CFR 761 (Subpart G).
(g) Calculated from toxicity values provided in HEAST 1994.
(h) Toxicity values for Endosulfan adopted for Endosulfan I, Endosulfan II, and Endosulfan sulfate
(i) Value for mixture of dinitrotoluene isomers
(j) Range of anthropogenic and naturally occurring PAH concentrations (Blumer 1977, Mallet 1961)
(k) EPA 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/625/3-89/016. March 1989.
(l) The sum of benzene, toluene, ethylbenzene, and xylene isomer concentrations is less than 500 mg/kg, with benzene individually less than 100 mg/kg.
New Mexico Environmental Improvement Board, New Mexico Special Waste Requirement Regulations. Adopted effective January 30, 1992.
(m) New Mexico Department of Environmental Improvement New Mexico UST Regulations, amended through July 18, 1991.
(n) New Mexico Environmental Improvement Board, New Mexico UST Regulations, TPH Action Level. Under New Mexico Special Waste Requirement Regulations, the TPH Action Level is 1,000 mg/kg.
(o) EPA 1989. Interim Procedures for Estimating risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and -Dibenzofurans (CDDs and CDFs). EPA/625/3-89/016. March 1989.
* Carcinogens

TABLE 3-4

POTENTIAL SCREENING CONCENTRATIONS FOR INORGANIC COMPOUNDS IN SOIL (TO BE CONSIDERED) CANNON AFB - APPENDIX II SWMUs

Compound	RFI Guidance TBCs[a] (mg/kg)	Proposed RCRA Action Level Level TBCs[b] (mg/kg)	Proposed RCRA Action Level TBCs[c] (mg/kg)	Other TBCs[d] (mg/kg)	Average Background Concentration[e] (mg/kg)	Range of Background Concentrations[e,f] (mg/kg)
Aluminum	-	-	-	-	5700	860 - 10,540
Antimony	30	30	32[g]	-	6.75	1.33 - 12.2
Arsenic*	-	80	0.4[g]	-	3.5	0 - 15.5
Barium	4,000	4,000	5600[g]	-	166	0 - 642
Beryllium*	0.14	0.2	0.16[g]	-	0.41	0.09 - 0.73
Cadmium	-	40	40[g]	-	1.1	0 - 2.9
Calcium	-	-	-	-	69,200	0 - 186,400
Chromium III	80,000	-	80,000[g]	-	6.98	1.42 - 12.5
Chromium VI	400	400	400[g]	-		
Cobalt	-	-	-	-	2.5	0.5 - 4.5
Copper	-	-	-	-	5.4	0 - 13.0
Cyanide	2,000	2,000	1,600[g]	-		
Iron	-	-	-	-	4,780	840 - 8,720
Lead	-	-	-	500 - 1000	7.12	0 - 25.8
Magnesium	-	-	-	-	4,650	0 - 11,790
Manganese	-	-	8,000[g]	-	72	0 - 164
Mercury	-	20	24[h]	-	0.11	0.9 - 0.13
Nickel	2,000	2,000	-	-	5.0	1.0 - 9.0
Potassium	-	-	-	-	1360	148 - 2,572
Selenium	-	-	400[g]	-	8.23	0 - 56.6
Silver	200	200	400[g]	-	1.2	0.2 - 2.2
Sodium	-	-	-	-	514	0 - 1,042
Thallium	-	-	-	-	0.50	0 - 1.2
Vanadium	-	-	-	-	14.9	4.50 - 25.3

TABLE 3-4

POTENTIAL SCREENING CONCENTRATIONS FOR INORGANIC COMPOUNDS IN SOIL (TO BE CONSIDERED) CANNON AFB - APPENDIX II SWMUs

Compound	RFI Guidance TBCs[a] (mg/kg)	Proposed RCRA Action Level Level TBCs[b] (mg/kg)	Proposed RCRA Action Level TBCs[c] (mg/kg)	Other TBCs[d] (mg/kg)	Average Background Concentration[e] (mg/kg)	Range of Background Concentrations[e,f] (mg/kg)
Zinc	-	-	24,000[g]	-	11.3	0.72 - 21.9

[a] RCRA Facility Investigation Guidance (EPA 1989a); human health-based criteria for systemic toxicants representing an estimate of the daily exposure an individual can experience without appreciable risk of health effects during a lifetime.
[b] Source: Corrective Action for SWMUs at Hazardous Waste Management Facilities (55 FR 30798, 27 July 1990). These risk-based levels trigger the need for a corrective action measure study.
[c] Human Health proposed action levels using calculations in 55 FR 30798. Sources of toxicity factors used in calculations include: (1) Integrated Risk Information System (IRIS) and (2) Health Effects Assessment Summary Tables (HEAST) FY1992.
[d] Source: OSWER Directive 9355.4-02.
[e] Source: Woodward-Clyde Consultants, 1993.
[f] Average ± 2 standard deviations
[g] IRIS April, 1994
[h] HEAST 1994
* Carcinogen

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Resource Conservation and Recovery Act (RCRA)			
1. New facilities where treatment, storage or disposal of hazardous waste will be conducted is prohibited within 61 meters (200 feet) of a fault displaced in Holocene time [40 CFR 264.18(a)]*	No	No	Treatment, storage and disposal of waste will not be conducted within 61 meters of a fault displaced in Holocene time.
2. New facilities where treatment, storage or disposal of hazardous waste will be conducted is prohibited within the 100-year floodplain. [40 CFR 264.18(b)]*	No	No	Treatment, storage and disposal of waste will not be conducted within the 100-year floodplain of adjacent rivers.
3. Prohibits noncontainerized or bulk liquid hazardous waste placement in salt domes, salt bed formations, and underground mines or caves. [40 CFR 264.18(c)]*	No	No	No action which would place waste in a salt dome or salt bed formation, underground mine or cave is anticipated at this site.
E.O. 11988 Protection of Floodplains			
4. Limits activities in floodplain. Floodplain is defined as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of off-shore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." [40 CFR 6, Appendix A and 40 CRF 6.302]	No	No	Remedial activities will not be conducted within any floodplains.

*Adopted by the State of New Mexico and incorporated within Part V of the New Mexico Hazardous Waste Management Regulations.

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
E.O. 11990 Protection of Wetlands			
5. Minimizes impacts on areas designated as wetlands. [40 CRF 6, Appendix A]	No	No	Although playas are considered wetlands by the U.S. Fish and Wildlife Service, regulations are applicable only if the remedial activities impact the wetland areas. No impacts to the wetland areas are anticipated at this time.
Clean Water Act Section 404			
6. Action to prohibit discharge of dredged or fill material into waters of U.S. without permit. [33 USC 1251; 40 CFR 230; 33 CFR 320-330]	No	No	Dredge and fill permit requirements will not apply as no waters of the U.S. will be impacted by remedial activities on the site.
7. Requires Federal agencies to avoid, to the extent possible, adverse impacts associated with destruction or loss of wetlands	No	No	As described above, although wetlands are considered by the U.S. Fish and Wildlife Service to occur on the base in the form of playas, regulations are applicable only if the remedial activities impact the wetland area.

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Endangered Species Act			
8. Protects endangered species and threatened species and preserves their habitat. [16 USC 1531 et sequence; 50 CFR 200, 50 CFR 402]	Yes	---	Although Walk, Haydel & Associates report in their Remedial Investigation that there are no critical habitats in the immediate vicinity of the site (according to the Wildlife Management Plan for the base), two federally listed endangered species are known to inhabit the area within a 50-mile radius of the site (Lee Wan & Associates, Inc., 6/90).
Bald Eagle Protection Act			
9. Protects all eagle species and restricts activities that may threaten or adversely affect their habitat (16 USC Section 688 et. seq)	Yes	---	If eagle species are found to occur on the base, special protection provisions will need to be coordinated with US Fish and Wildlife Service. Bald eagles are known to inhabit the area within a 50-mile radius of the site (Lee Wan & Associates, Inc., 6/90).
Migratory Bird Treaty Act			
10. Protects migratory, resident, or range habitat of migratory birds including raptors and waterfowl. (16 USC Section 703 et. seq).	Yes	--	Remedial actions cannot threaten or adversely affect the habitats of migratory waterfowl or raptors.

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Wilderness Act			
11. Limits activities within an area designed as a wilderness area. [16 USC 1311 et seq.; 50CFR 53.1 et seq.]	No	No	The site is not within a federally-owned area designated as a wilderness area.
12. Limits the type of activities permitted in an area designated as a National Wildlife Refuge system [16 USC 668 et seq.; 50 CFR Part 27]	No	No	The site is not in an area designated as part of the National Wildlife Refuge System (the closest NWRS are over 25 miles from the site).
Fish and Wildlife Coordination Act			
13. Prohibits activities affecting/modifying streams or bodies of water if the activity has a negative impact on fish or wildlife. [16 USC 661 et seq.; 33 CFR Parts 320-330; 40 CFR 6.302]	No	No	As described above, no streams, rivers, or playas will be impacted by remedial activities.
Wild and Scenic Rivers Act			
14. Protects rivers that are designated as wild, scenic or recreational. [16 USC 1271; 40 CFR 6.302(e)]	No	No	No rivers designated as wild, scenic or recreational will be affected by remedial activities.

TABLE 3-5

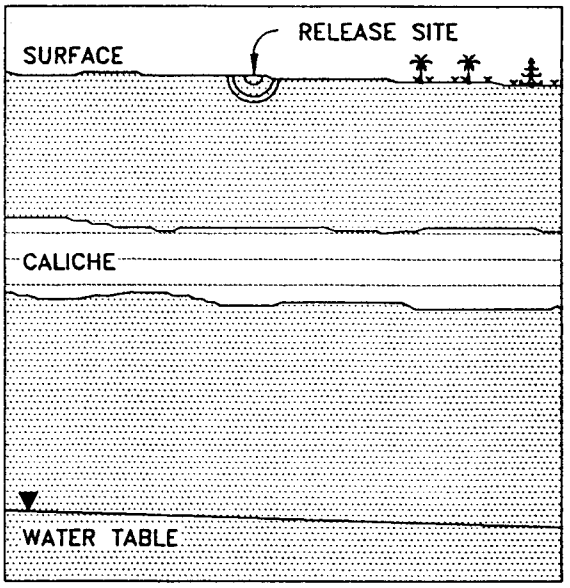
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
National Historic Preservation Act (NHPA)			
15. Requires the preservation of historic properties included in or eligible for the National Register of Historic Places and to minimize harm to National Historic Landmarks. [16 USC 470 et seq.; 7 CFR 650; 36 CFR Part 65, Part 800]	Yes	---	Pursuant to Section 106 of NHPA, proposed federal undertaking in any state shall take into consideration the effect of the undertaking on any site, building, structure, or object that is included or eligible for inclusion in the National Register; nothing has been placed on the register to date, but surveys are ongoing. Also applicable if historical sites are discovered during a remedial action or if known historical sites exist near a remedial action site.
The Historic and Archaeological Data Preservation Act of 1974			
16. Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity program (16 USC 469, 40 CFR 6.301(c))	Yes	---	May be available if remedial activities affect historical and/or undiscovered archaeological data of the site.
The Archaeological Resource Protection Act of 1979			
17. Requires a permit for any excavation or removal of archaeological resources form public or Indian lands (16 USC 470aa-47011)	Yes	---	May be applicable if any remedial activity involves removal of archaeological resources; substantive requirements need to be met.
Coastal Zone Management Act			

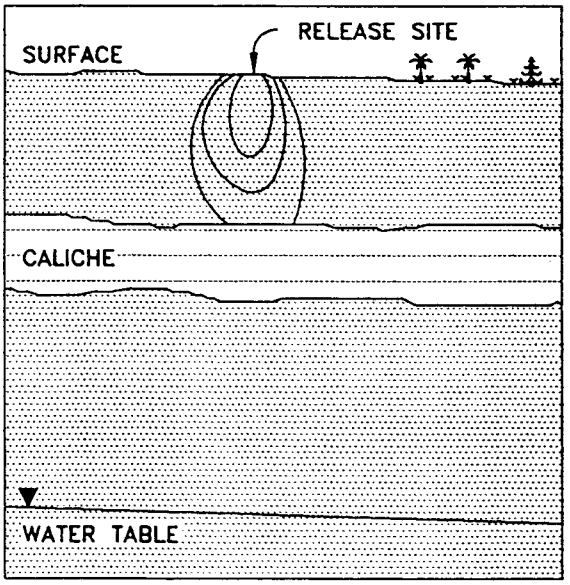
TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

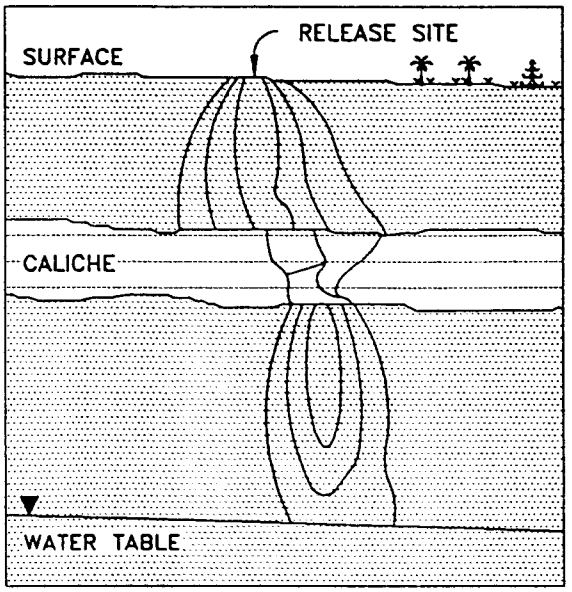
Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
18. Limits activities affecting the coastal zone, including lands thereunder and adjacent shorelands. [16 USC Section 1451 et sequence]	No	No	The site is not located in the coastal zone management area.
State Regulations			
Endangered Species Act (New Mexico Regulation 682)			
19. Requires coordination with the Department of Game and Fish if activities impact on endangered/ threatened species or their habitat.	Yes	---	As stated above, although Walk, Haydel & Associates report in their Remedial Investigation that there are no significant habitats in the immediate vicinity of the site, state listed threatened/ endangered species have been identified at or near the base.
1978 New Mexico State Cultural Properties Act (Sections 18-6-1 through 18-6-17 NMSA 1978)			
20. Provides for the preservation, protection, and enhancement of structures, sites, and objects of historical significance within the State.	Yes	--	Although the Cannon AFB site, including its properties/buildings are not listed on the State Register of Historic Places, coordination with the State Historic Preservation Office is ongoing with respect to the historical and archaeological surveys that have been conducted at the base; State laws closely follow the federal laws.



A. SINGLE EVENT RELEASE OF A SMALL QUANTITY.



A. SINGLE EVENT RELEASE OF A LARGE QUANTITY.



A. CONTINUOUS RELEASE OF CONTAMINANTS. NOTE MIGRATION OF LIQUIDS THROUGH FRACTURES IN THE CALICHE.

NO SCALE

DRN BY JWB	DATE 08/19/92	PENDANT PLUMES CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	3-1

REPORT F. .SE: PHASE II
03/20/1995 12:03
3M11MM11.DWG

CANNON AFB DECISION DIAGRAM FOR PHASE II INVESTIGATION OF APPENDIX II SWMUs

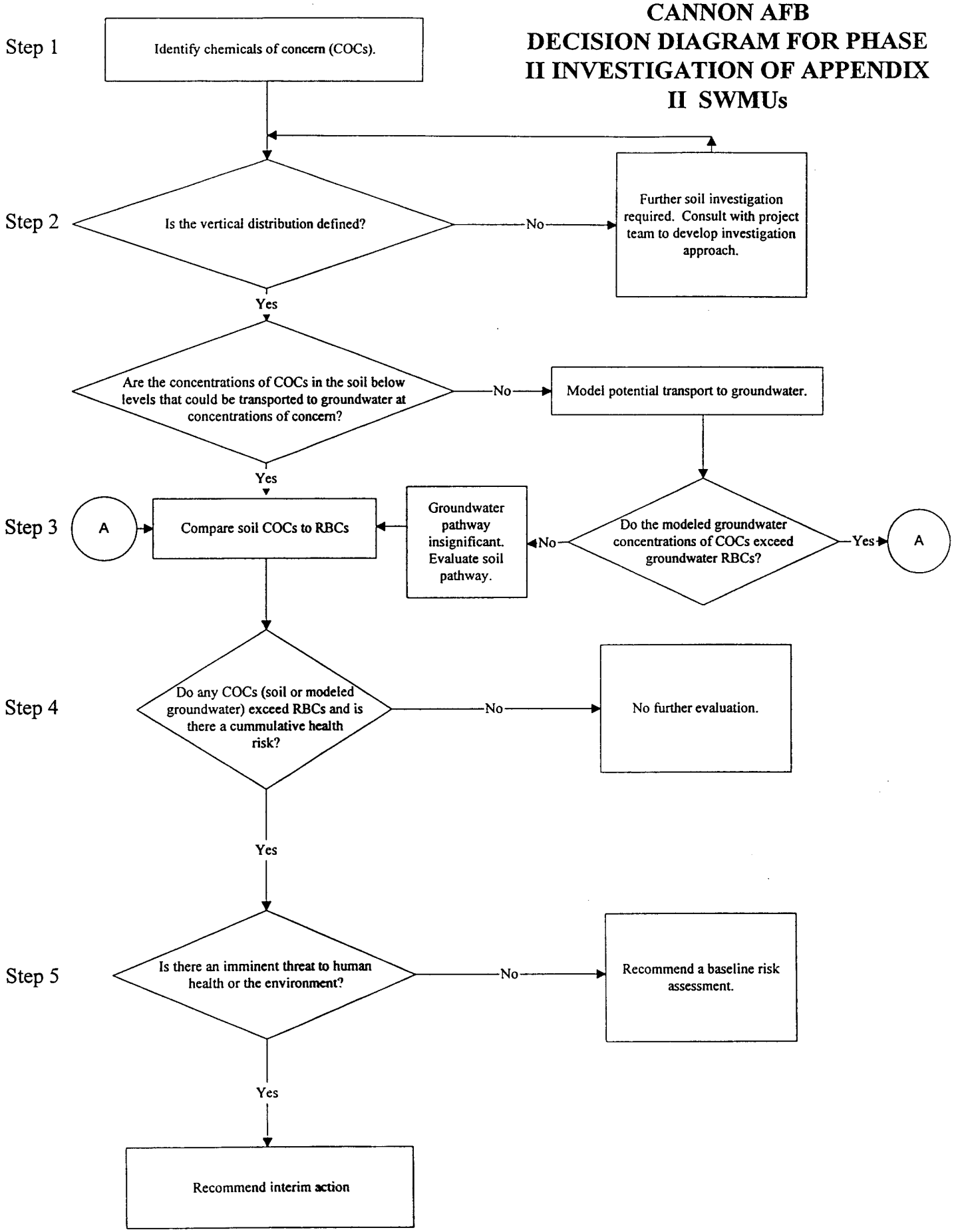
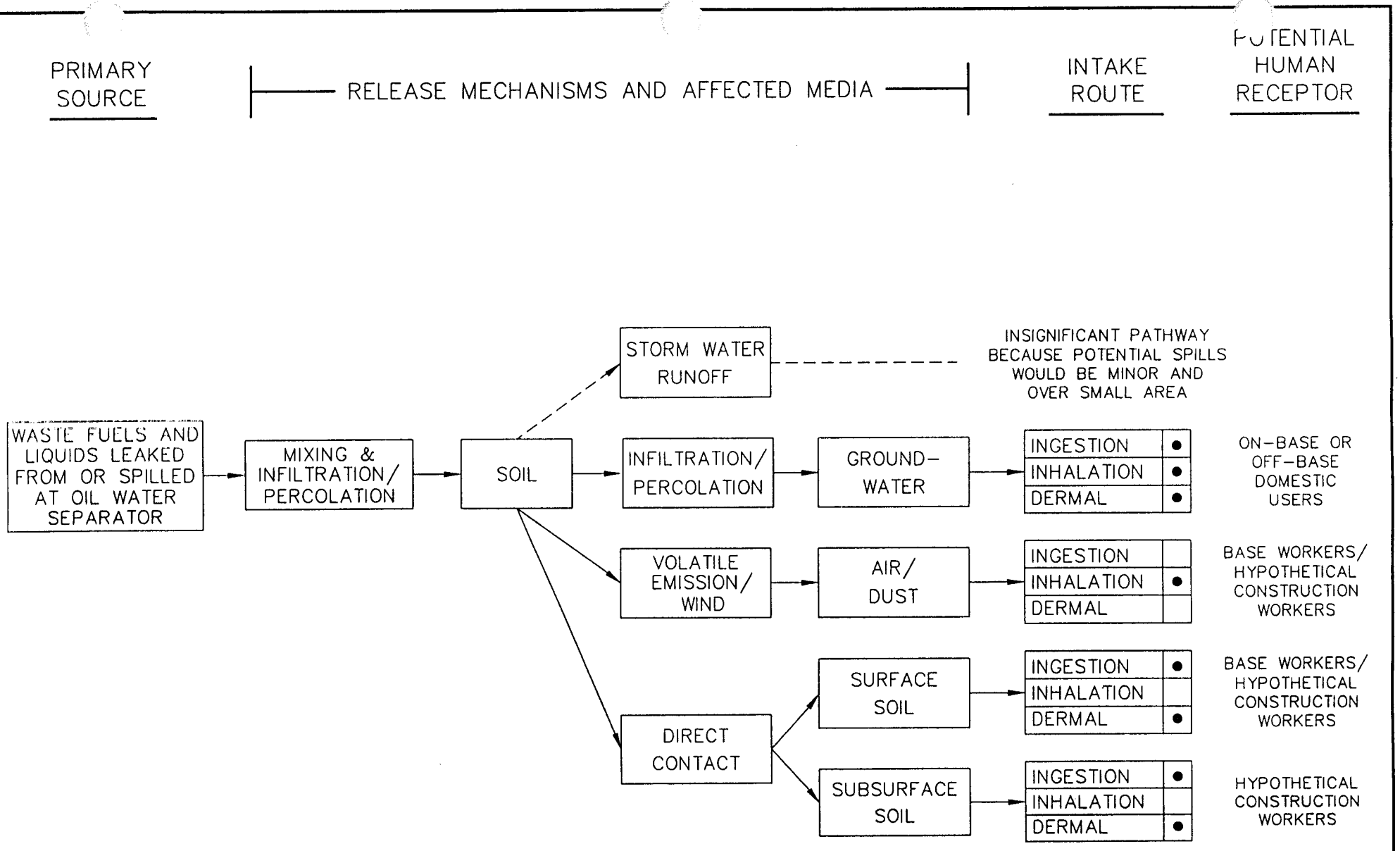


FIGURE 3-2

S:\CANNON\APPXII.VSD



NOTE:

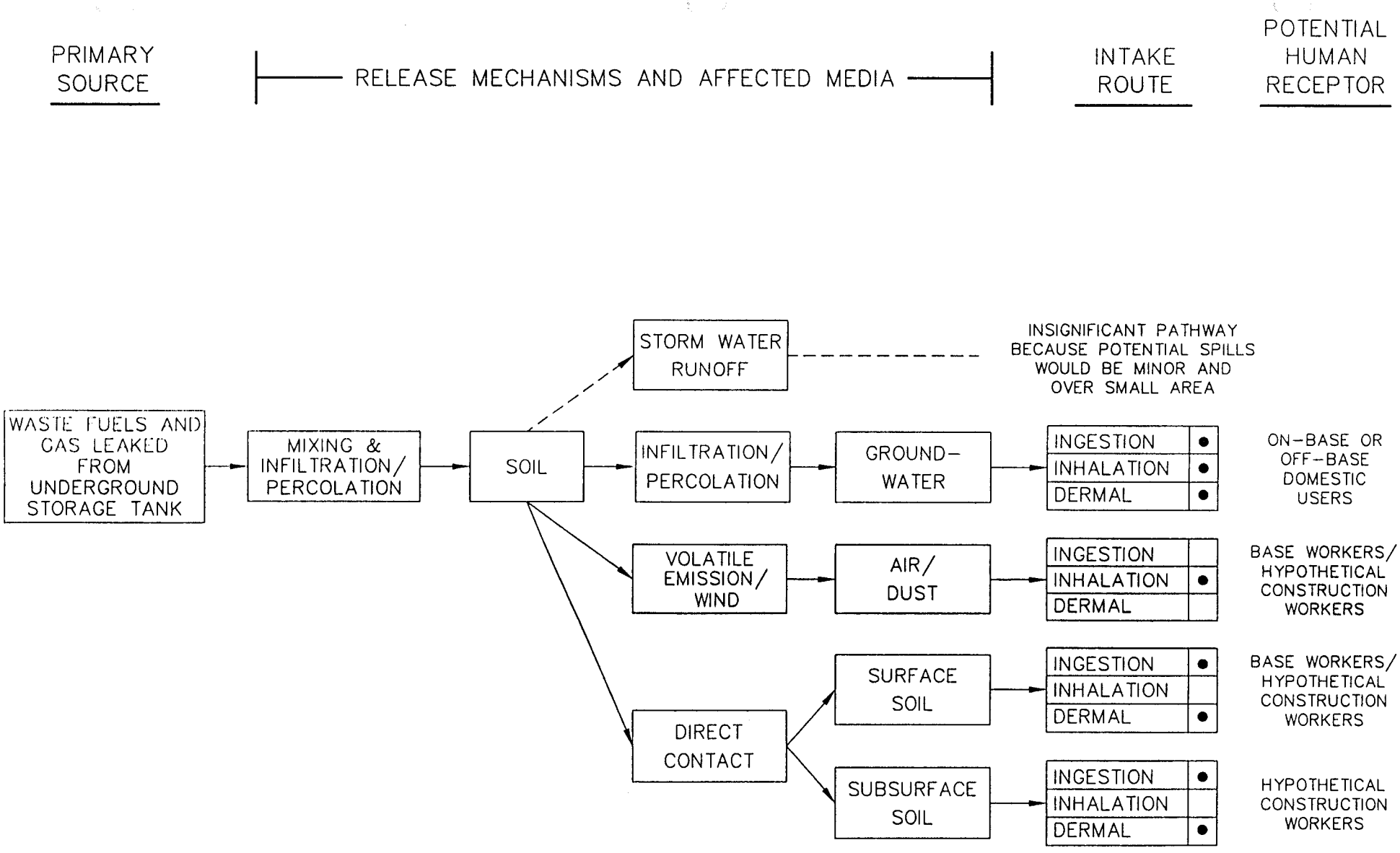
SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 03/17/95	SITE CONCEPTUAL EXPOSURE MODEL OIL WATER SEPARATORS (SWMU's 3,5,83) CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY .	REVISIONS: 0		FIG. NO. 3-3

3M11MM10.DWG V=UST 02/18/1995 10:38



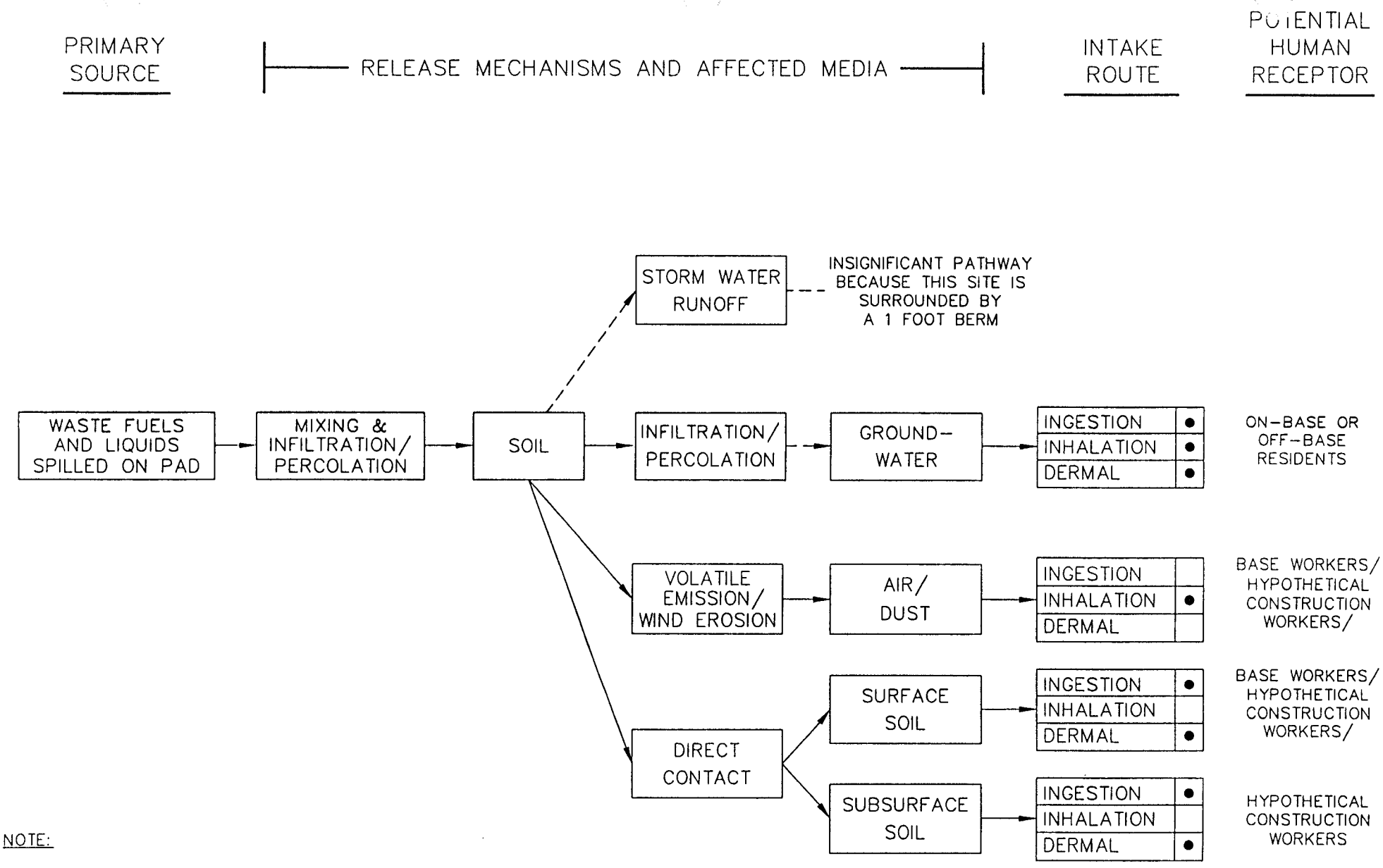
NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 03/17/95	SITE CONCEPTUAL EXPOSURE MODEL UST / AST SWMU 48A / SWMU 48B CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY .	REVISIONS: 0		C3M11MM	3-4



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 03/17/95	SITE CONCEPTUAL EXPOSURE MODEL EOD DISPOSAL AREA SWMU - 108 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY .	REVISIONS: 0		FIG. NO. 3-5

4.0
FIELD INVESTIGATION

4.1 SURFACE SOIL SAMPLING

Surface soil samples were collected at soil boring sites to help evaluate the potential risk to human health and the environment and to assess whether any releases of SWMU-related compounds had occurred. The surface samples were typically collected from the depth interval of 0 to 2 feet. Most of the surface samples, those at SWMUs 05, 48A, 48B, and 83, were collected by driving a decontaminated 2.5-inch ID by 2-foot-long stainless-steel split spoon through the targeted depth interval. Many of the boring locations at the above mentioned SWMUs were capped by asphalt. Where pavement was present, holes were cut into this surface, and the drill rig and stainless steel split-spoon were used to collect the soil sample beginning at the asphalt/soil contact. Other surface soil samples were collected from the surface to a depth of about 0.5 feet by using decontaminated stainless steel hand implements. This was done at SWMUs 03 and 108. The sample material was dug up completely by hand with the tools provided.

For both types of sample collection, sample containers for volatile organic compound (VOC) analysis were filled immediately with soil from the sampler or the hand utensils. The remaining soil was then homogenized and used to fill any additional sample containers required for that site. Collected samples were labeled and placed in an ice-filled cooler for preservation. All tools and bowls used for sample collection were decontaminated after use by washing in a liquinox/water solution, rinsing in potable water, and rinsing again with a double rinse of deionized water. Surface soil sampling activities followed the applicable Standard Operating Procedures (SOPs) included in the QAPP (W-C 1994).

4.2 SOIL BORING DRILLING AND SAMPLING

Soil borings were drilled and sampled using either a CME-55 or CME-85 hollow-stem auger (HSA) drill rig. The CME-55 drill rig was equipped with 3.5-inch inside diameter HSAs, while the CME-85 was equipped with 4.25-inch inside diameter HSAs. Each drill rig was

also equipped with two 2-foot by 3-inch-diameter stainless steel split spoons, and hydraulically operated automatic sampling hammers.

The soil samples were collected by driving a decontaminated, 3-inch ID by 2-foot-long stainless steel split-spoon sampler through the targeted depth interval. Blow counts were recorded to provide standard penetration test data for each interval sampled. The sampler was retrieved from the boring and opened for sample recovery. Sample containers for VOC samples were filled first directly from the split spoon. Once these samples were secured, the remaining material was homogenized in a stainless-steel bowl and placed in the remaining sample containers. If recovered sample volume was inadequate for the targeted interval, a decontaminated split-spoon sampler was reinserted into the boring and driven deeper to assure that sufficient material was collected for analysis. On the successful completion of sampling at each target interval, the HSAs advanced the boring to the top of the next sample interval, where the process was repeated.

All sampling equipment was decontaminated between sample intervals with a liquinox/water solution wash, potable water rinse and a final rinse of deionized water sprayed liberally over the equipment. Soil boring, drilling, and sampling activities generally followed the applicable SOPs included in the QAPP (W-C 1994).

4.3 SURVEY OF SAMPLING LOCATIONS

On the completion of field activities, the locations of all soil boring sites were accurately surveyed in terms of northing, easting, and elevation relative to the Cannon AFB coordinate system. Boring sites were also located relative to significant nearby physical features such as building corners and street intersections. All survey work was performed by a surveyor licensed by the State of New Mexico. The data generated during this site survey were used to accurately depict the locations of soil borings in figures found elsewhere within this document. A table containing the actual coordinates and elevations of all soil borings drilled under this investigation is also available in the Appendixes to the RFI report.

5.0
DATA REVIEW, QUALITY ASSURANCE AND ASSESSMENT

5.1 GENERAL

The data review process which involved a review of the laboratory summary data, was implemented to assess the quality of data resulting from the field sampling program with respect to the quality assurance objectives established for the project. Additionally, 10 percent of the data was validated, which involved the review of laboratory summary data and raw data, following the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluation Inorganic Analyses (EPA 1988). Data assessment for each SWMU involved a consideration of the major data uses, the decision types, the identification of data which were qualified or otherwise did not meet Cannon AFB RFI Quality Assurance Project Plan (QAPP) Addendum (W-C 1994) requirements, and limitations on data in order to evaluate the appropriate usage of the data in supporting decisions to be made at each SWMU.

5.2 DATA REVIEW PROCESS

Analytical laboratory results were reviewed following the procedures described below utilizing the quality control (QC) data specified in the Cannon AFB RFI QAPP Addendum (W-C 1994) for the respective EPA analytical methodologies. The QC elements reviewed in laboratory analytical data packages included the following: completeness of the data package; compliance with required holding times; presence or absence of analytes in method blanks and field blanks; results of duplicate control samples (DCS); recoveries of surrogate spikes in samples; results of matrix spike samples, matrix duplicates (metals); and field duplicate samples.

The analytical data received from the laboratory have been summarized and are included in the Cannon AFB RFI Quality Control Summary Report (QCSR). The laboratory flagged data J when a result was below reporting limits to indicate that the concentration reported is an estimated value. The data review procedures used are described in this section. Qualified data are addressed in the data assessment for each SWMU. The data, including all W-C

qualifiers, are presented in the summary tables which are presented in the section discussing the chemical investigation results for each SWMU.

Based on results of the data review process, sample data may have been qualified as **J** (estimated), **UJ** (estimated nondetect), **U** (nondetect), or **R** (rejected). The review process was performed in accordance with the Cannon AFB RFI QAPP Addendum (W-C 1994) with guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). Although the data packages provided were not CLP deliverables, the guidance was followed where applicable.

In accordance with these guidelines, professional judgment was invoked in certain areas in determining the need for data qualification. Professional judgment as prescribed by the Functional Guidelines involves a secondary evaluation of data with respect to qualifications, which takes into account additional knowledge based on experience with laboratory practices, analyte-specific factors, such as chemical properties, and other current resolution of technical issues addressed in the literature.

The data review results are presented in the respective data assessment section for each SWMU and the QCSR. Each SWMU-specific QC review details quality control issues associated with the analysis of the sample, describes if qualification of data was required, and describes how professional judgment was used.

5.2.1 Completeness of Data Package

Data packages were reviewed to make certain that they contained the data contractually required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with the requested QC documentation for the respective EPA methods.

5.2.2 Holding Times

Sample holding times were calculated from the date of sampling as determined from the Chain-of-Custody (COC) forms to the date of sample extraction/analysis. Holding times were compared to the criteria specified in Tables 5-1a and 5-1b of the Cannon AFB RFI QAPP Addendum (W-C 1994). If the sample analysis was conducted outside of the required holding times, all results for that sample were qualified as estimated **J** (detects) or **UJ** (nondetects) or rejected **R**, depending on the severity of the holding time exceedance in accordance with EPA Functional Guidelines.

5.2.3 Blanks

The same guidelines were applied to the results of method blanks and trip blanks in the evaluation and usage of blank results. If analytes were reported in the blank, but not in samples associated with the method blank, data were not qualified. If analytes were reported in the blank and in associated samples, the following actions were taken:

- No positive sample results were reported unless the concentration of the analyte in the sample exceeded 10 times (10x) the amount in any blank for the common laboratory contaminants (methylene chloride, acetone, 2-butanone, methyl isobutyl ketone, and common phthalate esters) or exceeded 5 times (5x) the amount for other compounds.

- When the sample results were greater than the reporting limit, but less than the required multiple (5x or 10x) of the blank result, sample results were qualified as nondetect **U**, and the reporting limit raised to the sample concentration.

- When the sample results were less than the reporting limits and less than the required multiple of the blank result, sample results were qualified as nondetect **U** at the reporting limit.

- When the sample results were greater than the required multiple (5x or 10x) of the blank result, sample results were reported without qualification.

5.2.4 Surrogates and Duplicate Control Samples

Surrogates were used to access accuracy for organic analyses on a case-by-case basis. Criteria for recovery of surrogates spiked into samples are listed in Table 4-3 of the Cannon AFB RFI QAPP (W-C 1994). If any one surrogate for volatile organic (VOC) analyses or any two surrogates for semivolatile organic (SVOC) analyses were out of specification due to recoveries greater than the upper evaluation limit, positive results for that fraction were qualified as estimated **J**; nondetect data did not require qualification. If recoveries were below the lower evaluation limit, but greater then 10 percent, positive results for that fraction were qualified as estimated **J**, and nondetect results were qualified as estimated **UJ**. If any surrogate in a fraction had a recovery less than 10 percent, positive results were qualified as estimated **J**, and nondetect results for that fraction were rejected **R**. Surrogate recovery review is not applicable to total recoverable petroleum hydrocarbons (TRPH) or metals analyses.

Duplicate control samples (DCS) are well-characterized, laboratory-generated samples used to monitor the laboratory's day-to-day performance for inorganic and organic analyses and to access the accuracy and precision the analytical process independently of matrix effects. Evaluation criteria for DCS are provided in Table 4-2a through Table 4-2e of the Cannon AFB RFI QAPP Addendum (W-C 1994). Sample results associated with the DCS which were below the evaluation limits were qualified as estimated **J** (detects) or **UJ** (nondetects) based on potential low bias. Detected sample results associated with the DCS which were above the evaluation limits were qualified as estimated **J** based on potential high bias.

5.2.5 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed for organics and matrix spike/duplicate (MS/D) samples were analyzed for inorganics. Evaluation criteria for accuracy (percent recovery) and precision (relative percent difference [RPD]) of these MS/MSD and MS/D samples are listed in Table 4-4, Table 4-5, and Table 4-6 of the Cannon AFB RFI QAPP Addendum (W-C 1994).

For MS/MSD samples with percent recoveries greater than the upper evaluation limit nondetect sample results were considered to be acceptable, and detected results were qualified

as estimated **J**. For percent recoveries less than the lower evaluation limit both nondetect and reported sample results were qualified as estimated **J**. If MS or MSD recoveries were less than 10 percent for organics and less than 30 percent for metals analyses, nondetect sample results were rejected **R**, and detected results were qualified as estimated **J**. MS and MSD samples where RPDs were greater than 100 percent were qualified as unusable **R**.

In general for soil samples, sample results for the sample on which the MS/MSD was prepared were qualified using the above guidelines. However, using informed professional judgment in conjunction with a review of the other QC criteria, the data reviewer may determine the need for qualification of other sample data for the analytical batch for the SWMU.

5.2.6 Field Duplicate Samples

Precision evaluation criteria of 50 percent relative percent difference (RPD) for soil samples were considered if the analyte concentrations were greater then 5x the reporting limit. For analytical results less than or equal to 5x the reporting limit, precision evaluation limits of ± 2x the reporting limit were utilized. Duplicate results were evaluated on a case-by-case basis to determine if qualification of data was necessary. Where it was determined that qualification based on field duplicate samples was required, associated data were qualified **J** (detects) or **UJ** (nondetects).

5.3 MEASUREMENT OF QUALITY ASSURANCE OBJECTIVES

5.3.1 Precision

Precision is the measure of variability between individual sample measurements under prescribed conditions. Precision is assessed by replicate measurements of known standards and analysis of duplicate environmental samples. Precision was assessed by evaluating the RPDs obtained from results of DCS, matrix spike duplicate samples, and field duplicate samples. The precision of the data is discussed in Section 4.0 of the QCSR.

5.3.2 Accuracy

Accuracy is the degree of agreement of a measurement to an accepted reference or true value. Accuracy was assessed by evaluating percent recoveries for DCS, matrix spike samples, and surrogates. The accuracy of the data is discussed in Section 4.0 of the QCSR.

5.3.3 Completeness

Following the QC review of the data packages for each SWMU, the data were assessed with respect to the fulfillment of quality assurance objectives and usability. The completeness for laboratory analytical data for each SWMU was calculated by the ratio of acceptable (including estimated data) analyses requested on the samples submitted for analysis.

$$\%\ Complete = \frac{Valid\ Analytical\ Results\ [including\ estimated\ (J)\ results]}{Total\ Number\ of\ Analytical\ Results\ Requested}$$

The percent completeness with respect to overall project objectives for each SWMU was evaluated for data required to make decisions on a case-by-case basis.

5.3.4 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness of the analytical results with respect to the medium sampled can be assessed by comparing the results for field duplicate samples collected from a SWMU.

As stated in the EPA Functional Guidelines, there are no review criteria for field duplicate analyses. Evaluation criteria for the field duplicate samples are discussed in Section 5.2.6. Each SWMU-specific QC review in the QCSR contains a qualitative assessment of data representativeness as defined by the Cannon AFB QAPP (W-C 1994).

5.3.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data are comparable when collection techniques and measurement procedures, methods, and reporting are equivalent for the samples within the sample set. Each SWMU-specific QC review in the QCSR contains a qualitative assessment of data comparability.

5.4 SAMPLE REPORTING LIMITS

The sample reporting limit (RL) is the lowest concentration of an analyte that can be reported by the laboratory to be present in a sample with a specified level of confidence. The RLs are a function of the sample characteristics, method quantitation, and laboratory performance.

Method quantitation limits are determined by the laboratory and defined as the level at which the laboratory can reliably quantitate the concentration of an analyte on multiple analyses. The RLs can be equal to the method quantitation limits, but often are above since method quantitation limit studies are performed using laboratory-prepared samples (spiked deionized [DI] water); whereas, environmental samples are naturally more variable. Reporting Limits were provided in Table 8-2 through Table 8-5 and Table 8-7 of the Cannon AFB RFI QAPP Addendum (W-C 1994). For the Cannon AFB project, Quanterra does report data below the RLs as estimated. For samples analyzed by Method 8240 (VOCs), estimated values were reported to 1/5 the RL. For Method 8270, estimated values were reported to 1/10 the RL. For inorganic data, estimated values were reported down to the instrument detection limit. Factors which may result in elevated RLs are discussed below.

1. High concentrations of target or nontarget analytes may require that the sample extract be diluted to avoid saturation of the detector or to quantify the analyte concentration within the calibration range of the instrument. Consequently, RLs are elevated in proportion to the dilution factor.

2. Matrix interferences may require that the sample be diluted to reduce or eliminate the interference. Consequently, the RLs are elevated in proportion to the dilution factor.

3. Analytical results and RLs are corrected for the moisture content of the sample. The RLs listed in the Cannon AFB RFI QAPP (W-C 1993) for soil are based on wet weight. RLs calculated by the laboratory for soil on a dry weight basis will be higher. Because moisture content can vary from sample to sample, RLs will vary accordingly.

4. The physical characteristics of the matrix do not permit concentration to the required final volume during sample preparation resulting in a larger sample extract volume and consequently an elevation in RLs.

5. Matrix interference may require the RLs be elevated because of the inability to quantify data below the elevated RL.

In a given sample, one or more of these effects may be exhibited. When the reporting limits have been elevated as a result of one or more of the above causes, surrogate or target compounds present at low concentrations may not be detected. The possibility exists that the low level analytes may have been diluted below the detection limit; therefore, elevated RLs may cause limitations to the objective of the data. These limitations on data for contaminants of concern are discussed on a case-by-case basis.

5.5 DATA ASSESSMENT

The assessment of data for each SWMU involved a consideration of the major data uses, the potential decisions, the identification of data which were qualified or otherwise deviated from Cannon AFB RFI QAPP Addendum (W-C 1994) requirements, and limitations associated with the evaluation of data use in supporting decisions to be made at each SWMU.

5.5.1 Uses of Data

The major uses for data collected in the RFI were:

- Characterization of the physical setting and nature and extent of contamination at a SWMU

- Human risk assessment screening to determine if a baseline risk assessment is needed

- Recommendations for each SWMU regarding further evaluation or no further action

Characterization of the nature and extent of contamination released from a SWMU included identifying specific compounds and their concentrations present in environmental media (e.g., soil, groundwater). Nature and extent characterization also involved consideration of the lateral and vertical distribution within certain spatial and temporal boundaries in environmental media of contamination released from a SWMU.

The human risk assessment screening involved a comparison of metal concentrations to background. Metals detected above background and detected organics were compared to EPA Region IV RBCs for each SWMU.

5.5.2 Summary of Data Quality Requirements

Data collected in the RFI must be of known quality to support the uses for which it is intended. That is, the data must be able to support remedial decisions concerning the respective SWMUs. The data collected must be able to support the primary uses of the data. Data must be able to characterize what chemicals were released from the SWMU and, at an acceptable level of uncertainty, what their concentrations are in environmental media of concern at potential exposure points. RLs must meet the levels necessary to determine whether analytes are present at concentrations of concern (i.e., above RBCs).

Inherent to providing defensible data is the need for a QA/QC program. The QA/QC program must have measurement tools so that data collected will be of known quality. QA/QC objectives for sampling and analysis were developed for this project which use as indicators: precision, accuracy, completeness, comparability, and representativeness.

5.5.3 Sampling Issues

Daily Quality Control Reports (DQCRs) were completed daily during the field activities. The DQCRs summarized the weather conditions, the work performed, QC activities, and any problems encountered. The DQCRs were reviewed to determine if there were any sampling issues which would impact the data usability.

5.5.4 Data Usability Assessment

For each SWMU, a determination of data usability was made with respect to project data quality objectives (DQOs). Sampling issues and data review issues were discussed in terms of the appropriateness of using the data as intended as well as making recommendations or limitations on data usage. These discussions addressed items such as elevated reporting limits, analytes suspected as laboratory contaminants, potential bias in results, and professional judgment utilized in the data review.

6.1 SITE BACKGROUND

6.1.1 Site Description

SWMU No. 3 was either an oil/water separator or a grease trap and was located on the west side of former Hangar 125. The location of the former unit is presently covered with asphalt pavement. The exact location of the former unit is unknown, but it is believed to have been about 8 feet west and 96 feet south of the northwest corner of Building 108 (Figure 6-1). The depth of the bottom of the former unit is also unknown.

6.1.2 Site History

In about 1990 the unit was removed, and Hangar 125 was demolished and replaced with Building 108. SWMU No. 3 was active from 1943 until it was removed. The unit received wastewater from Building 102 and wash water from aircraft maintenance operations in Building 121. The wastewater was discharged to the sanitary sewer line (SWMU No. 98).

6.1.3 Current Use

The oil/water separator has been removed and is currently covered with asphalt.

6.1.4 Potential Contaminants

Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

6.1.5 Previous Investigation

During the Phase I RFI, three soil borings were drilled and sampled to a depth of 10 feet below ground surface (bgs) (LRL 1993) at the site of former Oil/Water Separator No. 108

to determine whether or not a release of SWMU-related chemicals had occurred from the unit. The previous boring locations are shown on Figure 6-2. Target analytes for the samples collected included Target Compound List (TCL) VOCs, priority metals, and benzene, toluene, ethylbenzene, and xylenes (BTEX). Toluene and chromium were detected in low concentrations at the surface in Boring No. 3-1. Acetone, nickel, and mercury were detected in low concentrations in Boring No. 3-1 at 5 feet. Nickel was detected in low concentrations in Boring No. 3-2 at the surface and at 2.5 feet. Barium was detected in low concentrations in Boring No. 3-2 at 10 feet. Chromium was detected in low concentrations in Boring No. 3-3 at the surface. Barium was detected in low concentrations in Boring 3-3 at 10 feet. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU.

6.1.6 Phase II Sampling Objectives

The depth of the bottom of the former OWS is unknown. The Phase I investigation sampled soils to 10 feet bgs. The Phase II investigation included three new soil borings to a depth of 20 feet bgs. Five soil samples were collected for chemical analysis from the surface to the bottom of each boring. Chemical analysis included VOCs, semivolatile organic compounds (SVOCs), Target Analyte List (TAL) metals, and total recoverable petroleum hydrocarbons (TRPH).

New data collected during the Phase II investigation were used to complete a screening-level risk evaluation and to characterize the vertical extent of soil contamination. The results of this evaluation were the bases for recommending either further evaluation or no further action.

The overall objective of sampling at the site of former Oil/Water Separator No. 108 was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the former oil/water separator or grease trap which could pose a significant risk to human health or the environment. The analytical data collected from this investigation was used in a health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the former oil/water separator or grease trap.

Potential release points include spills at the surface that may have occurred during removal by pumping from the separator/grease trap and leaks in either the separator/grease trap or the associated underground piping.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

6.2 FIELD INVESTIGATION AND DATA COLLECTION

6.2.1 Soils Sampling

Three 20-foot soil borings were drilled and soil samples were collected in the area surrounding the presumed location of the former oil/water separator. The borings were placed about 15 feet from the unit in roughly a triangular pattern. The boring locations were chosen to assess the presence and extent of site-related soil contaminants at the 20-foot depth interval (10 feet below the Phase I RFI soil borings and the presumed bottom of the unit). Phase II RFI boring numbers and sample descriptions are shown in Table 6-1 and on Figure 6-2.

Soil samples were collected from the 0- to 2-foot, 3- to 5-foot, 8- to 10-foot, 13- to 15-foot, and 18- to 20-foot depth intervals in all Phase II RFI borings as specified in the Field Sampling Plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling, and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Field screening was done on boring samples, and the results are shown in Table 6-2. Target analytes included:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- TAL metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

Since the site is currently covered by pavement, the surface sampling interval began immediately below the pavement surface.

6.2.2 Geologic Summary of Boring Logs

Logs from the three Phase II RFI borings indicate a consistent subsurface lithology in the area of the SWMU. All three borings encountered asphalt pavement at the surface to a depth of about 5 inches. Below the asphalt in all borings is a 7-inch layer of stiff, dark brown, low plastic, silty clay fill (USCS symbol CL) which contains traces of asphalt and fine gravel. Below this fill layer, and to the total depth of 20 feet in all borings, is alluvial material consisting of loose to dense, reddish-brown, clayey silt (USCS symbol ML) with traces of caliche and occasional well-cemented zones of caliche. All soils in the three borings were described as dry. A simplified view of the boring lithology in stick log format is shown on Figure 6-3.

No visual signs of soil contamination were observed while drilling and logging the borings. Field screening results from borings 0304 and 0305 were highest at the near-surface sample and at the 10-foot interval (Table 6-2). Field screening readings at the 20-foot depth in these borings decreased to low levels. In boring 0306, field screening readings increased from the surface to 10 feet, and then decreased markedly to the total depth of 20 feet. Copies of the boring logs may be found in Appendix B.

6.2.3 Site Topography

The site remains covered by an asphalt parking lot. Building 108 is located immediately southeast of the site. A concrete sidewalk exists between Building 108 and the unit.

6.3 CHEMICAL INVESTIGATION RESULTS

6.3.1 General

Soil samples were collected from three borings (0304 through 0306). Sampling and analyses performed are summarized in Table 6-1. A summary of the analytical results for these soil samples are provided in Table 6-3. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in QCSR - Appendix A.

6.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN003-0304-0000, CAN003-0305-000 and CAN003-0306-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 6-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC reported was toluene in concentrations of 11 μg/kg and 1.5 μg/kg reported for samples CAN003-0304-0000 and CAN003-0306-0000, respectively. Results reported for SVOCs consisted primarily of polycyclic aromatic hydrocarbons (PAHs). Di-n-octyl phthalate was the only non-PAH SVOC compound, reported at a concentration of 540 μg/kg in sample CAN003-0306-0000. PAHs were detected in every near-surface sample. PAH compounds detected included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, and fluoranthene. Total PAH concentrations in sample CAN003-0304-0000 were the highest at a concentration of 1,106 μg/kg, followed by sample CAN003-0306-0000 at a concentration of 953 μg/kg and sample CAN003-0305-0000 at a concentration of 44 μg/kg. Chrysene was the only PAH compound detected in sample CAN003-0305-0000. Petroleum hydrocarbons as TRPH were detected in estimated concentrations in samples CAN003-0304-0000, CAN003-0305-0000, and CAN003-0306-0000 at concentrations of 1,120 mg/kg, 191 mg/kg, and 771 mg/kg, respectively.

6.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN003-0304-0005, CAN003-0304-0010, CAN003-0304-0015, and CAN003-0304-0020 for boring 0304, CAN003-0305-0005, CAN003-0305-0010, CAN003-0305-0015, and CAN003-0305-0020 for boring 0305, and CAN003-0306-0005, CAN003-0306-0010, CAN003-0306-0015, and CAN003-0306-0020 for boring 0306) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 6-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC reported was toluene at a concentration of 3.2 μg/kg reported for sample CAN003-0305-0010. The only SVOC reported was bis(2-ethylhexyl)phthalate in boring 0304 at 5, 10, 15, and 20 feet, and

boring 0305 at 20 feet. However, this compound is a common laboratory artifact and is probably not indicative of true contamination of these samples. Petroleum hydrocarbons as TRPH were reported only in sample CAN003-0304-0005 at a concentration of 51.2 mg/kg.

6.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 6-1. The range of results for metals reported in these soil samples are summarized in Table 6-A.

TABLE 6-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	15/15	2,380	0304-0000	10,500	0304-0005
Antimony	0/15	-	-	-	-
Arsenic	15/15	1	0306-0020	4.8	0306-0000
Barium	15/15	106	0304-0005	1,510	0304-0020
Beryllium	7/15	0.26	0305-0361	0.63	0305-0015
Cadmium	0/15	-	-	-	-
Calcium	15/15	35,000	0304-0005	301,000	0304-0015
Chromium	13/15	1.6	0306-0010	9.1	0304-0005
Cobalt	12/15	1.4	0306-0010	4.7	0304-0005
Copper	15/15	2	0304-0020	7.8	0304-0005
Iron	15/15	2,810	0304-0015	9,660	0304-0005
Lead	15/15	1.6	0305-0020	8.8	0305-0005
Magnesium	15/15	1,280	0305-0000	22,500	0306-0020
Manganese	15/15	25.6	0304-0020	625	0306-0000
Mercury	0/15	-	-	-	-
Nickel	12/15	3.4	0305-0000	8.4	0304-0005
Potassium	15/15	307	0306-0000	2,060	0304-0005
Selenium	0/15	-	-	-	-
Silver	0/15	-	-	-	-
Sodium	0/15	-	-	-	-
Thallium	0/15	-	-	-	-
Vanadium	15/15	7.9	0304-0015	25.3	0304-0000
Zinc	14/15	7.8	0306-0010	24.4	0304-0005

6.4 DATA ASSESSMENT

An assessment of the Oil/Water Separator No. 108 (SWMU 3) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

6.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

6.4.2 Data Review Issues

For the laboratory chemical data, Quality Assurance/Quality Control (QA/QC) criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1989).

For the organic analyses, qualification of data was not required based on outlying accuracy parameters. The MS recoveries were reported below evaluation criteria for antimony, barium, copper, manganese, lead, and selenium, and the matrix spike/matrix spike duplicate (MS/MSD) recoveries were reported above evaluation criteria for TRPH. Antimony, barium, copper, manganese, lead, and selenium data for all of the SWMU 3 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected TRPH data were qualified estimated to indicate a potential high bias. Additionally, data were qualified as nondetect **U** for methylene chloride and bis(2-ethylhexyl)phthalate (common laboratory contaminants) based on blank contamination.

Precision parameters were within evaluation criteria for the organic analysis. Matrix duplicate RPDs for barium and copper were also outlying the evaluation criteria. Associated data, however, were already qualified based on outlying accuracy parameters.

6.4.3 Reporting Limits

Reporting limits were raised for several analyses for metals and for several analyses for TRPH. In no case were RLs raised more than 10 times nominal RLs. For selenium, reporting limits were raised for all the SWMU samples due to matrix interference. Selenium and thallium data had raised reporting limits for all samples due to either matrix interferences or dilutions. Selenium and thallium data, which had raised reporting limits due to matrix interferences, were qualified as estimated **J** (detects) or **UJ** (nondetects). Lead analyses for sample CAN003-0306-0005, CAN003-0306-0010, CAN003-0305-0005, CAN003-0305-0010, CAN003-0304-0010, and CAN003-0304-6005 required dilutions which raised the reporting limits due to matrix interferences. For Method 6010 analyses, dilutions were required due to concentrations of calcium above the calibration range. Method 6010 dilutions were required for samples:

> CAN003-0306-0000, CAN003-0306-0005, CAN003-0306-0010, CAN003-0306-0020, CAN003-0304-0000, CAN003-0305-0000, CAN003-0305-0005, CAN003-0305-0361, CAN003-0304-0015, and CAN003-0304-0020

TRPH analyses also required dilutions due to concentrations above the calibration range for samples CAN003-0304-0000 and CAN003-0304-6005.

6.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 3 were determined to meet quality criteria, and the elevated reporting limits were judged not limit the use of the data for the human health risk screening because either the RLs were below the RBCs or the laboratory would report estimated concentrations below the RBCs. Based on the analytical data review and other information, including field observations, the data support the identification of the nature and extent of contamination and provide concentrations for use in the human health risk screening.

6.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas southwest, northeast, and west of the location of the oil/water separator (Figure 6-2). One boring, 0304, was located between two

of the borings from the previous investigation. The borings assessed the presence of contamination to the 20-foot depth, 10 feet deeper than the previous investigation borings.

The surface samples in borings 0304 and 0306 had reported concentrations of toluene at 11 μg/kg and 1.5 μg/kg, respectively (Figure 6-3 and Table 6-3). Toluene was found at depth only in boring 0305 (sample CAN003-0305-0010) at a concentration of 3.2 μg/kg. The surface samples from all three borings contained reportable concentrations of SVOCs, mainly in the form of PAHs, and TRPH (Figure 6-3 and Table 6-3). Total PAH concentrations ranged from a high of 1,106 μg/kg in sample CAN003-0304-0000 to a low of 44 μg/kg in sample CAN003-0305-0000. The only non-PAH SVOC detected was di-n-octyl phthalate in the surface sample of boring 0306 at a concentration of 540 μg/kg. The surface samples from borings 0304 and 0305 contained the highest (1,120 mg/kg) and lowest (191 mg/kg) concentrations of TRPH, respectively. All soil samples below 10 feet of depth had no reported concentrations of any analytes. Since the site is capped by asphalt with asphalt-containing fill beneath the pavement, the high PAH results, and possible the TRPH results, may be due to the asphalt.

As shown on Figure 6-3, the majority of site contamination occurs in the near-surface soil samples. It appears that the vertical distribution of site contaminants is defined and shows no increasing concentrations with depth or high concentrations at depth.

Metals that exceeded UTLs and background concentrations are shown next to the sample interval where they were detected on Figure 6-3. A discussion of these metals detections is provided in Section 6.6.

6.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals of potential concern were evaluated to assess whether or not they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional

soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 6-4 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium, and zinc did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. Barium and manganese exceeded background levels and were retained for further evaluation as chemicals of concern in soil. A brief discussion of the background comparison interpretations is given below.

Seven of fifteen soil samples contained barium at concentrations (ranging from 682 mg/kg to 1,530 mg/kg) which exceeded the background UTL of 642 mg/kg. These concentrations also exceeded the regional barium literature value (500 mg/kg) by as much as a factor of 3. Two samples (0304-0020 and 0306-0000) contained barium at concentrations (1,510 mg/kg and 1,530 mg/kg, respectively) which exceeded the detected range of background concentrations. Even though barium has been shown to substitute for calcium in caliche (Klein and Hurlbutt 1985) and the high concentrations of barium may be naturally occurring, to be conservative, barium was considered to exceed background levels and was retained for further evaluation.

The maximum detected concentration of cobalt (4.9 mg/kg) exceeded the background UTL of 4.5 mg/kg. However, this concentration was within the range of detected Basewide background concentrations and is consistent with the literature values for cobalt in the area (3 to 7 mg/kg). Therefore, cobalt was considered to be within background levels and was not retained for further evaluation.

The maximum detected concentration of zinc (24.4 mg/kg) exceeded the background UTL of 21.9 mg/kg. However, this concentration was within the range of detected Basewide background concentrations and is consistent with literature values for zinc in the region (45 mg/kg). Therefore, zinc was considered to be within background levels and was not retained for further evaluation.

6.7 RISK EVALUATION

6.7.1 Site Conceptual Exposure Model

There are three potentially complete exposure pathways at SWMU 3:

- Direct contact with soil
- Inhalation of airborne emissions from soil
- Domestic use of groundwater on the Base or at the Base boundary

Potential receptors at the SWMU include Base workers (e.g., military and Base personnel), Base contractors, hypothetical future construction workers, occasional Base visitors (e.g, families of military personnel, visitors at those sites without restricted access), and residential receptors at the Base boundary downgradient of the SWMU who may use the groundwater. A complete discussion of potentially complete exposure pathways and potential receptors is presented in Section 3.4 and Figure 3-3.

6.7.2 Comparison of Concentrations in Soil to RBCs

Table 6-3 shows a summary of chemicals detected in soil samples at SWMU 3. Maximum detected soil concentrations of organic compounds and metals which exceeded background levels (Section 6.6) were compared to conservative EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994) to evaluate whether or not a significant release (i.e., that could pose a risk to human health) has occurred at SWMU 3. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived using accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is given in Section 3.4 and Appendix D.

Table 6-5 shows the comparison of SWMU concentrations with residential soil RBCs. Benzo(a)pyrene was the only chemical detected at a concentration (0.22 mg/kg) which exceeded the RBC (0.088 mg/kg). The potential carcinogenic risk from this concentration is 2.5×10^{-6}. The estimated risk is within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) for exposure to chemicals released from a hazardous waste site (EPA 1990a, 1990b, 1991a, 1992a). The potential risk is based on residential exposure

assumptions and significantly overestimates the potential risks because SWMU 3 is an OWS located in an industrial area of the Base that is likely to remain an industrial area in the future. Therefore, comparing SWMU concentrations to residential RBCs results in a significant overestimation of potential risk from chemicals detected at the SWMU. The maximum detected concentration of benzo(a)pyrene (0.22 mg/kg) did not exceed the industrial soil RBC of 0.39 mg/kg. Therefore, no chemicals were detected at concentrations which are likely to pose a potentially significant human health risk based on the most likely future land use scenario for SWMU 3.

It is important to note that the maximum concentration of benzo(a)pyrene was detected in the soil directly beneath the asphalt. The detected concentration may be caused by the presence of the asphalt and not activities associated with the former OWS. The presence of asphalt over the area of the former OWS further overestimates potential risk because exposure to soils beneath the asphalt is limited.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as naphthalene, benzene, toluene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU.

At SWMU 3, TRPH was detected at a maximum concentration of 1,120 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. However, none of the potentially hazardous TRPH constituents were detected at concentrations that exceeded industrial soil RBCs; and only benzo(a)pyrene, in one sample, exceeded residential soil RBCs. It is unlikely that other TRPH constituents would contribute significantly to risks at the site.

6.7.3 Evaluation of the Groundwater Pathway

The vertical distribution of the soil contamination was used to evaluate whether contaminant releases pose a threat to groundwater. TRPH and related constituents were detected in surface soil, but no evidence of contamination (other than common laboratory contaminants) was detected in subsurface soil (i.e., 10 feet to 20 feet). This demonstrates that contaminants are

not being transported to groundwater located at approximately 240 feet to 280 feet bgs. In addition, the area where OWS 108 was located is currently covered with asphalt pavement, so future infiltration will be limited.

6.7.4 Conclusions

The results of the soil investigation at SWMU 3 show no evidence that a chemical release at this SWMU has occurred which would pose an unacceptable health risk for any potential exposure pathway. Therefore, no further evaluation of this SWMU is warranted.

6.8 SUMMARY AND RECOMMENDATIONS

Fifteen soil samples were collected and analyzed from the three 20-foot soil borings drilled at SWMU No. 3. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Fourteen organic compounds (nine of these are PAHs) and two metals were reported as detected in the site soil samples.

The highest concentrations of site contaminants occur in the surface soils at the site. The vertical distribution of site contaminants has been adequately defined and the potential impact to groundwater is considered low. The comparison of chemicals detected in SWMU soil samples showed that one analyte, benzo(a)pyrene, exceeded the RBC for residential soil. However, the estimated risk from this chemical is within the EPA's target risk range of 10^{-4} to 10^{-6}. This chemical did not exceed the RBC for industrial soils. Also, because the site is capped with asphalt, the source of the PAHs (including benzo(a)pyrene) may be the asphalt and not from site-related contamination. Because there is no unacceptable health risk posed by any chemicals detected at this site, it is recommended that no further evaluation of the SWMU is necessary.

TABLE 6-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
OIL/WATER SEPARATOR NO. 108 (SWMU NO. 3)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 0304	0 - 2	CAN003-0304-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN003-0304-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN003-0304-6005	MS/MSD	Soil	X	X	X	X	2	1
	8 - 10	CAN003-0304-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN003-0304-0015		Soil	X	X	X	X	2	1
	18 - 20	CAN003-0304-0020		Soil	X	X	X	X	2	1
Boring 0305	0 - 2	CAN003 -0305-0000		Soil	X	X	X	X	2	1
	0 - 2	CAN003 -0305-0361	MRD	Soil	X	X	X	X	2	1
	3 - 5	CAN003 -0305-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN003 -0305-0361	FD	Soil	X	X	X	X	2	1
	8 - 10	CAN003 -0305-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN003 -0305-0015		Soil	X	X	X	X	2	1
	18 - 20	CAN003 -0305-0020		Soil	X	X	X	X	2	1
Boring 0306	0 - 2	CAN003 -0306-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN003 -0306-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN003 -0306-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN003 -0306-0015		Soil	X	X	X	X	2	1
	18 - 20	CAN003 -0306-0020		Soil	X	X	X	X	2	1

FD = Field duplicate
MRD = Missouri River Division split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 6-1 for locations of the borings.

TABLE 6-2

FIELD SCREENING DATA
PHASE II RFI
OIL/WATER SEPARATOR NO. 108 (SWMU NO. 3)

Boring/Sample Number	Date	Time Collected (hrs)	Time of Field Screening	Sample Depth	Field Screening Concentrations (ppm)
CAN003-0304	12/11/94	1420	1452	2.0	115.3
		1429	1503	5.0	13
		1440	1516	10.0	127.3
		1448	1521	15.0	5.6
		1505	1537	20.0	6.3
CAN003-0305	12/11/94	1213	1247	2.0	24.2
		1223	1258	5.0	10
		1234	1306	10.0	118.5
		1244	1314	15.0	140
		1252	1321	20.0	13.5
CAN003-0306	12/11/94	1304	1330	2.0	27.6
		1313	1346	5.0	14
		1325	1355	10.0	59.9
		1335	1359	15.0	11
		1405	1437	20.0	8.5

TABLE 6-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 003
CANNON AFB

LOCATOR	CAN003-0304-0000			CAN003-0304-0005			CAN003-0304-6005 [1]			CAN003-0304-0010			CAN003-0304-0015			CAN003-0304-0020		
LAB SAMPLE NUMBER	0397770006SA			0397770013SA			0397770017SA			0397770014SA			0397770015SA			0397770016SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	11	10		<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.2	U	3	5.7	J	3.9	5.7	J	2.9	5.7	J	3.4	5.5	J	4	5.7	J
Toluene	11	5.2		<	5.7	U	5	5.7	J	<	5.7	U	<	5.5	U	<	5.7	U
Semivolatile Organics (µg/kg)																		
Benzo(a)anthracene	130	350	J	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Benzo(a)pyrene	220	350	J	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Benzo(b)fluoranthene	140	350	J	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Benzo(g,h,i)perylene	39	350	J	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
bis(2-Ethylhexyl)phthalate	<	350	U	300	370	J	640	380		170	380	J	230	360	J	350	380	J
Chrysene	470	350		<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Di-n-octyl phthalate	<	350	U	<	370	U	890	380		<	380	U	<	360	U	<	380	U
Dibenz(a,h)anthracene	58	350	J	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Fluoranthene	49	350	J	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Phenanthrene	<	350	U	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Pyrene	<	350	U	<	370	U	<	380	U	<	380	U	<	360	U	<	380	U
Metals (mg/kg)																		
Aluminum	2380	21		10500	11.3		8700	11.4		5200	22.9		4670	54.9		6260	23	
Arsenic	4.6	0.52		2.1	0.57		2.3	0.57		1.6	0.57		1.5	0.55		1	0.57	
Barium	951	2.1	J	106	1.1		184	1.1		107	2.3		914	5.5		1510	2.3	
Beryllium	<	0.42	U	0.51	0.23		0.53	0.23		0.3	0.46	J	<	1.1	U	<	0.46	U
Calcium	132000	42		35000	22.6		38600	22.8		199000	45.8		301000	110		208000	45.9	
Chromium	3.2	2.1		9.1	1.1		8.9	1.1		3.5	2.3		<	5.5	U	3.7	2.3	
Cobalt	1.9	2.1	J	4.7	1.1		4.9	1.1		2.8	2.3		<	5.5	U	<	2.3	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] MS/MSD for the preceeding sample number.

TABLE 6-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 003
CANNON AFB

LOCATOR	CAN003-0304-0000			CAN003-0304-0005			CAN003-0304-6005 [1]			CAN003-0304-0010			CAN003-0304-0015			CAN003-0304-0020		
LAB SAMPLE NUMBER	0397770006SA			0397770013SA			0397770017SA			0397770014SA			0397770015SA			0397770016SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.																		
Copper	5.5	4.2	J	7.8	2.3		16.9	2.3		3.6	4.6	J	3.7	11	J	2	4.6	J
Iron	5460	21		9660	11.3		9240	11.4		3900	22.9		2810	54.9		3410	23	
Lead	4.1	0.52	J	8.8	0.57		9.9	1.1		3.4	1.1		1.8	0.55		4.7	0.57	
Magnesium	1540	42		2470	22.6		2330	22.8		4470	45.8		4900	110		11200	45.9	
Manganese	618	2.1	J	184	1.1		219	1.1		54.8	2.3		26.3	5.5		25.6	2.3	
Nickel	6.4	8.4	J	8.4	4.5		8.8	4.6		7.5	9.2	J	<	22	U	5.8	9.2	J
Potassium	372	1050	J	2060	566		1910	569		1020	1150	J	968	2750	J	893	1150	J
Vanadium	25.3	2.1		18.5	1.1		19.5	1.1		9.3	2.3		7.9	5.5		12	2.3	
Zinc	18.6	4.2		24.4	2.3		24.1	2.3		9.8	4.6		8.2	11	J	8	4.6	
TRPH (mg/kg)																		
Total Petroleum Hydrocarbons	1120	126	J	51.2	45.2		615	45.6		<	45.8	U	<	43.9	U	<	45.9	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] MS/MSD for the preceeding sample number.

TABLE 6-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 003
CANNON AFB

LOCATOR	CAN003-0305-0000			CAN003-0305-0005			CAN003-0305-0361[2]			CAN003-0305-0010			CAN003-0305-0015			CAN003-0305-0020		
LAB SAMPLE NUMBER	0397770007SA			0397770008SA			0397770009SA			0397770010SA			0397770011SA			0397770012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	7.8	11	J	8.5	11	J	<	11	U	<	11	U	3.9	12	J
Methylene chloride	<	5.4	U	1.2	5.7	J	<	5.6	U	<	5.6	U	<	5.7	U	3.4	5.8	J
Toluene	<	5.4	U	<	5.7	U	<	5.6	U	3.2	5.6	J	<	5.7	U	<	5.8	U
Semivolatile Organics (µg/kg)																		
Benzo(a)anthracene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Benzo(a)pyrene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Benzo(b)fluoranthene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Benzo(g,h,i)perylene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
bis(2-Ethylhexyl)phthalate	<	300	U	<	370	U	<	510	U	<	370	U	<	380	J	300	390	J
Chrysene	44	360	J	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Di-n-octyl phthalate	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Dibenz(a,h)anthracene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Fluoranthene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Phenanthrene	<	360	U	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Pyrene	47	360	J	<	370	U	<	370	U	<	370	U	<	380	U	<	390	U
Metals (mg/kg)																		
Aluminum	2770	10.9		8670	22.7		6550	22.4		4690	11.2		8150	11.4		6560	58.3	
Arsenic	3.9	0.54		2.4	0.57		2	0.56		2.6	0.56		1.8	0.57		1.2	0.58	
Barium	682	1.1	J	147	2.3	J	303	2.2	J	162	1.1	J	702	1.1	J	398	5.8	
Beryllium	<	0.22	U	0.42	0.45	J	0.26	0.45	J	0.44	0.22		0.63	0.23		<	1.2	U
Calcium	89400	21.7		117000	45.4		149000	44.8		73500	22.4		113000	22.9		279000	117	
Chromium	4.3	1.1		5.9	2.3		5	2.2		5	1.1		5.8	1.1		<	5.8	U
Cobalt	2.2	1.1		3	2.3		3.4	2.2		3.4	1.1		3.2	1.1		<	5.8	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[2] Duplicate sample for the preceeding sample number.

TABLE 6-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 003
CANNON AFB

LOCATOR	CAN003-0305-0000			CAN003-0305-0005			CAN003-0305-0361[2]			CAN003-0305-0010			CAN003-0305-0015			CAN003-0305-0020		
LAB SAMPLE NUMBER	0397770007SA			0397770008SA			0397770009SA			0397770010SA			0397770011SA			0397770012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.																		
Copper	4.6	2.2	J	5.8	4.5	J	4.5	4.5	J	5	2.2	J	3.7	2.3	J	5.5	11.7	J
Iron	4750	10.9		7460	22.7		6210	22.4		5950	11.2		5980	11.4		3690	58.3	
Lead	4.6	0.54	J	4.4	1.1	J	3.8	0.56	J	4.4	1.1	J	5	0.57	J	1.6	0.58	
Magnesium	1280	21.7		2810	45.4		3620	44.8		2620	22.4		4660	22.9	J	20600	117	
Manganese	389	1.1	J	94.5	2.3	J	95.6	2.2	J	110	1.1	J	80.3	1.1		30.7	5.8	
Nickel	3.4	4.3	J	7.4	9.1	J	5.4	9	J	7.4	4.5		6.2	4.6		<	23.3	U
Potassium	462	543	J	1580	1140		1400	1120		1220	559		2000	572		963	2920	J
Vanadium	18.4	1.1		16.8	2.3		18.5	2.2		21.5	1.1		14.4	1.1		15.2	5.8	
Zinc	13.6	2.2		17.6	4.5		14.6	4.5		13.6	2.2		15.2	2.3		<	11.7	U
TRPH (mg/kg)																		
Total Petroleum Hydrocarbons	191	43.5	J	<	45.4	U	<	44.8	U	<	44.7	U	<	45.7	U	<	46.7	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[2] Duplicate sample for the preceeding sample number.

TABLE 6-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 003 CANNON AFB

LOCATOR	CAN003-0306-0000			CAN003-0306-0005			CAN003-0306-0010			CAN003-0306-0015			CAN003-0306-0020		
LAB SAMPLE NUMBER	0397770001SA			0397770002SA			0397770003SA			0397770004SA			0397770005SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	9.8	11	J	7.6	11	J	2.5	11	J	<	11	U	6.5	12	J
Methylene chloride	1.8	5.4	J	2.5	5.7	J	2.3	5.6	J	1.9	5.5	J	<	6	U
Toluene	1.5	5.4	J	<	5.7	U	<	5.6	U	<	5.5	U	<	6	U
Semivolatile Organics (µg/kg)															
Benzo(a)anthracene	42	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Benzo(a)pyrene	100	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Benzo(b)fluoranthene	70	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Benzo(g,h,i)perylene	<	360	U	<	380	U	<	370	U	<	360	U	<	390	U
bis(2-Ethylhexyl)phthalate	<	540	U	<	380	U	<	370	U	<	360	U	<	530	U
Chrysene	130	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Di-n-octyl phthalate	540	360		<	380	U	<	370	U	<	360	U	<	390	U
Dibenz(a,h)anthracene	<	360	U	<	380	U	<	370	U	<	360	U	<	390	U
Fluoranthene	71	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Phenanthrene	52	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Pyrene	190	360	J	<	380	U	<	370	U	<	360	U	<	390	U
Metals (mg/kg)															
Aluminum	2640	21.7		7240	23		3800	22.3		4390	11		6960	23.9	
Arsenic	4.8	0.54		2.3	0.57		1.5	0.56		1.4	0.55		0.91	0.6	
Barium	1530	2.2	J	110	2.3	J	421	2.2	J	107	1.1	J	1090	2.4	J
Beryllium	<	0.43	U	0.46	0.46		<	0.45	U	0.36	0.22		<	0.48	U
Calcium	145000	43.3		156000	46		154000	44.6		56900	21.9		190000	47.8	
Chromium	4.6	2.2		5.3	2.3		1.6	2.2	J	4.1	1.1		4.5	2.4	
Cobalt	2.1	2.2	J	4.5	2.3		1.4	2.2	J	2.8	1.1		1.9	2.4	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 6-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 003 CANNON AFB

LOCATOR	CAN003-0306-0000			CAN003-0306-0005			CAN003-0306-0010			CAN003-0306-0015			CAN003-0306-0020		
LAB SAMPLE NUMBER	0397770001SA			0397770002SA			0397770003SA			0397770004SA			0397770005SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.															
Copper	6.3	4.3	J	6.8	4.6	J	2.5	4.5	J	2.8	2.2	J	3.5	4.8	J
Iron	5730	21.7		6830	23		3270	22.3		3870	11		3700	23.9	
Lead	5.4	0.54	J	6.9	2.9	J	2.6	1.1	J	3.8	0.55	J	2.2	0.6	J
Magnesium	1940	43.3		3200	46		2880	44.6		2310	21.9		22500	47.8	
Manganese	625	2.2	J	113	2.3	J	45.4	2.2	J	67.6	1.1	J	37.9	2.4	J
Nickel	4.9	8.7	J	8.3	9.2	J	<	8.9	U	3.7	4.4	J	6.6	9.6	J
Potassium	307	1080	J	1530	1150		893	1120	J	1250	548		1120	1190	J
Vanadium	23.2	2.2		17.2	2.3		9.5	2.2		12.1	1.1		16.9	2.4	
Zinc	15.6	4.3		17.2	4.6		7.8	4.5		10.1	2.2		9.3	4.8	
TRPH (mg/kg)															
Total Petroleum Hydrocarbons	771	43.3	J	<	46	U	<	44.6	U	<	43.8	U	<	47.8	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

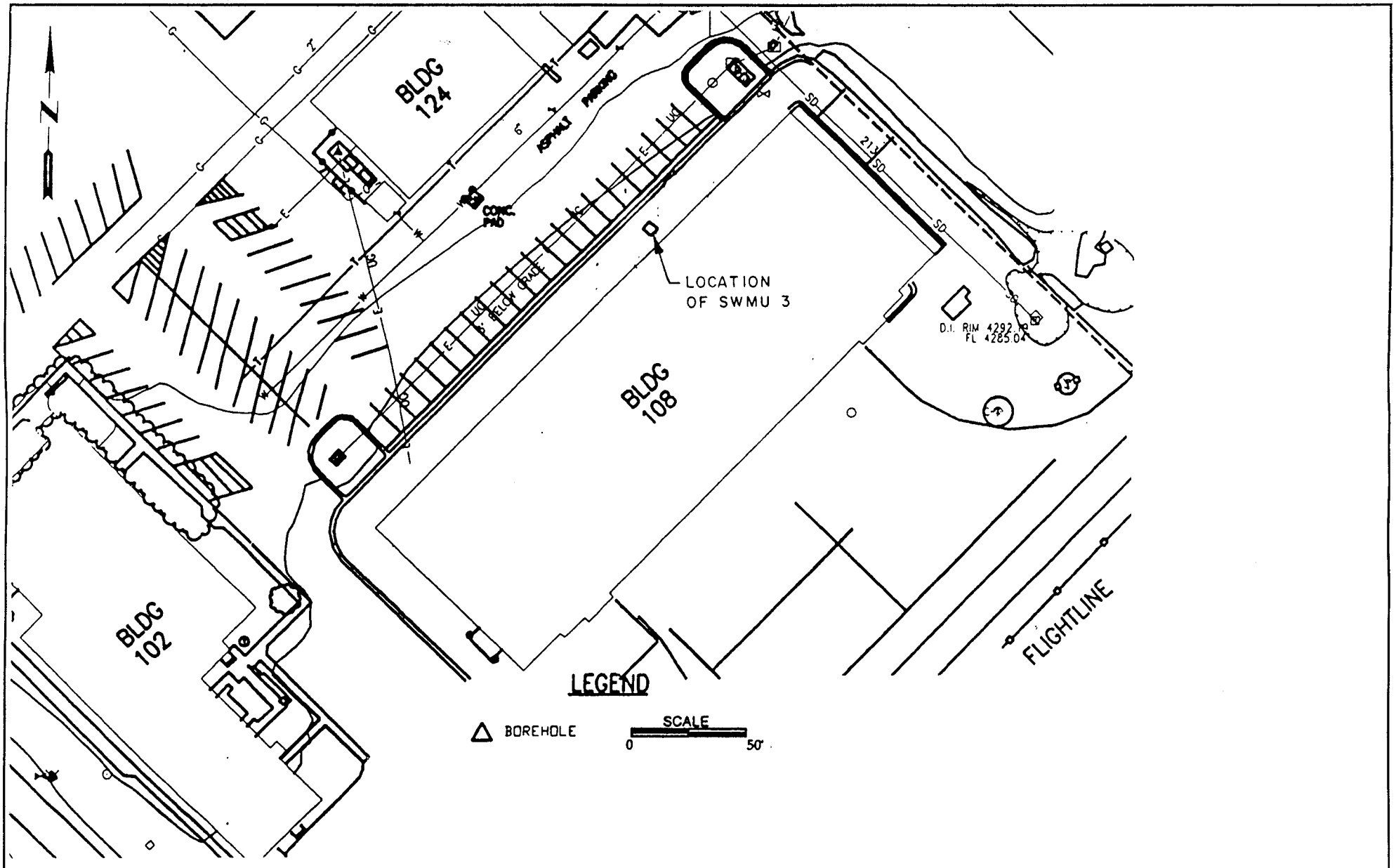
TABLE 6-4

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1) AT SWMU 3, CANNON AFB

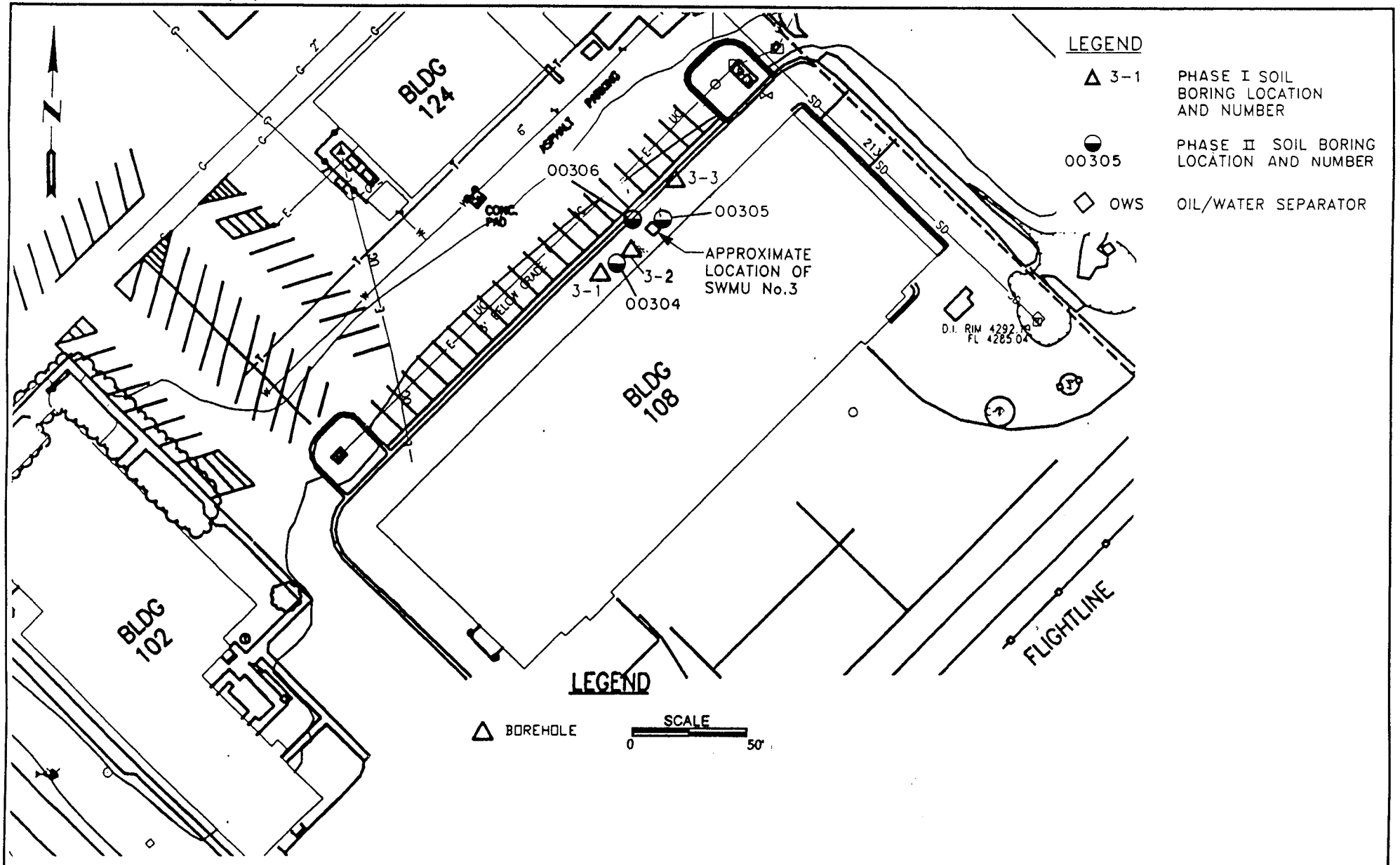
Oil/Water Separator No. 108

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations (2)	Upper Tolerance Limit (UTL) Background Concentration(3)	Reported Level in Clovis, NM Region (4)	Does Maximum Detected Exceed Background
CAN003-0304-0005	Aluminum	10,500	1,410 - 11,000	10,540	50,000	NO
CAN003-0306-0000	Arsenic	4.8	0.67 - 28	15.5	6.5	NO
CAN003-0306-0000	Barium	1530	14.5 - 1200	642	500	YES
CAN003-0305-0015	Beryllium	0.63	0.17 - 0.77	0.73	1-2	NO
CAN003-0304-0005	Chromium	9.1	4 - 15.4	12.5	30	NO
CAN003-0304-0005	Cobalt	4.7	0.85 - 5.3	4.5	3-7	NO**
CAN003-0304-0005	Copper	7.8	<2 - 18.4	*	20	NO
CAN003-0304-0005	Lead	8.8	1.1 - 46	25.8	15	NO
CAN003-0306-0000	Manganese	625	22.4 - 216	164	500	YES
CAN003-0304-0005	Nickel	8.8	1.3 - 9.8	9	15	NO
CAN003-0304-0000	Vanadium	25.3	5.2 - 28.3	25.3	30-70	NO
CAN003-0304-0005	Zinc	24.4	<4.3 - 27.5	21.9	45	NO**

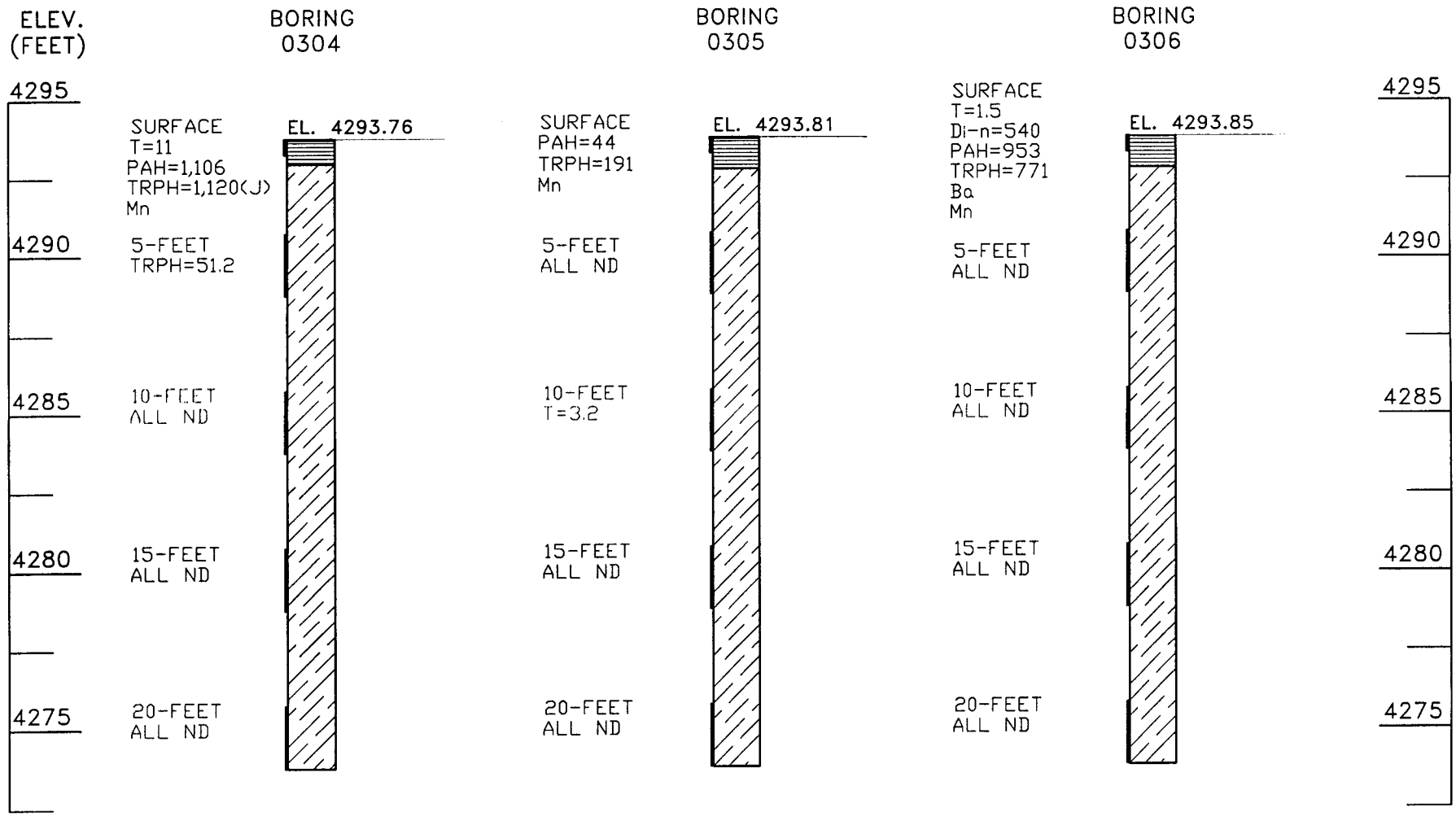
(1) All units in mg/kg.
(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and W-C 1994) and Walk, Haydel and Associates for the IRP (Walk Haydel and Associates 1990). Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM" (W-C 1993).
(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k = 2.02 for n=37.
(4) USGS 1984
* Data insufficient to calculate UTL of background concentration.
** Maximum concentration within or only slightly above Basewide background range and within naturally occurring levels (USGS 1984); therefore, is not considered to exceed background.



DRN BY SCR	DATE 09/19/94	OIL/WATER SEPARATOR No. 108 – SWMU 3 SITE PLAN	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0	CANNON AIR FORCE BASE NEW MEXICO	C3M11MM	6-1



DRN BY SCR	DATE 09/19/94	OIL/WATER SEPARATOR No. 108 – SWMU 3 SITE PLAN WITH PHASE I & PHASE II BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	6-2



SWMU-03 LEGEND

- ASPHALT
- SILTY CLAY (CL)(FILL)
- CLAYEY SILT (ML)
- SAMPLED INTERVAL

T=Toluene
Di-n=Di-n-butylphthalate
PAH=Polycyclic Aromatic Hydrocarbons
TRPH=Total Recoverable Petroleum Hydrocarbons
Ba=Barium
Mn=Manganese
(J)=estimated value
ND=Not Detected

Note: All results reported in μg/kg except TRPH (mg/kg). Only metals that exceeded UTLs and background levels are listed.

SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

SWMU-03 – SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
CANNON AIR FORCE BASE NEW MEXICO

DRN BY: TBS	DATE: 05/19/94	PROJECT NO.	FIG. NO.
CHK'D BY:	REVISION: 0	C3M11MM	6-3

7.1 SITE BACKGROUND

7.1.1 Site Description

SWMU No. 5 was either an oil/water separator or a grease trap located on the west side of Hangar 121. Hangar 121 and the unit were removed in about 1990. The area is presently covered with asphalt pavement. The exact location of the unit is unknown, but it is believed to have been about 140 feet southwest of Building 123 and about 135 feet southeast of Building 112 (Figure 7-1). The depth of the bottom of the unit is also unknown.

7.1.2 Site History

Hangar 121 and the unit were removed in about 1990. SWMU No. 5 was active from 1943 until it was removed. The unit received wastewater from Buildings 102 and 125 and wash water from aircraft maintenance operations in Hangar 121. The wastewater was discharged to the sanitary sewer line (SWMU No. 98).

7.1.3 Current Use

The oil/water separator has been removed and is currently covered with asphalt.

7.1.4 Potential Contaminants

Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

7.1.5 Previous Investigations

During the Phase I RFI three soil borings were drilled and sampled to a depth of 10 feet bgs (LRL 1993) at the site of Oil/Water Separator No. 121 to determine whether a release of

SWMU-related chemicals had occurred from the separator. The previous boring locations are shown on Figure 7-2. Target analytes for the samples collected included TCL VOCs, priority metals, and BTEX. Nickel was detected marginally above background in all three borings at 2.5 feet. Nickel and acetone were detected in low concentrations in Boring No. 5-2 at 10 feet. Acetone, barium, and mercury were detected in low concentrations in Boring No. 5-3 at 10 feet. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU.

7.1.6 Phase II Sampling Objectives

The depth of the bottom of the OWS at this site is unknown. The Phase I investigation sampled soils to 10 feet bgs. The Phase II investigation included three new soil borings to a depth of 20 feet bgs and one boring to a depth of 34.5 feet bgs. Five soil samples were collected for chemical analysis from the surface to the bottom of each 20-foot boring. Two samples were collected at the 28- and 33-foot depths from the deeper boring. Chemical analysis included VOCs, SVOCs, TAL metals, and TRPH.

New data collected during the Phase II investigation were used to complete a screening-level risk evaluation and to characterize the vertical extent of soil contamination. The results of this evaluation are the basis for recommending either further evaluation or no further action.

The overall objective of sampling at the site of former Oil/Water Separator No. 121 was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the former oil/water separator or grease trap which could pose a significant risk to human health or the environment. The analytical data collected from this investigation were used as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the former oil/water separator or grease trap. Potential release points include spills at the surface that may have occurred during removal by pumping from the separator/grease trap and leaks in either the separator/grease trap or the associated underground piping.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

7.2 FIELD INVESTIGATION AND DATA COLLECTION

7.2.1 Soils Sampling

During the original field investigation (December 1994), three 20-foot soil borings were drilled and soil samples collected in the area surrounding the presumed location of the former oil/water separator or grease trap. Boring depths specified in the Work Plan were 25 feet. Due to a field oversight, the borings were terminated at 20 feet. Two of the borings were placed at the presumed location of the unit, while the third boring was placed about 30 feet to the southwest of the presumed unit location. In October 1995, an additional soil boring was drilled to 34.5 feet bgs. The boring locations were chosen to assess the presence and extent of site-related soil contaminants up to the 34.5-foot depth interval (25 feet below the Phase I RFI soil borings and the presumed bottom of the unit). Phase II RFI boring numbers and sample descriptions are shown in Table 7-1 and on Figure 6-2.

In the three 20-foot soil borings, soil samples were collected from the 0- to 2-foot, 3- to 5-foot, 8- to 10-foot, 13- to 15-foot, and 18- to 20-foot depth intervals. In the 34.5-foot soil boring, soil samples were collected from the 28- to 29-foot and 33- to 34.5-foot depth intervals. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 -Subsurface Drilling and Sampling. Field screening was done on all soil samples collected, and the results are shown in Table 7-2. Target analytes included:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- TAL metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

Since the site is currently covered by pavement, the surface sampling interval began immediately below the pavement surface.

7.2.2 Geologic Summary of Boring Logs

Logs from the three 20-foot Phase II RFI borings show a consistent subsurface lithology in the area of the SWMU. All three borings encountered asphalt pavement at the surface to a depth of about 2 to 3 inches. Below the asphalt in all borings is a 4- to 8-inch layer of sandy gravel fill material placed as a foundation for the asphalt paving. From the base of this fill to depths ranging from 17.5 to 18.5 feet, the three 20-foot Phase II RFI borings contained silty clay alluvium of the Ogallala Formation. This silty clay is typically various shades of brown, red, and reddish-brown, dry to moist, low to medium plastic, with varying amounts of calcium carbonate nodules and occasional caliche cemented zones. The 34.5-foot boring encountered a hard caliche layer at approximately 25 feet. Clayey silt was encountered from 25 feet to the bottom of the boring. The borings are shown in simplified stick-log format on Figure 7-3.

No visual signs of soil contamination were observed while drilling and logging the borings. Field screening results at all depths in the three borings were nondetect (Table 7-2).

7.2.3 Site Topography

The site is level with a thin asphalt pavement. Building 123 lies about 100 feet to the northeast of the SWMU, a parking lot is immediately northwest of the SWMU, and an area under construction is about 50 feet to the southeast.

7.3 CHEMICAL INVESTIGATION RESULTS

7.3.1 General

Soil samples were collected from four borings (0504 through 0506 and 0504A). Sampling and analyses performed are summarized in Table 7-1. A summary of the analytical results for these soil samples are provided in Table 7-3. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

7.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN005-0504-0000, CAN005-0505-000, and CAN005-0506-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 7-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC reported was toluene at a concentration of 1.2 μg/kg reported for sample CAN005-0504-0000. No SVOC compounds were reported for any of the samples. Petroleum hydrocarbons as TRPH were detected at concentrations of 185 mg/kg, 299 mg/kg, and 507 mg/kg (estimated) in samples CAN005-0504-0000, CAN005-0505-0000 and CAN005-0506-0000, respectively.

7.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN005-0504-0005, CAN005-0504-0010, CAN005-0504-0015, and CAN005-0504-0020 for boring 0504; CAN005-0504-0028 and CAN005-0504-0033 for boring 0504A; CAN005-0505-0005, CAN005-0505-0010, CAN005-0505-0015, and CAN005-0505-0020 for boring 0505; and CAN005-0506-0005, CAN005-0506-0010, CAN005-0506-0015, and CAN005-0506-0020 for boring 0506) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 7-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC reported was toluene at concentrations of 3.2 μg/kg, 2.6 μg/kg, and 2.5 μg/kg reported for samples CAN005-0504-0005, CAN005-0504-0015, and CAN005-0505-0010. The only SVOC detected was bis(2-ethylhexyl) phthalate, reported just above the reporting limit at 400 μg/kg in sample CAN005-0504-0028. Petroleum hydrocarbons as TRPH were reported in samples CAN005-0504-0005, CAN005-0504-0010, CAN005-0504-0015, and CAN005-0504-0020 at concentrations of 87.7 mg/kg, 131 mg/kg, 170 mg/kg, and 209 mg/kg.

7.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 7-1. The range of results for metals reported in these soil samples are summarized in Table 7-A.

TABLE 7-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	17/17	3.960	0505-0005	14,300	0504-0005
Antimony	0/17	-	-	-	-
Arsenic	17/17	0.69	0504-0033	2.7	0504-0005
Barium	17/17	25.5	0504-0033	1,170	0506-0015
Beryllium	14/17	0.29	0505-0005	0.67	0505-0015
Cadmium	0/17	-	-	-	-
Calcium	17/17	18,600	0504-0033	217,000	0506-0015
Chromium	17/17	2.7	0505-0010	11.4	0504-0005
Cobalt	17/17	1.4	0504-0033	4.6	0505-0000
Copper	17/17	1.3	0504-0033	9.4	0505-0000
Iron	17/17	2,690	0504-0028	11,200	0504-0005
Lead	17/17	1.6	0504-0028	20.4	0505-0000
Magnesium	17/17	2,290	0505-0005	8,890	0504-0028
Manganese	17/17	24.2	0504-0028	277	0505-0000
Mercury	0/17	-	-	-	-
Nickel	16/17	4.2	0504-0033	10.4	0504-0005
Potassium	17/17	708	0504-0028	2,570	0505-0015
Selenium	0/17	-	-	-	-
Silver	0/17	-	-	-	-
Sodium	0/17	-	-	-	-
Thallium	1/17	0.13	0504-0010	0.13	0506-0010
Vanadium	17/17	9.5	0505-0010	21.6	0505-0000
Zinc	17/17	6.8	0504-0033	26.6	0504-0005

7.4 SWMU-SPECIFIC DATA ASSESSMENT

An assessment of the Oil/Water Separator No. 121 (SWMU 5) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

7.4.1 Sampling Issues

Target VOCs and SVOCs were reported as nondetect in the samples collected from the 33-foot depth. Only toluene, bis(2-ethylhexyl) phthalate, and common laboratory contaminants were detected in borings from the surface to 28 feet below ground surface (bgs). TRPH was detected in the 5-foot bgs to 20-foot bgs samples from boring 0504. TRPH was not detected in the 28- and 33-foot bgs samples.

7.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). A detailed review of SWMU 5 data is provided in the QCSR.

For the organic analyses, qualification of data was not required based on outlying accuracy parameters. The MS recoveries for antimony, selenium, and thallium and MS/MSD recoveries for TRPH were below evaluation criteria, and the MS recovery was above evaluation criteria for manganese. Antimony, selenium, and thallium data for all of the SWMU 5 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected manganese results were qualified as estimated **J** for the SWMU 5 samples to indicate a potential high bias. TRPH data for samples CAN005-056-0000, CAN005-0056-0005, CAN005-0056-0010, CAN005-0056-0015, CAN005-0050-0020, and CAN005-0056-0561 were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias.

Precision parameters were within evaluation criteria except for the matrix duplicate analysis of lead. Lead data for samples CAN005-056-0000, CAN005-0056-0005, CAN005-0056-0010, CAN005-0056-0015, CAN005-0050-0020, and CAN005-0056-0561 were qualified as estimated **J** (detects) or **UJ** (nondetects) based on the outlying precision parameters. Data were qualified as nondetect **U** for methylene chloride (a common laboratory contaminant)

based on blank contamination for samples CAN005-0056-0000, CAN005-0056-0010, CAN005-0056-0015, CAN005-0056-0020 and CAN005-0056-0005.

7.4.3 Reporting Limits

Reporting limits were raised for several metal analyses. In no cases were the RLs elevated more than 10 times the nominal reporting limit. For selenium and thallium, reporting limits were raised due to either matrix interference or dilutions. Selenium and thallium data, which had elevated reporting limits based on the matrix interferences, were qualified estimated **J** (detects) or **UJ** (nondetects). Calcium and lead analyses for several samples required dilutions which raised the reporting limits due to concentrations above the calibration range.

7.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 5 were determined to meet quality criteria. The elevated reporting limits were evaluated and judged not to impact the data usability because the RLs were below the RBCs. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of the contamination and to use the data for the human health risk screening.

7.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas southwest and north of the location of the oil/water separator (Figure 7-2). The borings were located close to the previous investigation boring locations. The borings assessed the presence of contamination to the 34.5-foot depth, 25 feet deeper than the previous investigation borings.

The surface sample from boring 0504 had a reported concentration of toluene at 1.2 μg/kg (Figure 7-3 and Table 7-3). Toluene was found at depth intervals of 5 and 15 feet in boring 0504 and at 10 feet in boring 0505 at concentrations of 3.2 μg/kg, 2.6 μg/kg, and 2.5 μg/kg, respectively (Figure 7-3 and Table 7-3). No other VOC compounds were reported for any of the samples collected at the SWMU. The surface samples from all three borings contained reportable concentrations of TRPH. The surface sample from borings 0506 and 0504 showed the highest (507 mg/kg) and lowest (185 mg/kg) concentrations of TRPH,

respectively. TRPH was detected in subsurface samples only in boring 0504 at depths of 5, 10, 15 and 20 feet and in concentrations of 87.7 mg/kg, 131 mg/kg, 170 mg/kg, and 209 mg/kg, respectively. TRPH was not detected at depths of 28 and 33 feet.

The extent of site soil contamination, as shown on Figure 7-3, is confined mainly to near-surface soils. The only VOC detected, toluene, was present in low concentrations that decrease slightly with depth. Only one SVOC, bis(2-ethylhexyl) phthalate, was detected at low concentrations.

Metals that exceeded UTLs and background concentrations are shown next to the sample interval where they were detected on Figure 7-3. A discussion of these metal detections is provided in Section 7.6.

7.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals of potential concern were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 7-4 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, lead, thallium, vanadium, and zinc did not exceed background levels; therefore, these metals were not retained for further evaluation as chemicals of concern. Manganese and nickel exceeded background levels and were retained for further evaluation as chemicals of concern in soil. A brief discussion of the background comparison interpretations is given below.

One of 18 soil samples contained aluminum at a concentration 14,300 mg/kg exceeded the background UTL of 10,540 mg/kg. However, this concentration only slightly exceeded the maximum detected concentration of the Basewide background range and was well below the literature value for aluminum in the region (50,000 mg/kg). Therefore, aluminum was considered to be within background levels at SWMU 3 and was not evaluated further.

One of 18 samples contained barium at a concentration of 1,170 mg/kg which exceeded the background UTL of 642 mg/kg. However, this concentration was within the range of detected Basewide background concentrations. Additionally, the barium concentration was detected in an otherwise uncontaminated sample at a depth of 15 feet bgs, and concentrations in shallower samples from the same boring were not elevated. Finally, since barium has been shown to substitute for calcium, it is believed that the barium is a naturally occurring constituent of the caliche (Klein and Hurlbut 1985). Therefore, barium was not considered to exceed background levels and was not evaluated further.

The maximum detected concentrations of cobalt (4.6 mg/kg) and zinc (26.6 mg/kg) exceeded the background UTLs, 4.5 mg/kg and 21.9 mg/kg, respectively. However, these maximum detected concentrations for cobalt and zinc were within the range of detected Basewide background concentrations. Additionally, the concentrations were consistent with published regional values. Therefore, cobalt and zinc were not considered to exceed background levels and were not evaluated further.

7.7 RISK EVALUATION

7.7.1 Site Conceptual Exposure Model

There are three potentially complete exposure pathways at SWMU 5:

- Direct contact with soil
- Inhalation of airborne emissions from soil
- Domestic use of groundwater on the Base or at the Base boundary

Potential receptors at the SWMU include Base workers (e.g., military and Base personnel), Base contractors, hypothetical future construction workers, occasional Base visitors (e.g.,

families of military personnel, visitors at those sites without restricted access), and residential receptors at the Base boundary downgradient of the SWMU who may use the groundwater. A complete discussion of potentially complete exposure pathways and potential receptors is presented in Section 3.4. and Figure 3-3.

7.7.2 Comparison of Concentrations in Soil to RBCs

Table 7-3 shows a summary of chemicals detected in soil samples at SWMU 5. Maximum detected soil concentrations of organic compounds and metals which exceeded background levels (Section 7.6) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether or not a significant release (i.e., that could pose a risk to human health) has occurred at SWMU 5. Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is given in Section 3.4 and Appendix D.

Table 7-5 shows that no organic compounds were detected at concentrations which exceed the residential soil RBCs. Additionally, metals which exceeded background levels did not exceed the soil RBCs. Therefore, no chemicals were detected at concentrations which are likely to pose a human health risk.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be BTEX and other potentially hazardous constituents (such as benzene, toluene, naphthalene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU.

At SWMU 5, TRPH was detected at a maximum concentration of 507 mg/kg which exceeds the State of New Mexico's TRPH action level of 100 mg/kg in soil. However, of the potentially hazardous constituents of TRPH, only toluene was detected and at a very low concentration (3.2. μg/kg). The toluene concentration is well below the RBC for residential soil (see Table 7-5), and it is not likely that other TRPH constituents would contribute significantly to risks at the site.

7.7.3 Evaluation of the Groundwater Pathway

The vertical distribution of the soil contamination was used to evaluate whether or not chemical releases pose a threat to groundwater. Two of the three borings had TRPH detected only in the surface soil indicating that the TRPH is not infiltrating and being transported to the groundwater. Additionally, TRPH was not detected in the two deepest samples collected at 28 and 33 feet bgs. The area where OWS 121 was located is currently covered with asphalt pavement, so future infiltration and vertical transport will be limited.

Since the TRPH concentrations in subsurface soil are low (209 mg/kg maximum), the area is paved (which will limit infiltration), and hazardous constituents of TRPH are not present at significant concentrations, it is unlikely that contamination detected at the site poses a threat to the groundwater. Also, the source of contamination has been removed, and there is no continuing release of contaminants.

7.7.4 Conclusions

The results of the soil investigation at SWMU 5 show no evidence that chemical release has occurred at this SWMU which would pose an unacceptable health risk for any potential exposure pathway. It was concluded (based on the low levels of hazardous contaminants and the low likelihood that infiltration beneath the parking lot pavement will transport contaminants to groundwater at a depth of 240 feet to 280 feet) that no further evaluation of this SWMU is warranted.

7.8 SUMMARY AND RECOMMENDATIONS

Seventeen soil samples were collected and analyzed from the three 20-foot-deep and one 34.5-foot-deep soil borings drilled at SWMU 5. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Four organic compounds and two metals were reported to be detected in the site soil samples.

The highest concentration of contaminants were detected in near-surface or shallow subsurface soils at the SWMU. The concentrations were low and did not increase with depth. The vertical distribution of contaminants has been adequately defined and potential impact to

groundwater is considered low. Since none of the detected chemicals exceeded RBCs, it is recommended that no further investigation of this SWMU is necessary.

TABLE 7-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
OIL/WATER SEPARATOR NO. 121 (SWMU NO. 5)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 00504	0 - 2	CAN005-0504-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN005-0504-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN005-0504-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN005-0504-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN005-0504-6015	MS/MSD	Soil	X	X	X	X	2	1
	18 - 20	CAN005-0504-0020		Soil	X	X	X	X	2	1
Boring 00504A	28 - 29	CAN005-0504-0028		Soil	X	X	X	X	2	1
	33 - 34.5	CAN005-0504-0033		Soil	X	X	X	X	2	1
Boring 00505	0 - 2	CAN005-0505-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN005-0505-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN005-0505-0010		Soil	X	X	X	X	2	1
	8 - 10	CAN005-0505-0562	FD	Soil	X	X	X	X	2	1
	13 - 15	CAN005-0505-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN005-0505-0502	MRD	Soil	X	X	X	X	2	1
	18 - 20	CAN005-0505-0020		Soil	X	X	X	X	2	1
Boring 00506	0 - 2	CAN005-0506-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN005-0506-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN005-0506-0010		Soil	X	X	X	X	2	1
	8 - 10	CAN005-0506-0561	FD	Soil	X	X	X	X	2	1
	13 - 15	CAN005-0506-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN005-0506-0501	MRD	Soil	X	X	X	X	2	1
	18 - 20	CAN005-0506-0020		Soil	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 7-1 for locations of the borings.

TABLE 7-2

FIELD SCREENING DATA
PHASE II RFI
OIL/WATER SEPARATOR NO. 121 (SWMU NO. 5)

Boring/Sample Number	Date	Time Collected (hrs)	Time of Field Screening	Sample Depth	Field Screening Concentrations (ppm)
CAN005-0504	12/11/94	1343	*	2.0	ND
		1350	*	5.0	ND
		1357	*	10.0	ND
		1410	*	15.0	ND
		1433	*	20.0	ND
CAN005-0504A	10/24/95	1116	*	4.0	ND
		1124	*	9.0	ND
		1130	*	14.0	ND
		1139	*	19.0	ND
		1215	*	28.0 - 29.0	ND
		1235	*	33.0 - 34.5	ND
CAN005-0505	12/11/94	1215	*	2.0	ND
		1235	*	5.0	ND
		1250	*	10.0	ND
		1258	*	15.0	ND
		1320	*	20.0	ND
CAN005-0506	12/11/94	0930	*	2.0	ND
		0948	*	5.0	ND
		1010	*	10.0	ND
		1028	*	15.0	ND
		1042	*	20.0	ND

* Exact time unknown; indicates 1/2 hour after sample collection.
ND = Nondetect

TABLE 7-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 005
CANNON AFB

LOCATOR	CAN005-0504-0000			CAN005-0504-0005			CAN005-0504-0010			CAN005-0504-0015			CAN005-0504-6015[1]			CAN005-0504-0020		
LAB SAMPLE NUMBER	0397760006SA			0397760007SA			0397760008SA			0397760009SA			0397760011SA			0397760010SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	13	11		7.7	12	J	6.8	11	J	<	11	U	9.7	11	J	<	11	U
Methylene chloride	3.1	5.7	J	3.2	5.8	J	3.1	5.7	J	3.1	5.7	J	1.3	5.7	J	3.3	5.7	J
Toluene	1.2	5.7	J	3.2	5.8	J	<	5.7	U	2.6	5.7	J	<	5.7	U	<	5.7	U
Semivolatile Organics (ug/kg)																		
bis(2-Ethylhexyl)phthalate	<	370	U	<	380	U	<	380	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)																		
Aluminum	6310	11.3		14300	11.6		7810	11.4		5760	11.3		4350	11.3		7830	11.4	
Arsenic	2.2	0.57		2.7	0.58		2.2	0.57		2.1	0.57		2.3	0.57		1.4	0.57	
Barium	142	1.1		95.8	1.2		360	1.1		222	1.1		152	1.1		231	1.1	
Beryllium	0.41	0.23		0.62	0.23		0.57	0.23		0.45	0.23		0.37	0.23		0.33	0.23	
Calcium	66600	22.6		37700	23.2		94900	22.8		71100	22.6		69400	22.6		111000	22.8	
Chromium	6	1.1		11.4	1.2		5.7	1.1		4.8	1.1		6.3	1.1		5.4	1.1	
Cobalt	3.1	1.1		4.3	1.2		3.4	1.1		3.1	1.1		2.9	1.1		2.4	1.1	
Copper	6.2	2.3		8.4	2.3		5.4	2.3		4.2	2.3		4.4	2.3		2.6	2.3	
Iron	6880	11.3		11200	11.6		6410	11.4		5530	11.3		5400	11.3		5290	11.4	
Lead	11.7	5.7		8.9	0.58		8.3	5.7		8.9	2.8		9.8	1.1		3.4	0.57	
Magnesium	3280	22.6		2630	23.2		3110	22.8		3160	22.6		2850	22.6		6000	22.8	
Manganese	109	1.1	J	171	1.2	J	93.1	1.1	J	99.9	1.1	J	93.7	1.1	J	39.3	1.1	
Nickel	5.8	4.5		10.4	4.6		6.4	4.6		5.4	4.5		7.9	4.5		<	4.6	U
Potassium	1190	566		2420	580		1730	571		1560	565		1270	565		1670	569	
Thallium	<	0.57	UJ	<	0.58	UJ	<	1.1	U	<	0.57	UJ	<	0.57	UJ	<	1.1	UJ
Vanadium	17	1.1		21.2	1.2		17.4	1.1		11.9	1.1		13.9	1.1		14.5	1.1	
Zinc	15.9	2.3		26.6	2.3		16.2	2.3		13.7	2.3		12	2.3		12.3	2.3	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	185	45.3		87.7	46.4		131	45.7		170	45.2		197	45.2		209	45.5	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] MS/MSD for the preceeding sample number.

TABLE 7-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 005
CANNON AFB

LOCATOR	CAN005-0504-0028			CAN005-0504-0033			CAN005-0505-0005			CAN005-0505-0010			CAN005-0505-0562[2]			CAN005-0505-0015			CAN005-0505-0020		
LAB SAMPLE NUMBER	0453690010SA			0453690011SA			0397760013SA			0397760014SA			0397760017SA			0397760015SA			0397760016SA		
COLLECT DATE	10/24/95			10/24/95			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qua	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	<	11	U	<	11	U	3.7	11	J	4.7	11	J	<	11	U	5.2	11	J	5.4	11	J
Methylene chloride	<	5.7	U	<	5.5	U	2.9	5.7	J	2.6	5.5	J	2.7	5.5	J	3	5.7	J	3.1	5.7	J
Toluene	<	5.7	U	<	5.5	U	<	5.7	U	2.5	5.5	J	<	5.5	U	<	5.7	U	<	5.7	U
Semivolatile Organics (ug/kg)																					
bis(2-Ethylhexyl)phthalate	400	380		<	360	U	<	390	U	<	360	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)																					
Aluminum	4130	22.8		4630	10.9		3960	22.6		8770	22.1		9980	22.2		10600	11.3		6400	22.8	
Arsenic	0.95	0.57		0.69	0.55		2.5	0.57		1.8	0.55		1.6	0.55		1.2	0.57		2	0.57	
Barium	84	2.3	J	25.5	1.1	J	129	2.3		451	2.2		694	2.2		156	1.1		468	2.3	
Beryllium	<	0.46	U	0.23	0.22		0.29	0.45	J	0.62	0.44		0.49	0.44		0.67	0.23		<	0.46	U
Calcium	139000	45.6		18600	21.9		133000	45.2		118000	44.2		155000	44.3		77100	22.6		191000	45.5	
Chromium	8.6	2.3		3.8	1.1		3.6	2.3		2.7	2.2		4.2	2.2		7.3	1.1		4	2.3	
Cobalt	1.8	2.3	J	1.4	1.1		2.8	2.3		2.6	2.2		2.1	2.2	J	3.5	1.1		1.5	2.3	J
Copper	1.5	4.6	J	1.3	2.2	J	5.5	4.5		3.5	4.4	J	3.8	4.4	J	4.6	2.3		3.4	4.6	J
Iron	2690	22.8		3860	10.9		4940	22.6		5240	22.1		5900	22.2		8000	11.3		4240	22.8	
Lead	1.6	0.57		2.2	0.55		4.3	0.57		5.3	0.55		6	0.55		6.1	1.1		2.3	0.57	
Magnesium	8890	45.6		3770	21.9		2290	45.2		3200	44.2		3770	44.3		4720	22.6		5810	45.5	
Manganese	24.2	2.3		29.3	1.1		57.4	2.3	J	98.8	2.2	J	98.9	2.2		110	1.1	J	32.8	2.3	J
Nickel	7.4	9.1	J	4.2	4.4	J	8.1	9	J	5.5	8.8	J	5	8.9	J	7.8	4.5		5.5	9.1	J
Potassium	708	1140	J	1170	546		992	1130	J	1590	1100		1670	1110		2570	565		1270	1140	
Thallium	10.2	2.3		10.3	1.1		<	1.1	U	<	2.2	U	<	5.5	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	7.2	4.6		6.8	2.2		13.5	2.3		9.5	2.2		12	2.2		20.1	1.1		9.9	2.3	
Zinc							11.3	4.5		15.3	4.4		16.3	4.4		20.6	2.3		10.7	4.6	
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	45.6	U	<	43.7	U	<	45.2	U	<	44.2	U	<	44.3	U	<	45.2	U	<	45.5	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[2] Duplicate sample for the preceeding sample number.

TABLE 7-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 005 CANNON AFB

LOCATOR	CAN005-0506-0000			CAN005-0506-0005			CAN005-0506-0010			CAN005-0506-0561[2]			CAN005-0506-0015			CAN005-0506-0020		
LAB SAMPLE NUMBER	0397740001SA			0397740002SA			0397740003SA			0397740006SA			0397740004SA			0397740005SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	<	11	U	<	10	U	<	11	U	<	11	U
Methylene chloride	1.8	5.6	UJ	2.7	5.6	UJ	1.8	5.7	UJ	<	5.1	U	1.7	5.7	J	<	5.6	U
Toluene	<	5.6	U	<	5.6	U	<	5.7	U	<	5.1	U	<	5.7	U	<	5.6	U
Semivolatile Organics (ug/kg)																		
bis(2-Ethylhexyl)phthalate	<	370	U	<	370	U	<	380	U	<	340	U	<	370	U	<	370	U
Metals (mg/kg)																		
Aluminum	5920	22.6		7530	22.5		6230	11.4		9090	10.2		6960	22.7		9270	11.2	
Arsenic	2.6	0.56		2.5	0.56		2.2	0.57		2.2	0.51		1.9	0.57		0.96	0.56	
Barium	528	2.3		143	2.3		305	1.1		196	1		1170	2.3		123	1.1	
Beryllium	<	0.45	U	0.4	0.45	J	0.51	0.23		0.51	0.2		0.32	0.45	J	0.5	0.22	
Calcium	197000	45.2		135000	45		86400	22.8		79500	20.5		217000	45.4		55100	22.3	
Chromium	4	2.3		5.4	2.3		5.3	1.1		6.6	1		6.3	2.3		6.3	1.1	
Cobalt	1.7	2.3	J	3	2.3		3.4	1.1		3.2	1		2.9	2.3		2.7	1.1	
Copper	3.9	4.5	J	6.8	4.5		4.6	2.3		4.5	2		3.6	4.5	J	3.9	2.2	
Iron	3940	22.6		6880	22.5		5990	11.4		6990	10.2		4640	22.7		7140	11.2	
Lead	4.3	0.56		5.2	0.56		5.4	0.57	J	5.5	0.51	J	3.4	0.57	J	2.7	0.56	
Magnesium	5380	45.2	J	2770	45	J	3010	22.8	J	3200	20.5	J	4690	45.4		3860	22.3	J
Manganese	57.6	2.3		102	2.3		110	1.1		105	1		51.1	2.3		110	1.1	
Nickel	9.9	9		8.6	9	J	6.3	4.6		6.3	4.1		6.8	9.1	J	5.9	4.5	
Potassium	946	1130	J	1610	1130		1440	570		1740	512		1400	1140		2290	558	
Thallium	<	1.1	U	<	1.1	UJ	0.13	1.1	J	0.19	1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	11.9	2.3		15.7	2.3		18.9	1.1		17.8	1		13.9	2.3		16.9	1.1	
Zinc	10.8	4.5		16.3	4.5		14.7	2.3		17.7	2		12.4	4.5		19.2	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	507	45.2	J	<	45	UJ	<	45.6	UJ	<	41	UJ	<	45.4	UJ	<	44.6	UJ

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[2] Duplicate sample for the preceeding sample number.

TABLE 7-4

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1) AT SWMU 5, CANNON AFB

Oil/Water Separator No. 121

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations (2)	Upper Tolerance Limit (UTL) Background Concentration(3)	Reported Level in Clovis, NM Region (4)	Does Maximum Detected Exceed Background
CAN005-0504-0005	Aluminum	14,300	1,410 - 11,000	10,540	50,000	NO**
CAN005-0504-0005	Arsenic	2.7	0.67 - 28	15.5	6.5	NO
CAN005-0506-0015	Barium	1170	14.5 - 1200	642	500	NO**
CAN005-0505-0015	Beryllium	0.67	0.17 - 0.77	0.73	1-2	NO
CAN005-0504-0005	Chromium	11.4	4 - 15.4	12.5	30	NO
CAN005-0505-0000	Cobalt	4.6	0.85 - 5.3	4.5	3-7	NO**
CAN005-0505-0000	Copper	9.4	<2 - 18.4	*	20	NO
CAN005-0505-0000	Lead	20.4	1.1 - 46	25.8	15	NO
CAN005-0505-0000	Manganese	277	22.4 - 216	164	500	YES
CAN005-0504-0005	Nickel	10.4	1.3 - 9.8	9	15	YES
CAN005-0506-0010	Thallium	0.13	0.14 - 0.22	*	----	NO
CAN005-0505-0000	Vanadium	21.6	5.2 - 28.3	25.3	30-70	NO
CAN005-0504-0005	Zinc	26.6	<4.3 - 27.5	21.9	45	NO**

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and W-C 1994) and Walk, Haydel and Associates for the IRP (Walk Haydel and Associates 1990). Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM" (W-C 1993).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k = 2.02 for n=37.

(4) USGS 1984

* Data insufficient to calculate UTL of background concentration.

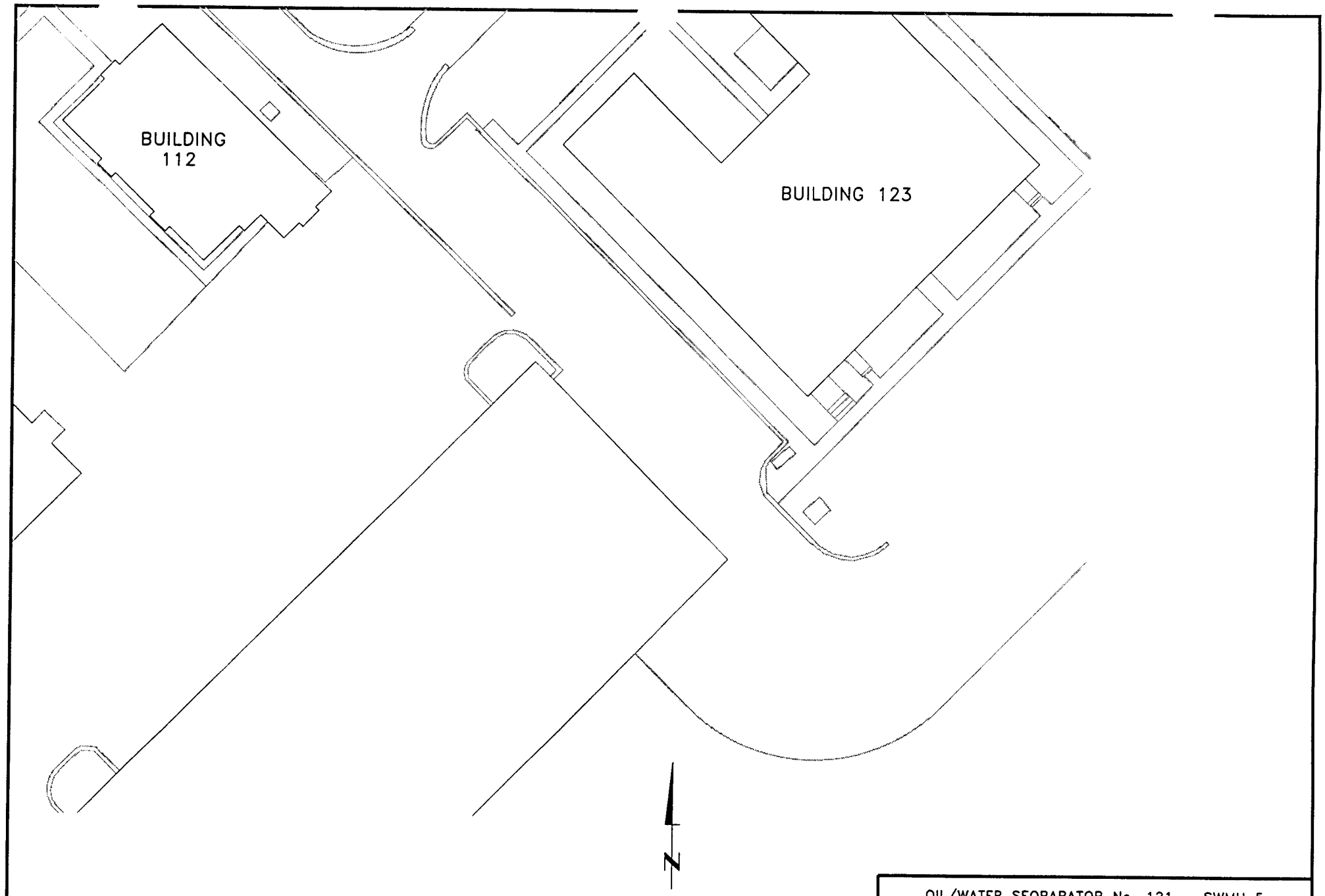
** Maximum concentration within or only slightly above Basewide background range and within naturally occurring levels (USGS 1984); therefore, is not considered to exceed background.

TABLE 7-5

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SWMU 5 TO RBCs FOR RESIDENTIAL SOIL

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?
Acetone	0.013	7,800	NO
Methylene Chloride	0.0033	85	NO
Toluene	0.0032	16,000	NO
Bis(2-ethylhexyl) phthalate	0.400	46	NO
Manganese	277	390	NO
Nickel	10.4	1600	NO

(1) EPA Region III Risk-Based Concentrations for Residential Soil (EPA 1994).



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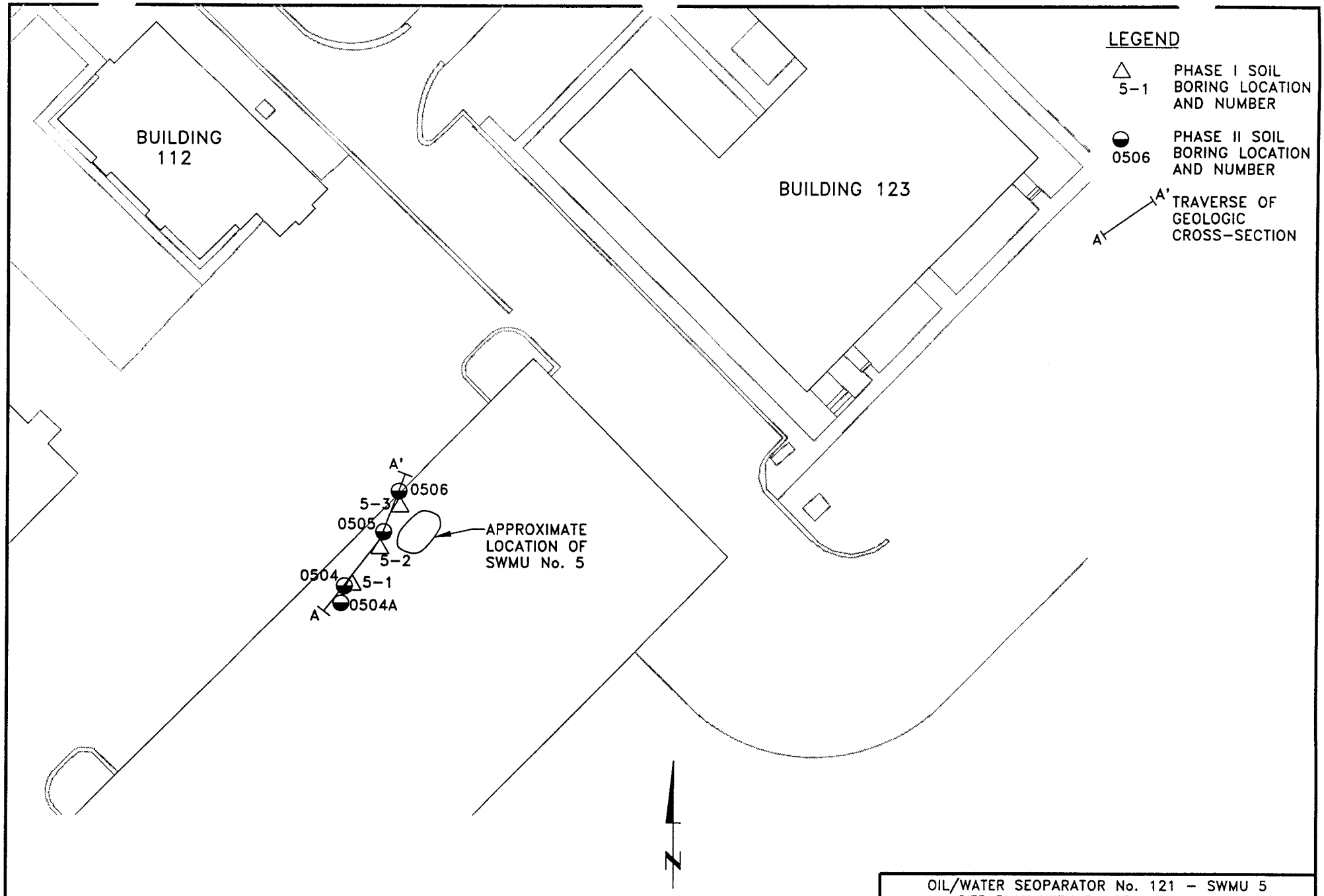
Drawing: T:\CANNON\C3M11MM\C3M11MM2.DWG (TSSM)
Xrefs: CAN-BASE.DWG

OIL/WATER SEOPARATOR No. 121 - SWMU 5
SITE PLAN
CANNON AIR FORCE BASE NEW MEXICO

DRN. BY: TSSM	DATE: 11/05/97	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	7-1



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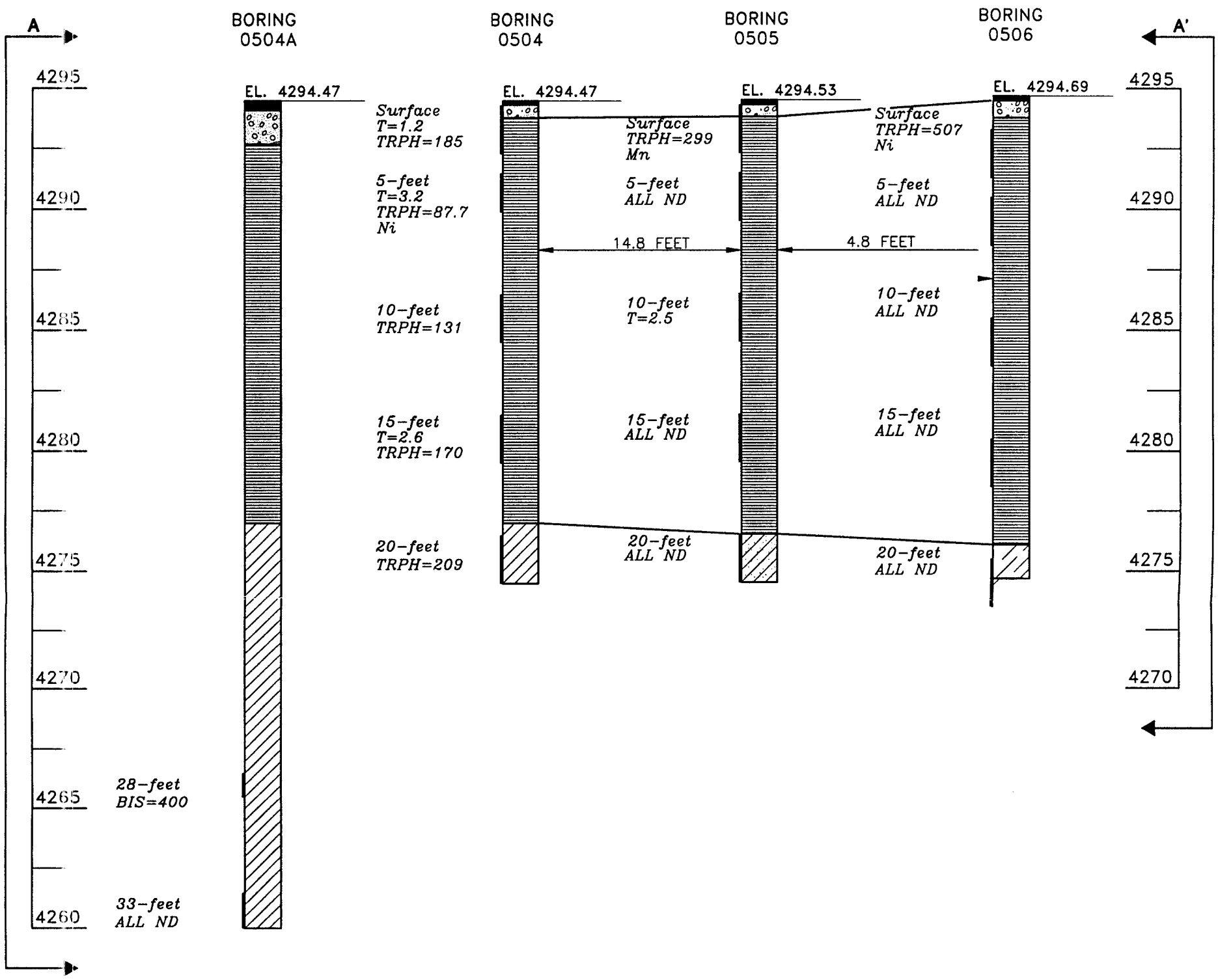
Xrefs: CAN-BASE.DWG

OIL/WATER SEOPARATOR No. 121 – SWMU 5
SITE PLAN WITH PHASE I & PHASE II
BORING LOCATIONS
CANNON AIR FORCE BASE NEW MEXICO

DRN. BY: TSSM	DATE: 11/05/97	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	7-2



SWMU-05 LEGEND

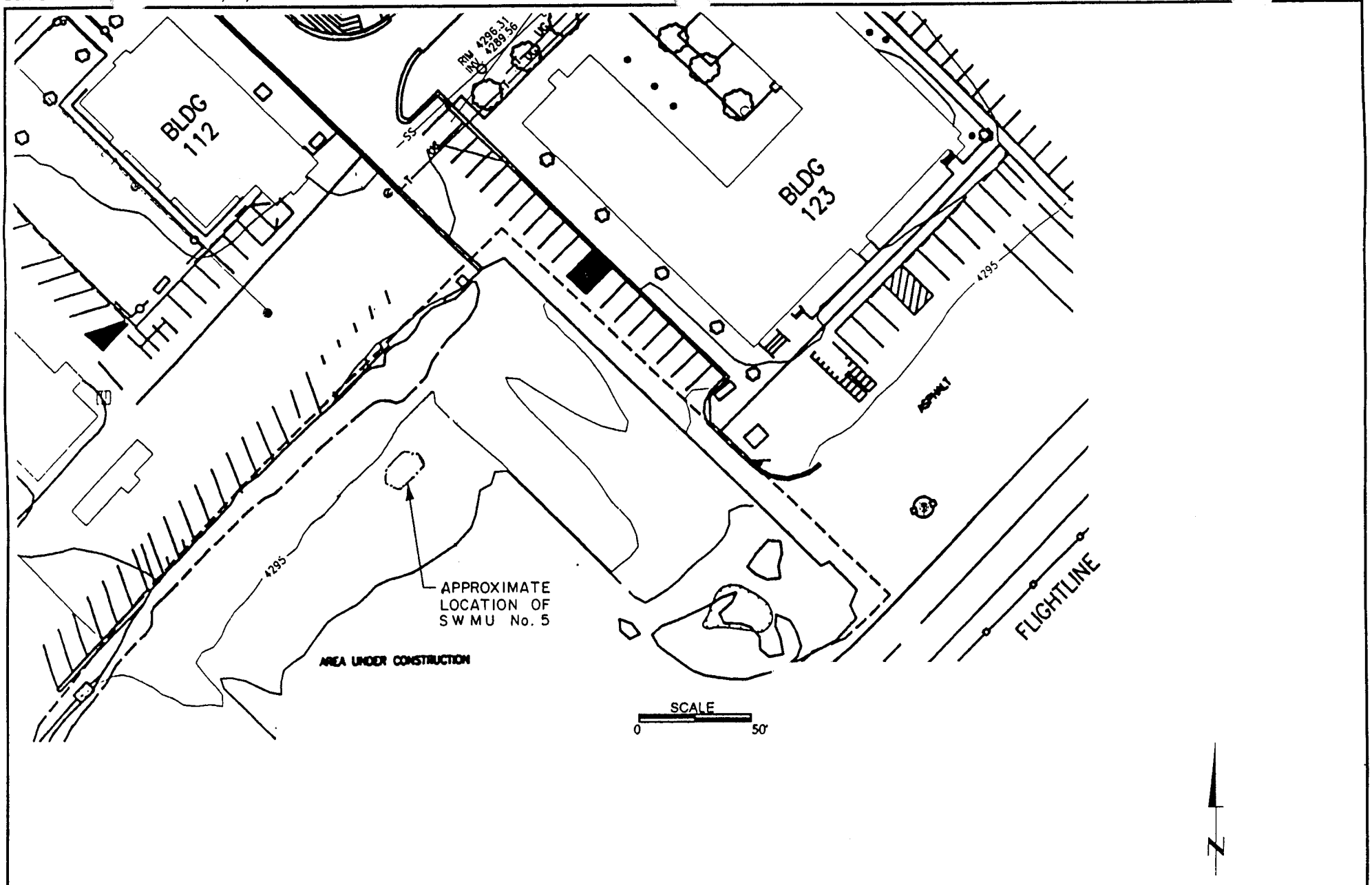
- ASPHALT
- SILTY CLAY (CL)(FILL)
- SANDY GRAVEL (GW)(FILL)
- SILT (ML)
- CLAYEY SILT (ML)
- SANDY SILT (ML)
- SAND (SP)
- SAMPLED INTERVAL

T=Toluene (μg/kg)
TRPH=Total Recoverable Petroleum Hydrocarbons (mg/kg)
BIS=(2-Ethylhexyl)phthalate (μg/Kg)
Mn
Ni
ND=Not Detected
Note: Only those metals that exceeded UTLs and background levels are listed.

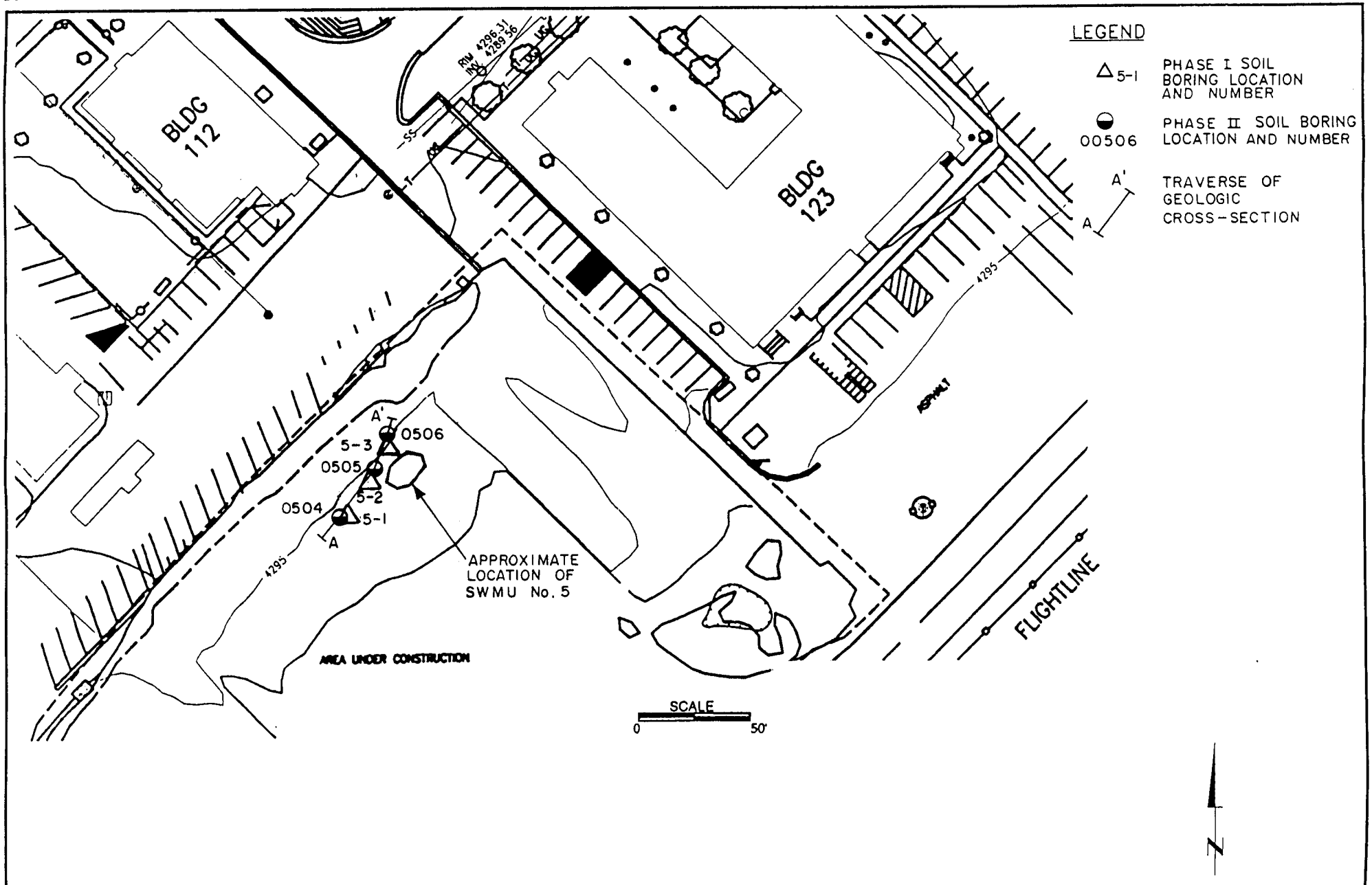
SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

November 11, 1997 8:35:09 a.m.
Drawing: T:\CANNON\C3M11MM\C3M11MM1.DWG (TSSM)

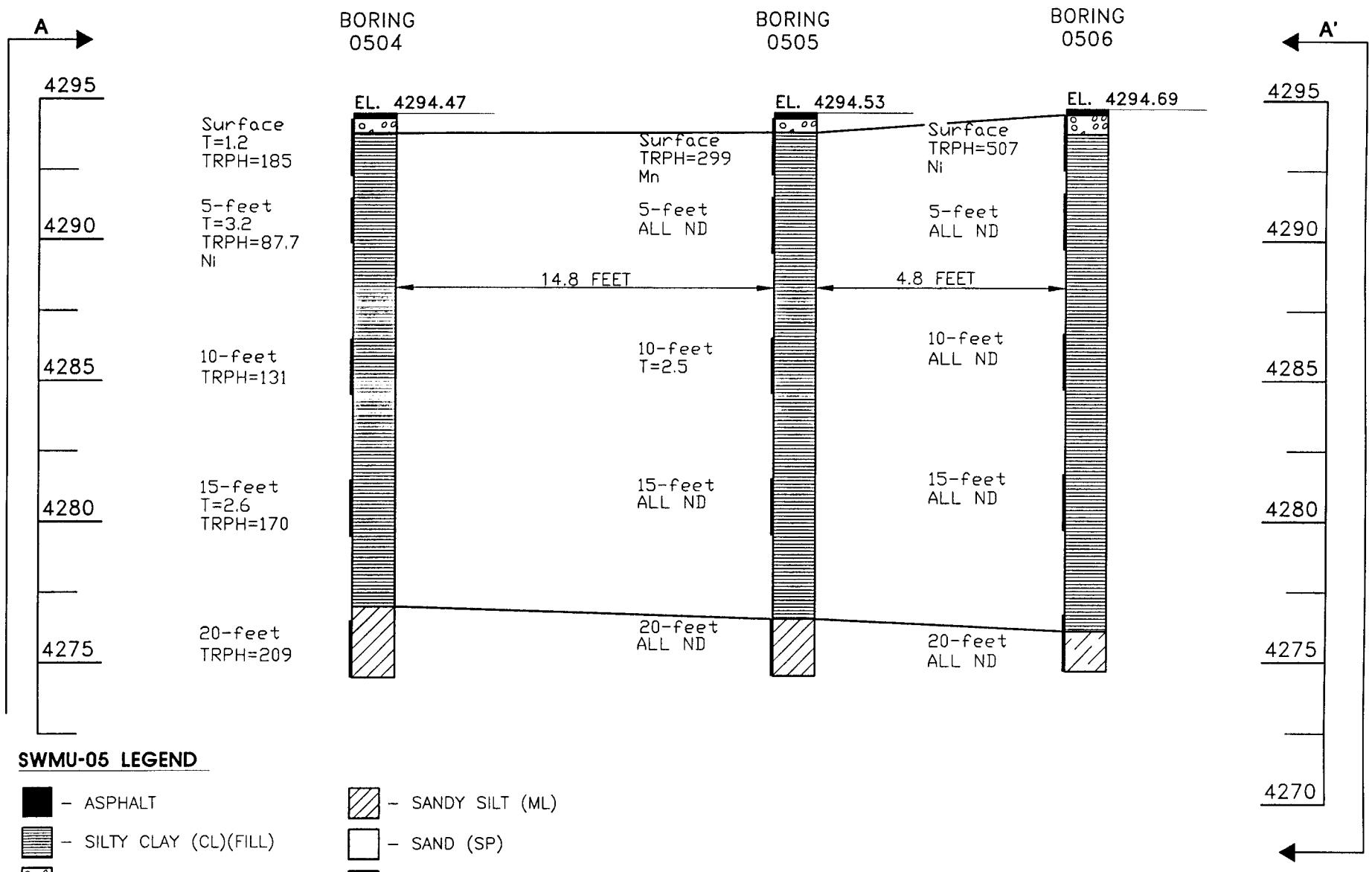
SWMU-05 – SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS CANNON AIR FORCE BASE NEW MEXICO			
DRN. BY: TSSM	DATE: 11/05/97	PROJECT NO. C3M11MM	FIG. NO. 7-3
CHK'D. BY:	REVISION: 0		



DRN BY: CJG	DATE: 06/16/94	OIL/WATER SEPARATOR No. 121 – SWMU 5 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY:	REVISION: 0		FIG. NO. 7-1



DRN BY: CJG	DATE: 06/16/94	OIL/WATER SEPARATOR No. 121 - SWMU 5 SITE PLAN WITH PHASE I & PHASE II BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY:	REVISION: 0		FIG. NO. 7-2



SWMU-05 LEGEND

- ASPHALT
- SILTY CLAY (CL)(FILL)
- SANDY GRAVEL (GW)(FILL)
- SILT (ML)
- CLAYEY SILT (ML)
- SANDY SILT (ML)
- SAND (SP)
- SAMPLED INTERVAL

T=Toluene (μg/kg)
TRPH=Total Recoverable Petroleum Hydrocarbons (mg/kg)
Mn
Ni
ND=Not Detected
Note: Only those metals that exceeded UTLs and background levels are listed.

SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

SWMU-05 – SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
CANNON AIR FORCE BASE NEW MEXICO

DRN BY: TBS	DATE: 03/17/95	PROJECT NO. C3M11MM	FIG. NO. 7-3
CHK'D BY:	REVISION: 0		

8.1 SITE BACKGROUND

8.1.1 Site Description

SWMU No. 16 was an oil/water separator located near the southwest corner of Building 680 (Figure 8-1). The separator was removed in 1991 during building renovations and was replaced with a unit located about 15 feet east of this SWMU. The site of the former separator is presently inside of a garage and is covered with concrete pavement. The former separator was constructed of concrete and consisted of a three-compartment underground unit with a skimmer, a 584-gallon main compartment, and a 140-gallon oil compartment. The bottom of the former unit is believed to have been between 7.5 and 12 feet below the ground surface.

8.1.2 Site History

As discussed in the site description, the separator was removed in 1991 during building renovations. SWMU No. 16 was active from 1965 until it was removed. The recovered oils were directed to the 140-gallon holding tank, and the wastewater was discharged to the sanitary sewer line (SWMU No. 98). Historically, the facility discharging into the separator was used for washing aircraft and for maintenance operations.

8.1.3 Current Use

The oil/water separator has been removed and is currently covered with concrete pavement.

8.1.4 Potential Contaminants

Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

8.1.5 Previous Investigations

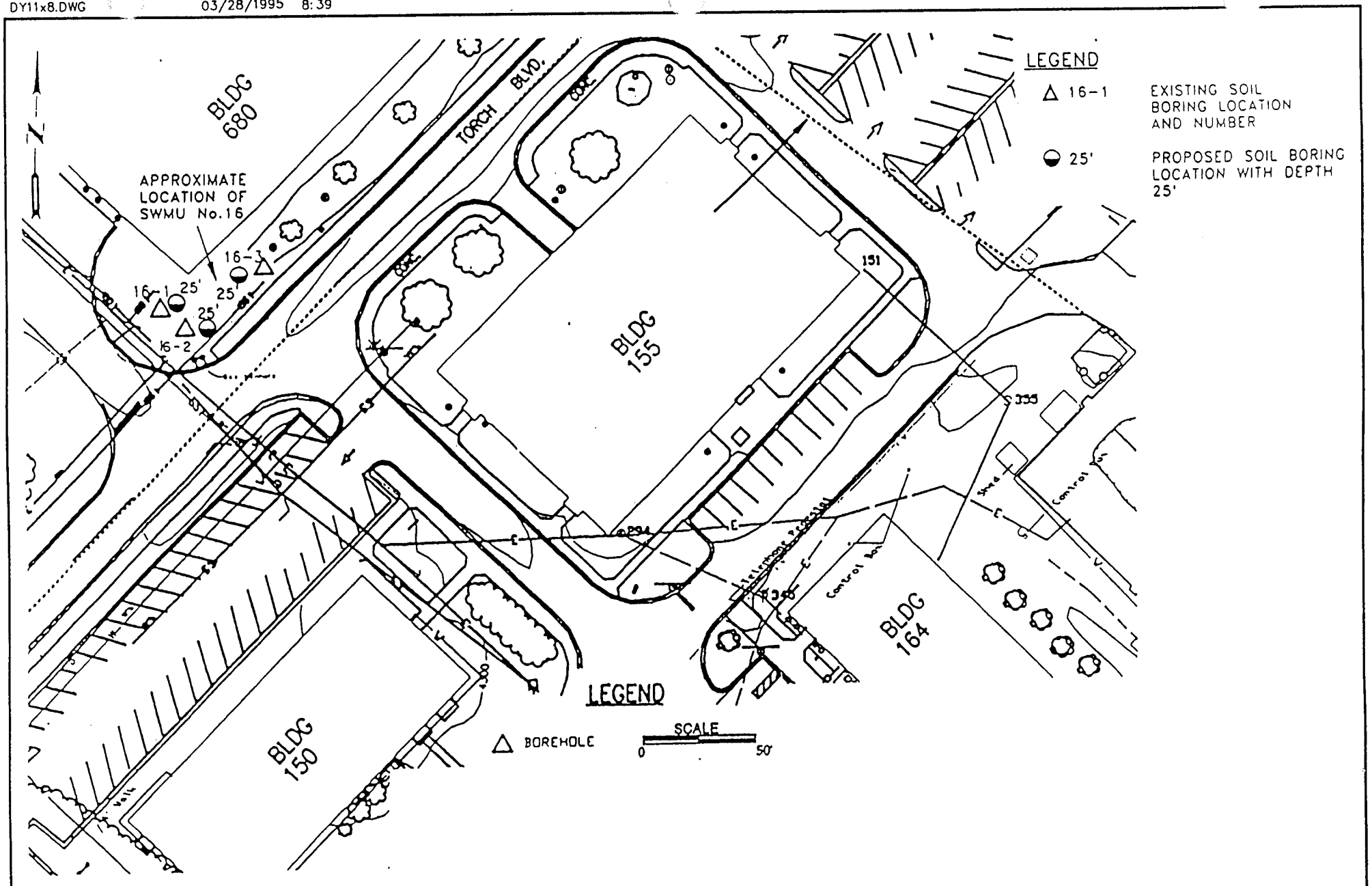
During the Phase I RFI, three soil borings were drilled and sampled to a depth of 10 feet bgs (LRL 1993) at the site of former Oil/Water Separator No. 680 to determine whether or not a release of SWMU-related chemicals had occurred from the separator. The previous boring locations are shown on Figure 8-2. Target analytes for the samples collected included TCL VOCs, priority metals, and BTEX. Nickel was detected marginally above background at 5 feet in all three borings. Lead was detected at low concentrations in Boring No. 16-3 at the surface. Mercury was detected at low concentrations in Boring No. 16-3 at 2.5 feet. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU.

8.1.6 Current Status of SWMU 16

Since the Phase I investigation, various construction activities at SWMU 16 have taken place. Apparently, the old oil/water separator has been removed and a new one has been constructed. A garage with a low overhead clearance has been built over the former location of the old oil/water separator. Also, the area contains numerous subsurface utilities in the general area planned to be drilled for the Phase II investigation. For these reasons, no drilling and soil sampling could be accomplished at SWMU 16 during the Phase II investigation. Concurrence was reached with the USACE project geologist on this matter.

8.2 SUMMARY AND RECOMMENDATIONS

No sampling activities could be completed for the Phase II RFI investigation at SWMU 16. Following consultation with the USACE Project Geologist and Cannon AFB, it was agreed that Cannon AFB personnel would inform USEPA regarding the inability to sample at this site.



DRN BY SCR	DATE 09/19/94	OIL/WATER SEPARATOR No. 680 – SWMU 16 SITE PLAN WITH EXISTING AND PROPOSED BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. C3MIIMM
CHK'D BY	REVISIONS: 0		FIG. No. 8-1

9.1 SITE BACKGROUND

9.1.1 Site Description

SWMU No. 48A was a 20,000-gallon underground storage tank located about 125 feet east of the intersection of Argentia Avenue and Torch Boulevard (Figure 9-1). The tank and associated piping were removed in 1988. The area is presently paved and used as a parking lot. The depth of the former tank is unknown.

9.1.2 Site History

As discussed in the site description, the tank and associated piping were removed in 1988. SWMU No. 48A was active from 1941 to 1985. Historically, the site was a gas station from 1941 to 1965. From 1965 to 1985, the tank was used to store waste products. The tank received waste oils, spent solvents, paint thinners, and recovered fuels. The products were removed periodically from the tank.

9.1.3 Current Use

The underground storage tank has been removed. The area is currently covered with asphalt pavement and is being used as a parking lot.

9.1.4 Potential Contaminants

Potential contaminants include waste oils, spent solvents, paint thinners, and recovered fuels.

9.1.5 Previous Investigations

During the Phase I RFI, three soil borings were drilled and sampled to a depth of 30 feet bgs (LRL 1993) at the site of the former underground storage tank to determine whether a release

of SWMU-related chemicals had occurred from the tank. The previous boring locations are shown on Figure 9-2. Target analytes for the samples collected included TCL VOCs, cyanide, TAL metals, and BTEX. Ethylbenzene, toluene, and xylene were detected in Boring No. 48A-2 at 10 and 20 feet. The concentration of xylene was 100 ppm at 20 feet. Metals were detected above background in surface samples and subsurface samples to 20 feet in all of the borings. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU (LRL 1993).

9.1.6 Phase II Sampling Objectives

The underground storage tank and associated piping at this site have been removed. The Phase I investigation sampled soils to 30 feet bgs. The Phase II investigation included three new soil borings to a depth of 40 feet bgs. Nine soil samples were collected for chemical analysis from the surface to the bottom of the boring. Chemical analysis included VOCs, SVOCs, TAL metals, and TRPH.

New data collected during the Phase II investigation were used to complete a screening-level risk evaluation and to characterize the vertical extent of soil contamination. The results of this evaluation were the basis for recommending either further evaluation or no further action.

The overall objective of sampling at the site of former underground storage tank was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the former tank which could pose a significant risk to human health or the environment. The analytical data collected from this investigation were used in a health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the former underground storage tank. Potential release points include spills at the surface that may have occurred during removal by pumping from the tank and leaks in either the tank or the associated underground piping.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

9.2 FIELD INVESTIGATION AND DATA COLLECTION

9.2.1 Soils Sampling

Three soil borings were drilled and soil samples collected in the area surrounding the presumed location of the former aboveground storage tank. Two of the borings (4804 and 4805) were drilled to a total depth of 39.5 feet, while the third boring (4806) was drilled to a total depth of 40 feet. Two of the borings, one at each end of the UST, were placed at the presumed location of the unit, while the third boring was placed about 20 feet to the northeast of the presumed north end of the former UST location. The third boring was relocated from its planned location due to overhead power line restrictions with the use of the drill rig. The boring locations were chosen to assess the presence and extent of site-related soil contaminants at the 40-foot depth interval (10 feet below the Phase I RFI soil borings). Phase II RFI boring numbers and sample descriptions are shown in Table 9-1 and on Figure 9-2.

Surface soil samples were collected from 0 to 0.5 feet in boring 4804, from 0.5 to 2.5 feet in boring 4805, and from 0 to 2.0 feet in boring 4806. All borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, 18 to 20 feet, 23 to 25 feet, 28 to 30 feet, 33 to 35 feet, and 38 to 40 feet (39.5 feet in borings 4804 and 4805) as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. The soil samples were screened, and the headspace information is shown in Table 9-2. Target analytes included:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

Since the site is currently covered by pavement, the surface sampling interval began immediately below the pavement surface.

9.2.2 Geologic Summary of Boring Logs

Logs from the three Phase II RFI borings show a subsurface lithology consisting of Ogallala Formation sediments in a fining upward sequence. All three borings have a 3-inch-thick asphalt pavement at the surface. Below the asphalt pavement is a 5- to 7-inch layer of sandy gravel fill placed as a foundation for the pavement. Silty clay (USCS symbol CL) was encountered below this layer in all borings to depths ranging from 8 to 13 feet. The silty clay is typically reddish-brown, red, or gray, low to medium plastic, stiff to very stiff, and moist. Some calcium carbonate and caliche cementation was present in isolated zones. A 0.5-foot layer of silty clay with some pebble and gravel is present from 4.5 to 5.0 feet in boring 4804. Silt (USCS symbol ML) was encountered below the silty clay layer in borings 4804 and 4806 to depths of 27.5 and 27 feet, respectively. The silt is light brown in boring 4804, gray in boring 4806, and is typically dry and hard with numerous calcium carbonate nodules and caliche cemented zones. The bottom 3.5 feet of the silt in boring 4804 contains some fine- to medium-grained quartz sand and is heavily cemented (caliche). Below the upper silty clay layer in boring 4805 is a red, moist, stiff, clayey silt (USCS symbol ML) layer to a depth of 17 feet. Below this layer, and below the silt in boring 4804, is a sandy silt (USCS symbol ML) to depths of 32 and 33 feet, respectively. Below the silt layer in boring 4806 and below the sandy silt layer in boring 4805 is a red or reddish brown, moist, very dense, very fine to fine-grained sand (USCS symbol SP) to the boring completion depths at 40 feet and 39.5 feet, respectively. Boring 4804 contained a silty sand (USCS symbol SP) below the sandy silt layer to the boring completion depth of 39.5 feet. The borings are shown in simplified stick-log format on Figure 9-3.

Borings 4804 and 4805 contained no visual or field screening indications of contamination. Boring 4806 had increasing field screening readings, up to a maximum of 125.7 ppm at a depth of 13.5 feet, beginning at a depth of 1 foot. Field screening readings then decreased below 13.5 feet to a depth of 28.5 feet, below which all field screening readings were nondetect. Strong petroleum odors were noted in this boring beginning at a depth of 3 feet and extending to a depth of at least 27 feet. The soils in the boring exhibited a gray color

from depths of 5 feet to about 24 feet, possibly indicating petroleum contamination, and black staining of unknown origin was noted at a depth of 23 feet.

Except for boring 04806, no field screening detections were observed (Table 9-2). The highest headspace observed in boring 04806 was 125.7 ppm at 15 feet of depth. The field screening concentrations decreased to nondetect at a depth of 90 feet.

9.2.3 Site Topography

The site is level with a thin asphalt pavement and is used as a parking lot. Building 192 is across Argentia Ave. about 100 feet to the southwest of the SWMU, "W" Street is about 50 feet north of the site, and a parking lot for Building 195 is about 50 feet southeast of the site.

9.3 CHEMICAL INVESTIGATION RESULTS

9.3.1 General

Soil samples were collected from three borings (4804 through 4806). Sampling and analyses performed are summarized in Table 9-1. A summary of the analytical results for these soil samples are provided in Table 9-3. For each sample type, the table provides results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

9.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN048-4804-0000, CAN048-4805-000, and CAN048-4806-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 9-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC reported in any of the surface samples was toluene at an estimated concentration of 1.3 μg/kg in sample CAN048-4806-0000. Only one SVOC, bis(2-ethylhexyl)phthalate, was detected in the surface samples at a concentration of 57 μg/kg in sample CAN048-4804-0000. TRPH was reported in all of the

near-surface samples at concentrations of 185 mg/kg (CAN048-4804-0000), 61.6 mg/kg (CAN048-4805-0000), and 56.2 mg/kg (CAN048-4806-0000).

9.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 9-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOCs reported were toluene, ethylbenzene, xylenes, and 2-butanone. Toluene was reported only in sample CAN048-4804-0005 at a concentration of 1.3 μg/kg. Ethylbenzene was reported in sample CAN048-4806-0020 at a concentration of 420 μg/kg. Total xylenes were reported in samples CAN048-4806-0020 and CAN048-4806-0025 at concentrations of 3,300 μg/kg and 69 μg/kg, respectively. 2-Butanone was reported in these last two samples at concentrations of 1,200 μg/kg and 140 μg/kg, respectively. Several SVOCs were reported in some of the subsurface samples. Most of these SVOCs are PAH compounds in the subsurface samples from boring 4806. Total PAH concentrations reported in samples CAN048-4806-0010, CAN048-4806-0015, CAN048-4806-0020 and CAN048-4806-0025 were 18,990 μg/kg, 9,050 μg/kg, 5,030 μg/kg, and 3,338 μg/kg, respectively. Other non-PAH compounds reported were:

- Acenaphthene - CAN048-4806-0015, 88 μg/kg (estimated)
- 4-Chloroaniline - CAN048-4806-0010, 7,900 μg/kg (estimated)
- Di-n-butyl phthalate - CAN048-4806-0010, 410 μg/kg (estimated)
- Dibenzofuran - CAN048-4806-0015, 220 μg/kg (estimated); and CAN048-4806-0025, 88 μg/kg
- 1,2-Dichlorobenzene - CAN048-4806-0010, 7,500 μg/kg; CAN048-4806-0015, 1,100 μg/kg (estimated); and CAN048-4806-0020, 220 μg/kg
- 1,3-Dichlorobenzene - CAN048-4806-0010, 700 μg/kg
- 1,4-Dichlorobenzene - CAN048-4806-0010, 1,800 μg/kg
- Phenol - CAN048-4806-0025, 38 μg/kg

TRPH was reported in several of the subsurface samples. Boring 4804 samples CAN048-4804-0005 and CAN048-4804-0010 had reported TRPH concentrations of 1,050 mg/kg

(estimated) and 81 mg/kg (estimated), respectively. None of the subsurface samples in boring 4805 had reported TRPH concentrations. Boring 4806 samples CAN048-4806-0005, CAN048-4806-0010, CAN048-4806-0015, CAN048-4806-0020, CAN048-4806-0025, and CAN048-4806-0030 had reported TRPH concentrations of 729 mg/kg, 17,300 mg/kg, 3,890 mg/kg, 2,080 mg/kg, 1,350 mg/kg, and 199 mg/kg, respectively.

9.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 9-1. The range of results for metals reported in these soil samples are summarized in Table 9-A.

TABLE 9-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	27/27	2,860	4806-0035	15,300	4805-0000
Antimony	2/27	5.5	4804-0000	14	4806-0020
Arsenic	27/27	0.57	4806-0040	3.4	4806-0010
Barium	27/27	23.1	4806-0040	2,390	4805-0025
Beryllium	15/27	0.13	4805-0035	0.71	4805-0000
Cadmium	0/27	-	-	-	-
Calcium	27/27	21,000	4805-0000	250,000	4804-0015
Chromium	25/27	2.3	4806-0040	13.8	4805-0000
Cobalt	25/27	0.82	4806-0035	5.9	4805-0000
Copper	25/27	0.94	4806-0040	14.5	4805-0025
Iron	27/27	1,980	4806-0015	13,300	4805-0000
Lead	27/27	1.4	4804-0030	25.7	4806-0005
Magnesium	27/27	1,930	4806-0035	17,700	4806-0025
Manganese	27/27	20.8	4806-0015	245	4805-0000
Mercury	0/27	-	-	-	-
Nickel	27/27	1.9	4806-0035	13.5	4805-0000
Potassium	27/27	448	4804-0015	3,110	4805-0020
Selenium	0/27	-	-	-	-
Silver	0/27	-	-	-	-
Sodium	0/27	-	-	-	-
Thallium	0/27	-	-	-	-
Vanadium	27/27	6.8	4806-0035	23.4	4805-0010
Zinc	27/27	5.5	4806-0020	33.1	4805-0000

9.4 DATA ASSESSMENT

An assessment of the Underground Storage Tank (SWMU 48A) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

9.4.1 Date Review Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

9.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). A detailed review of SWMU 48A data is provided in the QCSR.

For the organic analyses, qualification of data was required based on outlying internal standard areas, holding times, and surrogates. For samples CAN048-4806-0000 and CAN048-4806-0010, internal standard areas were reported below evaluation criteria. Analytes associated with the outlying internal standards were qualified estimated **J** (detects) or **UJ** (nondetects). The SVOC extraction holding times were outside of criteria (7 days) for sample CAN048-4806-0030 and for the reextraction of samples CAN048-4806-0010-RE and CAN048-4806-0015-RE. SVOC data for samples CAN048-4806-0030, CAN048-4806-0015-RE were qualified as estimated **J** (detects) or **UJ** (nondetects), and nondetect SVOC data for sample CAN048-4806-0010-RE were qualified as estimated nondetect **UJ**. The SVOC data were judged to be usable because SVOCs were not expected to be greatly affected by the exceedance of the holding times.

For the original analysis of sample CAN048-4806-0015, detected base/neutral SVOCs were qualified as estimated **J**, and nondetect base/neutral SVOCs were rejected **R** due to no

recovery of the surrogates. This rejected data does not limit the data usability because this sample was reanalyzed, and the reanalysis results are acceptable. Additionally, acetone, methylene chloride, and bis(2-ethylhexyl)phthalate were qualified as nondetect **U** for several samples based on blank contamination.

The MS recoveries for antimony, lead, selenium, and thallium and MS/MSD recoveries for TRPH were below evaluation criteria, and the MS recoveries were above evaluation criteria for beryllium and manganese. Antimony, selenium, and thallium data for all SWMU 48A samples and lead data for boring 4806 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. For samples CAN048-4804-0000, CAN048-4804-0005, CANO048-4804-0010, CAN048-4804-0015, CAN048-4804-0020, and CAN048-4804-0025, TRPH data were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias, and detected manganese results were qualified as estimated **J** to indicate a potential high bias. Detected beryllium data for boring 4805 samples and samples CAN048-4804-0030, CAN048-4804-0035, and CAN048-4804-0040 were qualified as estimated **J** to indicate a potential high bias.

Precision parameters were within evaluation criteria for the organic analyses. For the field duplicate samples CAN048-4806-0030 and CAN048-4806-4863, aluminum, barium, calcium, chromium, iron, vanadium, and zinc data were qualified as estimated **J** (detects) or **UJ** (nondetects) based on the outlying precision parameter. Calcium data for the field duplicate samples CAN048-4806-0000 and CAN048-4806-4862, and zinc data for field duplicate samples CAN048-4805-0010 and CAN048-4805-4861, were qualified as estimated **J** based on RPDs outlying evaluation criteria. The RPDs were also outlying evaluation criteria for TRPH and lead for the MS/MSD and MS/D samples. Associated data were qualified on the basis of MS/MSD recoveries; therefore, no further qualification of data was required.

9.4.3 Reporting Limits

Reporting limits were raised for several metal, VOC, SVOC, and TRPH analyses, but the RLs were not elevated by more than 10 times the nominal RL. For lead, selenium, and thallium analyses, reporting limits were raised due to either matrix interference or dilutions. Lead, selenium, and thallium data, which had elevated reporting limits based on the matrix interferences, were qualified estimated **J** (detects) or **UJ** (nondetects). Method 6010, arsenic,

TRPH, SVOC, and VOC analyses required dilutions which elevated the reporting limits due to target analyte concentrations above the calibration range.

For three VOC analyses and two TRPH analyses, reporting limits were elevated by more than 10 times the nominal RL. For the VOC analysis, samples CAN048-4806-0010, CAN048-4806-0015, and CAN048-4806-0020 were analyzed by the medium-level method which decreased sensitivity by factors of 500, 500, and 250, respectively. These samples were analyzed by the medium-level method due to concentrations of target and nontarget VOCs above the calibration range. For the TRPH analysis of samples CAN048-4806-0010 and CAN048-4806-0015, dilutions were required which raised the reporting limits by a factor of 25 due to concentrations above the calibration range.

9.4.4 Summary of Data Usability Limitations

The data generated may be limited due to elevated reporting limits or rejected data. The elevated RLs for the metals were compared to the RBCs and judged not to be a limitation to the use of the data for the human health risk screening. For VOC samples which had elevated reporting limits by a factor of 500 or 250, target VOCs were detected in the samples. However, the possibility exists that low level analytes may have been diluted to below the method detection limits; therefore, this was judged to be a limitation for the use of the data. For sample CAN048-4806-0015, base-neutral SVOCs were rejected based on the surrogate recoveries. This sample was reanalyzed, and the reanalysis results are acceptable. Therefore, the rejected data is not considered a limitation.

Overall, the data generated for SWMU 48A were determined to meet quality criteria. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of contamination and to be used for the human health risk screening.

9.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas at both ends and north of the former underground storage tank (Figure 9-2). The borings were located relatively close to the

previous investigation boring locations. The borings assessed the presence of contamination to the 40-foot depth, 10 feet deeper than the previous investigation borings.

The surface samples from borings 4804 and 4806 had reported concentrations of toluene at concentrations of 5.7 μg/kg and 1.3 μg/kg, respectively (Figure 9-3 and Table 9-3). Toluene was found at depth only in boring 4804 at 5 feet at a concentration of 1.3 μg/kg (Figure 9-3 and Table 9-3). The only other VOCs reported were ethylbenzene and total xylenes, all in boring 4806 subsurface samples. Ethylbenzene was reported at the 20-foot depth interval in a concentration of 420 μg/kg. Total xylenes were reported at the 20- and 25-foot depth intervals in concentrations of 3,300 μg/kg and 69 μg/kg, respectively. The VOC compound 2-butanone was also reported in these two samples at concentrations of 1,200 μg/kg and 140 μg/kg, respectively.

Several SVOCs were detected in the boring samples, mostly in the subsurface samples from boring 4806. The only SVOC reported in a surface sample was bis(2-ethylhexyl)phthalate in the surface sample from boring 4804 at a concentration of 57 μg/kg. This compound was also reported at the 25-foot depth in boring 4805 at a concentration of 120 μg/kg, and in boring 4806 at the 10- and 15-foot depth intervals at concentrations of 9,100 μg/kg and 3,300 μg/kg, respectively. However, bis(2-ethylhexyl)phthalate is a very common laboratory and field contaminant and these concentrations are probably not indicative of true site contamination. Several other SVOCs were detected in the subsurface samples from boring 4806. Total PAHs were detected at relatively high concentrations, decreasing with depth, at the 10-foot (18,990 μg/kg), 15-foot (9,050 μg/kg), 20-foot (5,030 μg/kg) and 25-foot (3,338 μg/kg) depth intervals. The site is capped with asphalt, but the majority of PAHs were detected at depth. Therefore, the source of the PAHs is considered to be site-related. Several non-PAH SVOCs were also detected in the subsurface samples from boring 4806 (Figure 9-3 and Table 9-3). These compounds included 4-chloroaniline, di-n-butylphthalate, dibenzofuran, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and phenol. Where these compounds were detected in multiple samples, the concentrations decreased with depth (Figure 9-3).

TRPH was detected in several of the boring samples, again mostly in the subsurface samples from boring 4806 (Figure 9-3 and Table 9-3). TRPH was reported in all three near-surface samples, ranging from a high of 185 mg/kg (boring 4804) to a low of 56.2 mg/kg (boring

4806). TRPH was also reported in the 5-foot (1,050 mg/kg) and 10-foot (81 mg/kg, estimated) samples from boring 4804. TRPH was detected in relatively high concentrations, decreasing with depth, in the subsurface samples to the 30-foot depth interval in boring 4806 (Figure 9-3). The highest concentration (17,300 mg/kg) occurred at the 10-foot interval, and concentrations decreased to 199 mg/kg at the 30-foot depth interval.

Metals that exceeded the UTLs and background concentrations are shown next to the sample interval where they were detected on Figure 9-3. A discussion of these metals detections is provided in Section 9.6.

The chemical results illustrated on Figure 9-3 show that although significant contamination was detected in some of the boring samples, the concentrations of contaminants decrease with depth. All samples below 15 feet in boring 4804, 25 feet in boring 4805, and 30 feet in boring 4806 showed no detectable concentrations of contaminants.

9.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals of potential concern were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 9-4 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, chromium, copper, lead, and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. Antimony, barium, cobalt, manganese, nickel, and zinc exceeded background levels and were retained for further

evaluation as chemicals of concern in soil. A brief discussion of the background comparison interpretation is given below.

Four of thirty-two soil samples contained aluminum at concentrations (11,900 to 15,300 mg/kg) which exceeded the background UTL of 10,540 mg/kg. These concentrations also exceeded the range of detected background concentrations for the Base. However, these concentrations are well below the regional value of 50,000 mg/kg. In addition, it is not likely that the UST which was used to store waste oil is a source of aluminum. Therefore, aluminum was not considered to exceed background and was not retained for further evaluation.

Two of thirty-two soil samples contained barium at concentrations (1,640 mg/kg and 2,390 mg/kg) which exceeded the background UTL of 642 mg/kg. These concentrations also exceeded the regional barium literature value (500 mg/kg) by as much as a factor greater than 4. These also exceeded the detected range of background concentrations. Even though barium has been shown to substitute for calcium in caliche (Klein and Hurlbutt 1985) and the high concentrations of barium may be naturally occurring, to be conservative, barium was considered to exceed background levels and was retained for further evaluation.

The maximum detected concentration of chromium (13.8 mg/kg) exceeded the background UTL of 12.5 mg/kg. However, the maximum concentration was within the range of detected background concentrations and was consistent with the literature values for chromium in the region (30 mg/kg). Therefore, chromium was considered to be within background levels and was not evaluated further.

A UTL for copper could not be calculated due to a large number of nondetects in the background data set; therefore, copper was compared to the background range and literature values. The maximum detected concentration of copper (14.5 mg/kg) was within the range of detected background concentrations and was consistent with the literature values for copper in the region (20 mg/kg). Therefore, copper was considered to be within background levels and was not retained for further evaluation.

9.7 RISK EVALUATION

9.7.1 Site Conceptual Exposure Model

There are three potentially complete exposure pathways at SWMU 48A: direct contact with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the Base or at the Base boundary. Potential receptors at the SWMU include Base workers (e.g., military and Base personnel, Base contractors, hypothetical future construction workers, occasional Base visitors) (e.g., families of military personnel, visitors at those sites without restricted access), and residential receptors at the Base boundary downgradient of the SWMU who may use the groundwater. A complete discussion of potentially complete exposure pathways and potential receptors is presented in Section 3.4 and Figure 3-4.

9.7.2 Comparison of Concentrations in Soil to RBCs

Table 9-3 shows a summary of chemicals detected in soil samples at SWMU 48A. Maximum detected soil concentrations of organic compounds and metals which exceeded background levels (Section 9.6) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether a significant release (i.e., that could pose a risk to human health) has occurred at SWMU 48A. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is presented in Section 3.4 and Appendix D.

Table 9-5 shows the comparison of the maximum detected SWMU concentrations with RBCs. None of the detected concentrations exceeded residential soil RBCs. The reporting limits for VOCs and SVOCs were significantly elevated for Boring 4806 in the 5-foot to 20-foot samples. The reporting limits were elevated as much as 500 times normal reporting limits due to high levels of target compounds (e.g., ethylbenzene, xylenes). The elevation may have caused other target compounds (e.g., PAHs) which may be present at low concentrations to be reported as nondetect. These compounds were not considered in the RBC comparison. Therefore, uncertainty exists regarding potential risks to hypothetical construction workers due to exposures to contaminants that may be present in the subsurface soil but that were reported as nondetect at the elevated reporting limits. However, detected concentrations do not pose

a risk even under a residential exposure scenario, and actual exposure to any chemicals of concern reported as nondetect due to elevated reporting limits would be minimal because of the small area involved (soil surrounding Boring 4806) and dilution with surrounding soil. Therefore, the average exposure would probably not show a risk. Additionally, construction workers have a short-term exposure potential and controls could be used to limit the exposure to the workers in the contaminated area. Because potential risks at this SWMU are minimal, no further investigation is recommended. However, it may be prudent to remove the contaminated soils.

The contract lab that analyzed the samples reported concentrations (**J**-qualified) at one-fifth the reporting limit. The highest reporting limit for SVOCs (i.e., PAHs) was 3.7 mg/kg (3,700 μg/kg). One-fifth of the level is 0.74 mg/kg. This concentration exceeds the residential RBCs for only the PAHs benzo(a)pyrene (0.088 mg/kg) and dibenzo(a,h)anthracene (0.088 mg/kg) and is below industrial RBCs for all PAHs. All of the PAHs (including benzo(a)pyrene and dibenzo(a,h)anthracene) would have been reported at estimated (**J**-qualified) concentrations had they been present in the samples at concentrations above 0.74 mg/kg (below industrial RBCs). Since this is below RBCs, the data show that the chemicals are not present at concentrations of concern. Further, only samples (from one boring) between 5 feet and 25 feet had elevated reporting limits. Only two samples had significant hits of TRPH (>100 mg/kg), so the potentially impacted area is quite limited in size. Since no contamination was detected in the 30-foot sample, there is no evidence of vertical transport to groundwater (at approximately 280 feet). Since no contamination was detected at the surface, no significant occupational or residential exposures are expected. Therefore, it can be concluded that the human health risk is minimal.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, toluene, naphthalene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU.

At SWMU 48A, TRPH was detected at a maximum concentration of 17,300 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Potentially toxic

constituents of the TRPH (e.g., ethylbenzene, toluene, and xylenes) were detected at low concentrations (see Table 9-5) which were well below the RBCs for residential soil. As stated earlier, several potentially toxic constituents of TRPH (e.g., PAHs) were reported as nondetect at elevated reporting limits at this SWMU. The elevated reporting limits may have caused these compounds to be reported as nondetect when they may be present at concentrations exceeding RBCs. Therefore, uncertainty exists regarding potential risks from contaminants detected at this SWMU, and further investigation may be warranted.

9.7.3 Evaluation of the Groundwater Pathway

The data from the soil borings indicate that a release has occurred at a depth of approximately 10 feet bgs. The presence of TRPH and fuel constituents and the lack of chemicals (e.g., solvents) that are not related to fuel indicate that the release consisted of fuel.

The vertical distribution of the soil contamination was used to evaluate whether the release poses a threat to groundwater. The soil data (SB4806) show that the release occurred around a depth of 10 feet and that the majority of the contamination is between 10 and 20 feet. Only TRPH was detected at 30 feet, and all of the fuel contamination is nondetect at 35 feet and below. The UST at this site was removed in 1988, so there is no longer a continuing source of contamination, and the soil data show that significant vertical transport has not occurred. In addition, the area where the UST was located is paved which limits infiltration and vertical transport. Therefore, it can be concluded that the potential for transport of contaminants in soil at this site to groundwater which is at a depth of 240 feet to 280 feet bgs is insignificant.

Finally, data from the investigation of the above ground storage tank (SWMU 48B) located next to this site demonstrate that the lateral extent of the soil contamination is limited. That is, results from SB4904 (approximately 15 feet east of SB4806) show that contamination is greatly reduced, and SB4903 (approximately 15 feet south of SB4806) was nondetect.

9.7.4 Conclusions

While no detected concentrations at this SWMU pose an unacceptable human health risk, the results of the soil investigation at SWMU 48A indicate that a significant release has occurred. Some uncertainty exists with regard to potential construction worker exposure to subsurface

soil; however, the contaminated area is confined to a small area of subsurface soils (boring 4806) and controls could be implemented to limit exposures to this soil during an excavation activity. Therefore, potential risks from this SWMU are minimal, but removal of the contaminated soil may be prudent.

9.8 SUMMARY AND RECOMMENDATIONS

Twenty-seven soil samples were collected and analyzed from the three 40-foot soil borings drilled at SWMU 48A. A screening level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Twenty-two organic compounds (five of them are PAHs) and six metals were reported as detected in the soil samples.

Several organic compounds were detected in site soil samples. Most of these compounds were detected in near-surface samples and subsurface samples to a depth of 30 feet in one boring (4806). Where compounds were detected in multiple samples, concentrations decreased with depth. TRPH was also detected in several samples with the highest concentrations occurring in the subsurface samples from boring 4806 to a depth of 30 feet. No contaminants were detected in any of the borings below a depth of 30 feet. Relatively high concentrations of TRPH in this boring resulted in greatly elevated reporting limits in some soil samples. Although a significant release appears to have occurred at this SWMU, and some uncertainty exists with regard to potential construction worker exposure to subsurface soil, the contaminated area is small and confined to the subsurface. Adequate controls could be implemented to limit exposures to this soil during an excavation activity. Because no detected concentrations of chemicals at this SWMU pose an unacceptable human health risk, it is recommended that no further investigation of this SWMU is necessary.

TABLE 9-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
UNDERGROUND STORAGE TANK (SWMU NO. 48A)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters			
					VOCs	SVOCs	Metals	TRPH
Boring 04804	0 - 0.5	CAN048-4804-0000		Soil	X	X	X	X
	3 - 5	CAN048-4804-0005		Soil	X	X	X	X
	8 - 10	CAN048-4804-0010		Soil	X	X	X	X
	13 - 15	CAN048-4804-0015		Soil	X	X	X	X
	18 - 20	CAN048-4804-0020		Soil	X	X	X	X
	23 - 25	CAN048-4804-0025		Soil	X	X	X	X
	28 - 30	CAN048-4804-0030		Soil	X	X	X	X
	33 - 35	CAN048-4804-0035		Soil	X	X	X	X
	38 - 40	CAN048-4804-0040		Soil	X	X	X	X
Boring 04805	0.5 - 2.5	CAN048-4805-0000		Soil	X	X	X	X
	3 - 5	CAN048-4805-0005		Soil	X	X	X	X
	8 - 10	CAN048-4805-0010		Soil	X	X	X	X
	8 - 10	CAN048-4805-4861	FD	Soil	X	X	X	X
	13 - 15	CAN048-4805-0015		Soil	X	X	X	X
	13 - 15	CAN048-4805-4801	MRD	Soil	X	X	X	X
	18 - 20	CAN048-4805-0020		Soil	X	X	X	X
	23 - 25	CAN048-4805-0025		Soil	X	X	X	X
	28 - 30	CAN048-4805-0030		Soil	X	X	X	X
	33 - 35	CAN048-4805-0035		Soil	X	X	X	X
	38 - 40	CAN048-4805-0040		Soil	X	X	X	X
Boring 04806	0 - 2.0	CAN048-4806-0000		Soil	X	X	X	X
	0 - 2.0	CAN048-4806-4862	FD	Soil	X	X	X	X
	3 - 5	CAN048-4806-0005		Soil	X	X	X	X
	3 - 5	CAN048-4806-4802	MRD	Soil	X	X	X	X

TABLE 9-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
UNDERGROUND STORAGE TANK (SWMU NO. 48A)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters			
					VOCs	SVOCs	Metals	TRPH
Boring 04806, cont.	8 - 10	CAN048-4806-0010		Soil	X	X	X	X
	13 - 15	CAN048-4806-0015		Soil	X	X	X	X
	18 - 20	CAN048-4806-0020		Soil	X	X	X	X
	23 - 25	CAN048-4806-0025		Soil	X	X	X	X
	28 - 30	CAN048-4806-0030		Soil	X	X	X	X
	28 - 30	CAN048-4806-4863	FD	Soil	X	X	X	X
	33 - 35	CAN048-4806-0035		Soil	X	X	X	X
	38 - 40	CAN048-4806-0040		Soil	X	X	X	X

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 11-1 for locations of the borings.

TABLE 9-2

FIELD SCREENING DATA
PHASE II RFI
UNDERGROUND STORAGE TANK (SWMU NO. 48A)

Boring/Sample Number	Date	Time Collected (hrs)	Time of Field Screening	Sample Depth	Field Screening Concentrations (ppm)
CAN048-4804	12/11/94	1625	*	0.5	ND
		1633	*	5.0	ND
		1638	*	10.0	ND
		1645	*	15.0	ND
		1655	*	20.0	ND
		1712	*	25.0	ND
	12/12/94	0800	*	30.0	ND
		0815	*	35.0	ND
		0830	*	40.0	ND
CAN048-4805	12/12/94	0855	*	0.5	ND
		0905	*	5.0	ND
		0915	*	10.0	ND
		0925	*	15.0	ND
		0940	*	20.0	ND
		0951	*	25.0	ND
		1008	*	30.0	ND
		1020	*	35.0	ND
		1030	*	40.0	ND
CAN048-4806	12/12/94	1058	*	0.5	5.2
		1115	*	5.0	50.5
		1133	*	10.0	58
		1148	*	15.0	125.7
		1200	*	20.0	106.1
		1215	*	25.0	86.8
		1225	*	30.0	ND
		1235	*	35.0	ND
		1245	*	40.0	ND

* Exact time unknown; indicates 1/2 hour after sample collection
ND = Nondetect

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A
CANNON AFB

LOCATOR	CAN048-4804-0000			CAN048-4804-0005			CAN048-4804-0010			CAN048-4804-0015			CAN048-4804-0020			CAN048-4804-0025		
LAB SAMPLE NUMBER	0397740007SA			0397740008SA			0397740009SA			0397740010SA			0397740011SA			0397740012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	3.4	11	J	<	11	U	3	12	J	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	12	U	<	11	U	<	11	U	<	11	U
Chlorobenzene	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Ethylbenzene	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Methylene chloride	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Toluene	5.7	5.6		1.3	5.7	J	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Xylenes (total)	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
bis(2-Ethylhexyl)phthalate	57	370	J	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
4-Chloroaniline	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Dibenzofuran	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
1,2-Dichlorobenzene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
1,3-Dichlorobenzene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
1,4-Dichlorobenzene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Fluoranthene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Fluorene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
2-Methylnaphthalene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Naphthalene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
N-Nitrosodiphenylamine	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Phenanthrene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Phenol	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4804-0000			CAN048-4804-0005			CAN048-4804-0010			CAN048-4804-0015			CAN048-4804-0020			CAN048-4804-0025		
LAB SAMPLE NUMBER	0397740007SA			0397740008SA			0397740009SA			0397740010SA			0397740011SA			0397740012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	12900	11.3		11900	11.3		8580	11.5		4400	55.6		8150	11.1		6370	22.1	
Antimony	5.5	6.8	J	<	6.8	UJ	<	6.9	U	<	33.3	UJ	<	6.7	UJ	<	13.2	UJ
Arsenic	3	0.56		2.6	0.57		2.9	0.58		2	0.56		1.2	0.56		1.8	0.55	
Barium	149	1.1		456	1.1		304	1.2		436	5.6		69.3	1.1		109	2.2	
Beryllium	0.53	0.23		0.5	0.23		0.46	0.23		<	1.1	U	0.26	0.22		<	0.44	U
Calcium	63800	22.5		102000	22.7		112000	23		250000	111		78900	22.3		173000	44.1	
Chromium	11.3	1.1		8.9	1.1		6.8	1.2		<	5.6	U	5.9	1.1		2.6	2.2	
Cobalt	4.1	1.1		3.5	1.1		3.3	1.2		<	5.6	U	1.6	1.1		1.2	2.2	J
Copper	7.3	2.3		7	2.3		5.9	2.3		<	11.1	U	1.8	2.2	J	1.9	4.4	J
Iron	9480	11.3		8550	11.3		6840	11.5		2410	55.6		4810	11.1		3680	22.1	
Lead	18.8	5.6	J	15.5	5.7	J	11.3	2.9	J	2.3	0.56	J	2.7	0.56	J	1.9	0.55	J
Magnesium	2830	22.5	J	3760	22.7	J	4160	23		13400	111		8310	22.3	J	10500	44.1	J
Manganese	133	1.1		168	1.1		118	1.2		21.4	5.6	J	40.5	1.1		34	2.2	
Nickel	8.2	4.5		7.8	4.5		8.3	4.6		9	22.2	J	5.7	4.5		4.2	8.8	J
Potassium	2140	563		1980	567		1540	576		448	2780	J	1400	556		1070	1100	J
Vanadium	18.6	1.1		18.3	1.1		17.2	1.2		17.7	5.6		18	1.1		15	2.2	
Zinc	29.2	2.3		28.2	2.3		18.2	2.3		6.1	11.1	J	10.3	2.2		7.5	4.4	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	185	45.1	J	1050	90.8	J	81	46.1	J	<	44.5	UJ	<	44.5	UJ	<	44.1	UJ

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

(1) Duplicate for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A
CANNON AFB

LOCATOR	CAN048-4804-0030			CAN048-4804-0035			CAN048-4804-0040			CAN048-4805-0000			CAN048-4805-0005			CAN048-4805-0010			CAN048-4805-4861[1]		
LAB SAMPLE NUMBER	0397940007SA			0397940008SA			0397940009SA			0397940010SA			0397940011SA			0397940012SA			0398000001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	4.8	11	J	4.9	11	J	6.7	11	J	<	11	U	9.5	12	J	<	11	U	17	11	
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U	<	11	U
Chlorobenzene	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Ethylbenzene	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Methylene chloride	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	5.6	5.5	
Toluene	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Xylenes (total)	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																					
Acenaphthene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
4-Chloroaniline	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Dibenzofuran	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
1,2-Dichlorobenzene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
1,3-Dichlorobenzene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
1,4-Dichlorobenzene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Fluoranthene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Fluorene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
2-Methylnaphthalene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Naphthalene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
N-Nitrosodiphenylamine	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Phenanthrene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Phenol	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A
CANNON AFB

LOCATOR	CAN048-4804-0030			CAN048-4804-0035			CAN048-4804-0040			CAN048-4805-0000			CAN048-4805-0005			CAN048-4805-0010			CAN048-4805-4861[1]		
LAB SAMPLE NUMBER	0397940007SA			0397940008SA			0397940009SA			0397940010SA			0397940011SA			0397940012SA			0398000001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Aluminum	4010	21.9		3210	10.7		3940	10.7		15300	11.3		6410	23.3		9080	10.9		4190	11	J
Antimony	<	13.1	UJ	<	6.4	UJ	<	6.4	UJ	<	6.8	UJ	<	14	UJ	<	6.6	UJ	<	6.6	UJ
Arsenic	1.6	0.55		0.85	0.53		0.67	0.53		2.5	0.57		2.1	0.58		2.1	0.55		2	0.55	
Barium	87.5	2.2		37.5	1.1		39.6	1.1		132	1.1		170	2.3		49.5	1.1		43.9	1.1	J
Beryllium	<	0.44	U	<	0.21	U	<	0.21	U	0.71	0.23	J	0.29	0.47	J	0.43	0.22	J	0.38	0.22	
Calcium	193000	43.8		67900	21.3		64000	21.3		21000	22.6		207000	46.6		49600	21.9		52600	22.1	J
Chromium	4.1	2.2		3	1.1		3.5	1.1		13.8	1.1		4.1	2.3		7.8	1.1		4.5	1.1	J
Cobalt	<	2.2	U	0.88	1.1	J	1.6	1.1		5.9	1.1		3	2.3		3.5	1.1		3.1	1.1	
Copper	2.2	4.4	J	1.8	2.1	J	2	2.1	J	10	2.3		3.2	4.7	J	5.4	2.2		4.5	2.2	
Iron	2830	21.9		3120	10.7		3800	10.7		13300	11.3		5230	23.3		8180	10.9		4480	11	J
Lead	1.4	0.55		1.8	0.53		1.7	1.1		11.8	1.1		3.7	0.58		5.9	0.55		5.2	1.1	J
Magnesium	7060	43.8		3260	21.3		5470	21.3		2840	22.6		2990	46.6		3410	21.9		2580	22.1	
Manganese	27.6	2.2		32.3	1.1		58.9	1.1		245	1.1		49.9	2.3		126	1.1		99.8	1.1	
Nickel	8.2	8.8	J	4.1	4.3	J	5	4.3		13.5	4.5		5.6	9.3	J	8.9	4.4		5.2	4.4	
Potassium	836	1100	J	725	533		838	533		2330	565		1040	1160	J	1810	547		1050	552	
Vanadium	9.5	2.2		7.4	1.1		11.6	1.1		22.2	1.1		13.9	2.3		23.4	1.1		20.7	1.1	J
Zinc	7	4.4		6.5	2.1		7.6	2.1		33.1	2.3		12.7	4.7		19.3	2.2		11.3	2.2	J
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	43.8	U	<	42.7	U	<	42.6	U	61.6	45.2		<	46.6	U	<	43.8	U	<	44.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A
CANNON AFB

LOCATOR	CAN048-4805-0015			CAN048-4805-0020			CAN048-4805-0025			CAN048-4805-0030			CAN048-4805-0035			CAN048-4805-0040		
LAB SAMPLE NUMBER	0397940013SA			0397940001SA			0397940002SA			0397940003SA			0397940004SA			0397940005SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	5	11	J	<	11	U	8.9	11	J	4.8	11	J	<	11	U	3.8	11	J
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chlorobenzene	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Ethylbenzene	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Methylene chloride	<	5.6	U	<	5.7	U	<	5.4	U	3.9	5.4	J	4.3	5.3	J	<	5.4	U
Toluene	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Xylenes (total)	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
bis(2-Ethylhexyl)phthalate	<	370	U	<	370	U	120	360	J	<	360	U	<	350	U	<	350	U
4-Chloroaniline	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Dibenzofuran	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
1,2-Dichlorobenzene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
1,3-Dichlorobenzene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
1,4-Dichlorobenzene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
Fluoranthene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Fluorene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
2-Methylnaphthalene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
Naphthalene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
N-Nitrosodiphenylamine	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Phenanthrene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Phenol	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4805-0015			CAN048-4805-0020			CAN048-4805-0025			CAN048-4805-0030			CAN048-4805-0035			CAN048-4805-0040		
LAB SAMPLE NUMBER	0397940013SA			0397940001SA			0397940002SA			0397940003SA			0397940004SA			0397940005SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	8100	11.1		12100	11.4		7480	21.8		6460	10.8		3790	10.6		3120	10.7	
Antimony	<	6.7	UJ	<	6.8	UJ	<	13.1	UJ	<	6.5	UJ	<	6.4	UJ	<	6.4	UJ
Arsenic	1.7	0.56		1.7	1.1		0.79	0.54		0.65	0.54		0.58	0.53		0.64	0.54	
Barium	96.1	1.1		331	1.1		2390	2.2		40.1	1.1		35.3	1.1		41.7	1.1	
Beryllium	0.46	0.22	J	0.53	0.23	J	<	0.44	U	0.18	0.22	J	0.13	0.21	J	<	0.21	U
Calcium	37400	22.3		75100	22.7		128000	43.5		53900	21.6		41900	21.2		49200	21.5	
Chromium	7	1.1		9	1.1		4.6	2.2		5.6	1.1		2.8	1.1		3	1.1	
Cobalt	3	1.1		2.7	1.1		2.2	2.2		1.5	1.1		1.8	1.1		1.4	1.1	
Copper	5	2.2		4.1	2.3		14.5	4.4		1.8	2.2	J	1.6	2.1	J	2.4	2.1	
Iron	7620	11.1		8180	11.4		6130	21.8		4670	10.8		3630	10.6		3160	10.7	
Lead	6.5	1.1		5.8	0.57		2.5	0.54		1.9	0.54		2	0.53		2.1	0.54	
Magnesium	3340	22.3		7730	22.7		13700	43.5		5080	21.6		2820	21.2		3600	21.5	
Manganese	124	1.1		81.1	1.1		79.8	2.2		36.7	1.1		58.5	1.1		44.3	1.1	
Nickel	7.7	4.5		9.6	4.5		7.9	8.7	J	5.1	4.3		4.3	4.2		3.5	4.3	J
Potassium	1880	556		3110	568		1350	1090		1380	539		817	530		593	537	
Vanadium	17.9	1.1		21.2	1.1		15.3	2.2		11.3	1.1		8.2	1.1		8.6	1.1	
Zinc	18.3	2.2		19.5	2.3		21.1	4.4		9.2	2.2		7	2.1		7.2	2.1	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.5	U	<	45.4	U	<	43.5	U	<	43.1	U	<	42.4	U	<	42.9	U

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R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A
CANNON AFB

LOCATOR	CAN048-4806-0000			CAN048-4806-4862[1]			CAN048-4806-0005			CAN048-4806-0010			CAN048-4806-0010			CAN048-4806-0015		
LAB SAMPLE NUMBER	0398000002SA			0398000007SA			0398000003SA			0398000004RA			0398000004SA			0398000005RA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	29	11					<	5500	U			
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U				<	5500	U			
Chlorobenzene	<	5.3	U	<	5.6	U	3	5.6	J				<	2800	U			
Ethylbenzene	<	5.3	U	<	5.6	U	1.8	5.6	J				890	2800	J			
Methylene chloride	5.2	5.3	J	5.5	5.6	J	6.5	5.6					<	2800	U			
Toluene	1.3	5.3	J	<	5.6	U	2.3	5.6	J				<	2800	U			
Xylenes (total)	<	5.3	U	<	5.6	U	26	5.6					12000	2800				
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	<	750	UJ
bis(2-Ethylhexyl)phthalate	<	350	U	<	370	U	<	3700	U	9100	1500		<	7400	UJ	3300	750	
4-Chloroaniline	<	350	U	<	370	U	<	3700	U	<	1500	UJ	7900	3600	J	<	750	UJ
Di-n-butyl phthalate	<	350	U	<	370	U	<	3700	U	<	1500	UJ	410	3600	J	<	750	UJ
Dibenzofuran	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	<	750	UJ
1,2-Dichlorobenzene	<	350	U	<	370	U	<	3700	U	7500	1500		4100	3600	J	1100	750	
1,3-Dichlorobenzene	<	350	U	<	370	U	<	3700	U	700	1500	J	450	3600	J	<	750	UJ
1,4-Dichlorobenzene	<	350	U	<	370	U	<	3700	U	1800	1500		950	3600	J	<	750	UJ
Fluoranthene	<	350	U	<	370	U	<	3700	U	1200	1500	J	700	3600	J	500	750	J
Fluorene	<	350	U	<	370	U	<	3700	U	190	1500	J	<	3600	UJ	110	750	J
2-Methylnaphthalene	<	350	U	<	370	U	<	3700	U	12000	1500		<	3600	UJ	5000	750	
Naphthalene	<	350	U	<	370	U	<	3700	U	5200	1500		2900	3600	J	2200	750	
N-Nitrosodiphenylamine	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	400	750	J
Phenanthrene	<	350	U	<	370	U	<	3700	U	400	1500	J	<	3600	UJ	110	750	J
Phenol	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	<	750	UJ

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J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.
[1] Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4806-0000			CAN048-4806-4862[1]			CAN048-4806-0005			CAN048-4806-0010			CAN048-4806-0010			CAN048-4806-0015		
LAB SAMPLE NUMBER	0398000002SA			0398000007SA			0398000003SA			0398000004RA			0398000004SA			0398000005RA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	5240	10.7	J	5640	11.1	J	9790	11.3	J				4050	55.1	J			
Antimony	<	6.4	UJ	<	6.7	UJ	<	6.8	UJ				<	33	U			
Arsenic	2.8	0.53		2.6	0.56		2.7	0.56					3.4	0.55				
Barium	242	1.1	J	169	1.1	J	206	1.1	J				1640	5.5	J			
Beryllium	0.37	0.21		0.41	0.22		0.44	0.23					<	1.1	U			
Calcium	54100	21.3	J	32000	22.3	J	47600	22.5	J				246000	110	J			
Chromium	5.2	1.1	J	6.2	1.1	J	8.2	1.1	J				<	5.5	UJ			
Cobalt	3	1.1		3.6	1.1		3.4	1.1					4.4	5.5	J			
Copper	6.5	2.1		7.1	2.2		6.9	2.3					<	11	U			
Iron	4900	10.7	J	5810	11.1	J	7930	11.3	J				2800	55.1	J			
Lead	11.2	1.1	J	16.1	1.1		25.7	2.8	J				8.9	1.1	J			
Magnesium	3100	21.3		2320	22.3		2140	22.5					7050	110				
Manganese	132	1.1		152	1.1		138	1.1					40.2	5.5				
Nickel	7	4.3		7.1	4.5		7.1	4.5					6	22	J			
Potassium	1150	533		1270	557		1830	563					926	2750	J			
Vanadium	13.4	1.1	J	14.7	1.1	J	15.9	1.1	J				12.3	5.5	J			
Zinc	17.5	2.1	J	17.7	2.2	J	23.1	2.3	J				9.4	11	J			
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	56.2	42.7		81.8	44.5		729	45					17300	1320				

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R = Rejected value.

D = Sample was diluted for analysis.

U = Nondetected value.

RL = Reporting Limit.

[1] Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4806-0015			CAN048-4806-0020			CAN048-4806-0025			CAN048-4806-0030			CAN048-4806-4863[1]			CAN048-4806-0035		
LAB SAMPLE NUMBER	0398000005SA			0398000006SA			0398000008SA			0398000009SA			0398000012SA			0398000010SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	5700	U	<	2900	U	410	110		13	12		<	11	U	9.2	10	J
2-Butanone (MEK)	<	5700	U	1200	2900	J	140	110		<	12	U	<	11	U	<	10	U
Chlorobenzene	<	2800	U	<	1400	U	<	56	U	<	5.8	U	<	5.3	U	<	5.2	U
Ethylbenzene	570	2800	J	420	1400	J	<	56	U	<	5.8	U	<	5.3	U	<	5.2	U
Methylene chloride	<	2800	U	<	1400	U	41	56	J	4.8	5.8	J	1.9	5.3	J	3.3	5.2	J
Toluene	<	2800	U	<	1400	U	<	56	U	<	5.8	U	<	5.3	U	<	5.2	U
Xylenes (total)	5500	2800		3300	1400		69	56		<	5.8	U	<	5.3	U	<	5.2	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	88	750	J	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
bis(2-Ethylhexyl)phthalate	<	750	UJ	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
4-Chloroaniline	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Di-n-butyl phthalate	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Dibenzofuran	220	750	J	<	1900	U	88	370	J	<	380	U	<	350	U	<	340	U
1,2-Dichlorobenzene	1100	750	J	220	1900	J	<	370	U	<	380	U	<	350	U	<	340	U
1,3-Dichlorobenzene	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
1,4-Dichlorobenzene	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Fluoranthene	510	750	J	230	1900	J	150	370	J	<	380	U	<	350	U	<	340	U
Fluorene	130	750	J	<	1900	U	47	370	J	<	380	U	<	350	U	<	340	U
2-Methylnaphthalene	5700	750	J	3600	1900		2300	370		<	380	U	87	350	J	<	340	U
Naphthalene	2100	750	J	1200	1900	J	800	370		<	380	U	<	350	U	<	340	U
N-Nitrosodiphenylamine	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Phenanthrene	98	750	J	<	1900	U	41	370	J	<	380	U	<	350	U	<	340	U
Phenol	<	750		<	1900	U	38	370	J	<	380	U	<	350	U	<	340	U

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J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.
[1] Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4806-0015			CAN048-4806-0020			CAN048-4806-0025			CAN048-4806-0030			CAN048-4806-4863[1]			CAN048-4806-0035		
LAB SAMPLE NUMBER	0398000005SA			0398000006SA			0398000008SA			0398000009SA			0398000012SA			0398000010SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	3630	22.7	J	3860	22.9	J	4590	22.4	J	5850	11.5	J	2030	10.7	J	2860	10.4	J
Antimony	<	13.6	UJ	14	13.7	J	<	13.4	UJ	<	6.9	UJ	<	6.4	UJ	<	6.3	UJ
Arsenic	1.7	0.57		1.4	0.57		1.6	0.56		0.82	0.58		0.94	2.1	J	0.61	2.1	J
Barium	402	2.3	J	205	2.3	J	518	2.2	J	244	1.2	J	63.6	1.1	J	24.3	1	J
Beryllium	<	0.45	U	<	0.46	U	0.23	0.45	J	0.2	0.23	J	0.12	0.21	J	<	0.21	U
Calcium	210000	45.3	J	170000	45.8	J	173000	44.7	J	33600	23.1	J	23000	21.4	J	27700	20.9	J
Chromium	5.8	2.3	J	2.4	2.3	J	6.5	2.2	J	4	1.2	J	1.3	1.1	J	2.5	1	J
Cobalt	1.6	2.3	J	1.2	2.3	J	1.8	2.2	J	1.2	1.2		0.79	1.1	J	0.82	1	J
Copper	1.4	4.5	J	1.4	4.6	J	2.9	4.5	J	1.6	2.3	J	0.9	2.1	J	1.3	2.1	J
Iron	1980	22.7		2320	22.9	J	2890	22.4	J	4360	11.5	J	1560	10.7	J	2890	10.4	J
Lead	1.8	0.57	J	1.9	0.57	J	2.1	0.56	J	2.1	0.58	J	2.1	0.53	J	1.6	0.52	J
Magnesium	16200	45.3		15500	45.8		17700	44.7		3330	23.1		2100	21.4		1930	20.9	
Manganese	20.8	2.3		26.8	2.3		28.9	2.2		34.6	1.2		24.5	1.1		32.1	1	
Nickel	8.5	9.1	J	4.4	9.2	J	6.2	8.9	J	3.6	4.6	J	1.7	4.3	J	1.9	4.2	J
Potassium	478	1130	J	483	1140	J	735	1120	J	1310	577		613	534		662	522	
Vanadium	18.9	2.3	J	20	2.3	J	19.8	2.2	J	9.8	1.2	J	5.5	1.1	J	6.8	1	J
Zinc	6.1	4.5	J	5.5	4.6	J	7.1	4.5	J	9	2.3	J	3.7	2.1	J	5.8	2.1	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	3890	907		2080	137		1350	492		199	46.2		172	42.7		<	41.8	U

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A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value.

D = Sample was diluted for analysis.

U = Nondetected value.

RL = Reporting Limit.

[1] Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4806-0040		
LAB SAMPLE NUMBER	0398000011SA		
COLLECT DATE	12/12/94		
	Result	RL	Qual
Volatile Organics (µg/kg)			
Acetone	3.5	11	J
2-Butanone (MEK)	<	11	U
Chlorobenzene	<	5.3	U
Ethylbenzene	<	5.3	U
Methylene chloride	2.1	5.3	J
Toluene	<	5.3	U
Xylenes (total)	<	5.3	U
Semivolatile Organics (µg/kg)			
Acenaphthene	<	350	U
bis(2-Ethylhexyl)phthalate	<	350	U
4-Chloroaniline	<	350	U
Di-n-butyl phthalate	<	350	U
Dibenzofuran	<	350	U
1,2-Dichlorobenzene	<	350	U
1,3-Dichlorobenzene	<	350	U
1,4-Dichlorobenzene	<	350	U
Fluoranthene	<	350	U
Fluorene	<	350	U
2-Methylnaphthalene	<	350	U
Naphthalene	<	350	U
N-Nitrosodiphenylamine	<	350	U
Phenanthrene	<	350	U
Phenol	<	350	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.
(1) Duplicate sample for the preceeding sample number.

TABLE 9-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48A CANNON AFB

LOCATOR	CAN048-4806-0040		
LAB SAMPLE NUMBER	0398000011SA		
COLLECT DATE	12/12/94		
	Result	RL	Qual
Metals (mg/kg)			
Aluminum	2970	10.5	J
Antimony	<	6.3	UJ
Arsenic	0.57	0.53	
Barium	23.1	1.1	J
Beryllium	<	0.21	U
Calcium	33300	21.1	J
Chromium	2.3	1.1	J
Cobalt	0.86	1.1	J
Copper	0.94	2.1	J
Iron	2810	10.5	J
Lead	1.5	0.53	J
Magnesium	2640	21.1	
Manganese	29.9	1.1	
Nickel	2.2	4.2	J
Potassium	625	527	
Vanadium	7	1.1	J
Zinc	5.6	2.1	J
TRPH (mg/kg)			
Total Recoverable Petroleum Hydrocarbons	<	42.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value.

D = Sample was diluted for analysis.

U = Nondetected value.

RL = Reporting Limit.

(1) Duplicate sample for the preceeding sample number.

TABLE 9-4

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND[1]
SWMU 48A CANNON AFB

Underground Storage Tank

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations (2)	Upper Tolerance Limit (UTL) Background Concentration(3)	Reported Level in Clovis, NM Region (4)	Does Maximum Detected Exceed Background
CAN048-4805-0000	Aluminum	15,300	1,410 - 11,000	10,540	50,000	NO**
CAN048-4806-0020	Antimony	14	<4.9 - <13	*	<1	YES
CAN048-4806-0010	Arsenic	3.4	0.67 - 28	15.5	6.5	NO
CAN048-4805-0025	Barium	2390	14.5 - 1200	642	500	YES
CAN048-4805-0000	Beryllium	0.71	0.17 - 0.77	0.73	1-2	NO
CAN048-4805-0000	Chromium	13.8	4 - 15.4	12.5	30	NO**
CAN048-4805-0000	Cobalt	5.9	0.85 - 5.3	4.5	3-7	YES
CAN048-4805-0025	Copper	14.5	<2 - 18.4	*	20	NO**
CAN048-4806-0005	Lead	25.7	1.1 - 46	25.8	15	NO
CAN048-4805-0000	Manganese	245	22.4 - 216	164	500	YES
CAN048-4805-0000	Nickel	13.5	1.3 - 9.8	9	15	YES
CAN048-4805-0010	Vanadium	23.4	5.2 - 28.3	25.3	30-70	NO
CAN048-4805-0000	Zinc	33.1	<4.3 - 27.5	21.9	45	YES

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1994) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990). Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM (W-C 1993).

(3) Upper Tolerance Limit (UTL) = mean + 2 * k standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation*, where k=2.02 for n=37.

(4) USGS 1984.

* Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

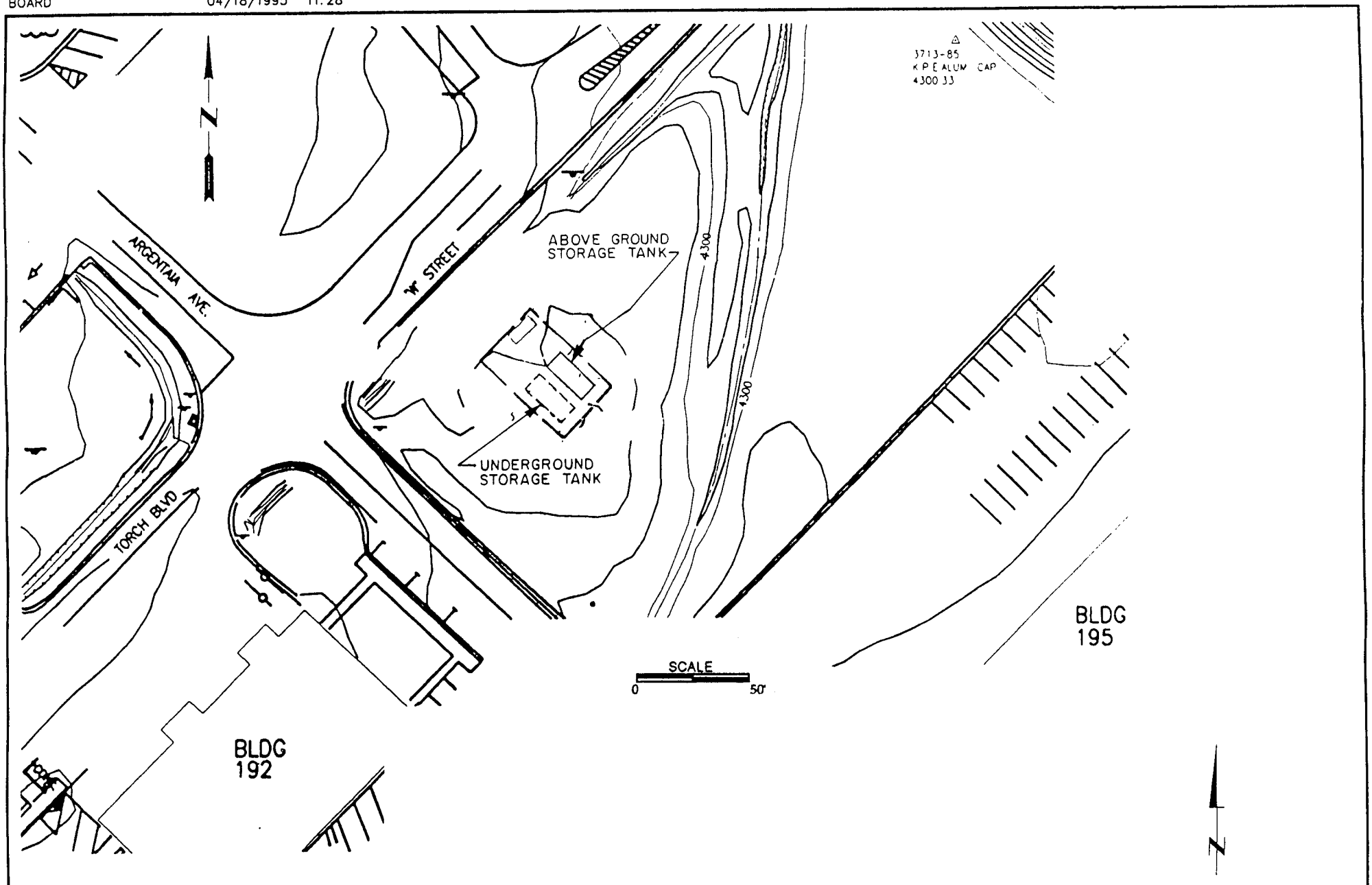
TABLE 9-5

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SWMU 48A TO RBCs FOR RESIDENTIAL SOIL UNDERGROUND STORAGE TANK

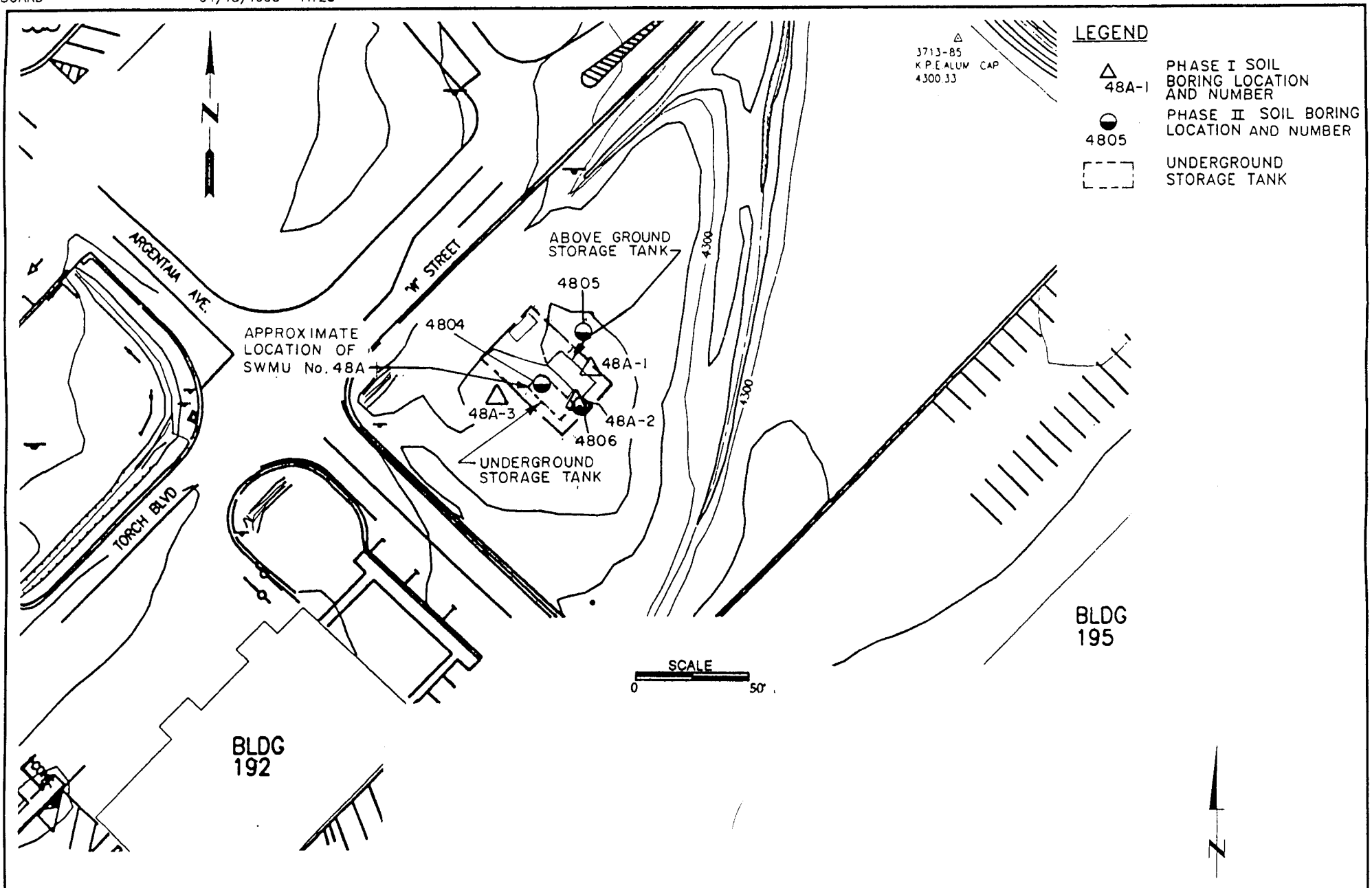
Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration[1] (mg/kg)	Exceeds RBC?
2-Butanone (MEK)	1.2	47,000	NO
Acetone	0.41	7,800	NO
Chlorobenzene	0.003	1,600	NO
Ethylbenzene	0.89	7,800	NO
Methylene Chloride	0.041	85	NO
Toluene	0.0057	16,000	NO
Xylenes (total)	12	160,000	NO
1,2-Dichlorobenzene	7.5	7,000	NO
1,3-Dichlorobenzene	0.7	7,000	NO
1,4-Dichlorobenzene	1.8	27	NO
2-Methylnaphthalene	12	NA(a)	--
4-Chloroaniline	7.9	310	NO
Acenaphthene	0.088	4,700	NO
Bis(2-ethylhexyl)phthalate	9.1	46	NO
Di-n-butylphthalate	0.41	7,800	NO
Dibenzofuran	0.22	310	NO
Fluoranthene	1.2	3,100	NO
Fluorene	0.19	3,100	NO
N-Nitrosodiphenylamine	0.4	130	NO
Naphthalene	5.2	3,100	NO
Phenanthrene	0.4	NA(a)	--
Phenol	0.038	47,000	NO
TRPH	17,300	NA(a)	--
Antimony	14	31	NO
Barium	2,390	5,500	NO
Cobalt	5.9	4,700	NO
Manganese	245	390	NO
Nickel	13.5	1,600	NO
Zinc	33.1	23,000	NO

(1) EPA Region III Risk-Based Concentrations for Residential Soil (EPA 1994).

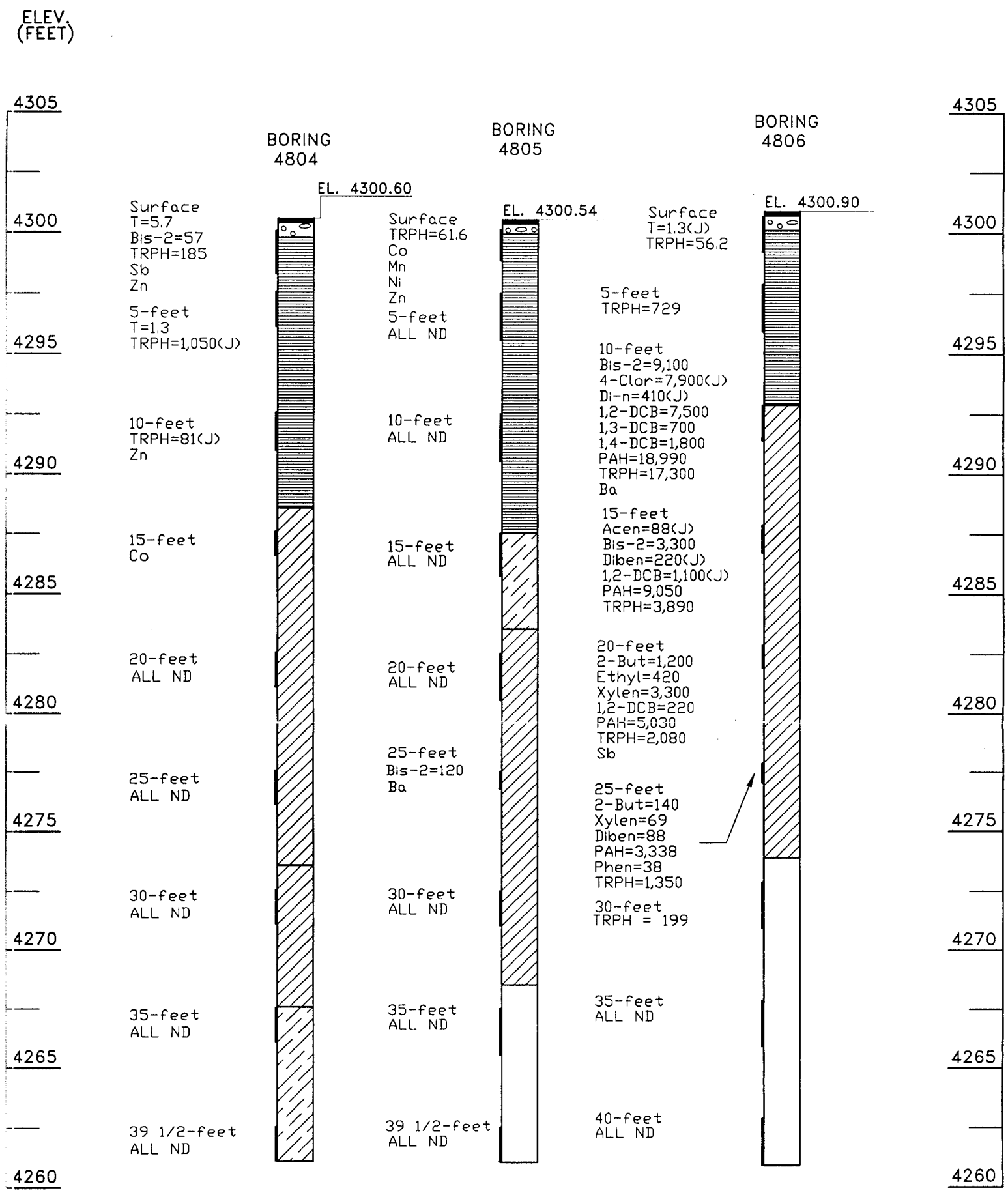
(a) Not Applicable: EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.



DRN BY: CJG	DATE: 06/16/94	UNDERGROUND STORAGE TANK - SWMU 48A SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 9-1
CHK'D BY:	REVISION: 0			



DRN BY: CJG	DATE: 06/16/94	UNDERGROUND STORAGE TANK - SWMU 48A SITE PLAN WITH PHASE I & PHASE II BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY: .	REVISION: 0		C3M11MM	9-2



SWMU-048A LEGEND

- ASPHALT
- SILTY CLAY (CL)(FILL)
- SILT (ML)
- CLAYEY SILT (ML)
- SANDY SILT (ML)
- SAND (SP)
- SILTY SAND (SM)
- SAMPLED INTERVAL

T=Toluene
Bis-2=Bis(2-Ethylhexyl)phthalate
4-Chlor=4-chloroaniline
Di-n=Di-n-butyl phthalate
1,2-DCB=1,2-Dichlorobenzene
1,3-DCB=1,3-Dichlorobenzene
1,4-DCB=1,4-Dichlorobenzene
Diben=Dibenzofuran
2-But=2-Butanone
Ethyl=Ethylbenzene
Xylen=Total xylenes
PAH=Polycyclic Aromatic Hydrocarbons
TRPH=Total Recoverable Petroleum Hydrocarbons
Sb=Antimony
Ba=Barium
Co=Cobalt
Mn=manganese
Ni=Nickel
Zn=Zinc
ND=Not Detected
(J)=estimated value

Note: All results are in $\mu g/kg$ except for TRPH (mg/kg). Only those metals that exceeded UTLS and background levels are listed.

SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

SWMU-048A – SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
CANNON AIR FORCE BASE NEW MEXICO

DRN. BY: TBS	DATE: 03/17/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	9-3

10.0
ABOVEGROUND STORAGE TANK - SWMU NO. 48B

10.1 SITE BACKGROUND

10.1.1 Site Description

SWMU No. 48B was a 2,000-gallon aboveground steel storage tank located about 125 feet east of the intersection of Argentia Avenue and Torch Boulevard (Figure 10-1). This SWMU and SWMU 48A were located adjacent to each other within a fenced area measuring about 20 feet by 40 feet in plan. The aboveground tank and associated piping were removed in 1992. The area is presently paved and used as a parking lot.

10.1.2 Site History

SWMU No. 48B was active from 1941 to 1985. The site was a gas station from 1941 to 1965. From 1965 to 1985 the tank was used to store waste products. The aboveground tank and associated piping were removed in 1992. The underground tank (SWMU NO. 48A) received waste oils, spent solvents, paint thinners, and recovered fuels. The aboveground tank served as an overflow tank for the underground tank. The products were removed periodically from the tanks.

10.1.3 Current Use

The aboveground storage tank has been removed and is currently covered with asphalt pavement and is being used as a parking lot.

10.1.4 Potential Contaminants

Potential contaminants include waste oils, spent solvents, paint thinners, and recovered fuels.

10.1.5 Previous Investigations

During the Phase I RFI two soil borings were drilled and sampled to a depth of 30 feet bgs (LRL 1993) at the site of the former aboveground storage tank to determine whether or not a release of SWMU-related chemicals had occurred from the tank. The previous boring locations are shown on Figure 10-2. Target analytes for the samples collected included TCL VOCs, cyanide, TAL metals, and BTEX. Acetone, xylene, and methylene chloride were detected in low concentrations in Boring No. 48B-2 at the surface and at 5 feet. Metals were detected above background in surface samples and subsurface samples to 20 feet in both of the borings. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU.

10.1.6 Phase II Sampling Objectives

The Phase I investigation sampled soils to 30 feet bgs. The Phase II investigation included two new soil borings to a depth of 40 feet bgs. Nine soil samples were collected for chemical analysis from the surface to the bottom of each boring. Chemical analysis included VOCs, SVOCs, TAL metals, and TRPH.

New data collected during the Phase II investigation were used to complete a screening-level risk evaluation and to characterize the vertical extent of soil contamination. The results of this evaluation were the basis for recommending either further evaluation or no further action.

The overall objective of sampling at the site of former aboveground storage tank was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the former tank which could pose a significant risk to human health or the environment. The analytical data collected from this investigation were used in a health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the former aboveground storage tank. Potential release points include spills at the surface that may have occurred during

removal by pumping from the tank and leaks in either the tank or the associated piping.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

10.2 FIELD INVESTIGATION AND DATA COLLECTION

10.2.1 Soils Sampling

Two soil borings were drilled and soil samples collected in the area surrounding the presumed location of the former aboveground storage tank. The borings were drilled to a total depth of 40 feet. One boring was drilled at each end of the presumed location of the unit. The boring locations were chosen to assess the presence and extent of site-related soil contaminants at the 40-foot depth interval (10 feet below the Phase I RFI soil borings). Phase II RFI boring numbers and sample descriptions are shown in Table 10-1 and on Figure 10-2.

Surface soil samples were collected from 0 to 0.5 feet in boring 4803 and from 0.5 to 2.5 feet in boring 4804. Both borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, 18 to 20 feet, 23 to 25 feet, 28 to 30 feet, 33 to 35 feet, and 38 to 40 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Soil samples were field screened, and results are shown in Table 10-2. Target analytes included:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

Since the site is currently covered by pavement, the surface sampling interval began immediately below the pavement surface.

Soils were field screened for headspace during drilling activities. The headspace results are shown on Table 10-2. Borings 4803 and 4804 contained no visual or field screening (headspace) indications of contamination. Boring 4806 had some strong unidentifiable odors in soils from about 13 feet to 18 feet; however, no visual or headspace readings were noted in this interval.

10.2.2 Geologic Summary of Boring Logs

Logs from the two Phase II RFI borings show a subsurface lithology consisting of Ogallala Formation sediments in a fining upward sequence. Both borings have a 3-inch-thick asphalt pavement at the surface. Below the asphalt pavement is a 5- to 7-inch layer of sandy gravel fill placed as a foundation for the pavement. Silty clay (USCS symbol CL) was encountered below this layer in both borings to depths of 18 and 7 feet in borings 4803 and 4804, respectively. The silty clay is typically reddish-brown or light brown, low to medium plastic, stiff to very stiff, and moist. Some calcium carbonate and caliche cementation was present in isolated zones. Clayey silt (USCS symbol ML) is present below the silty clay layer in boring 4804 to a depth of 12 feet. This clayey silt is light brown, dry, hard, and strongly cemented with calcium carbonate. Silt (USCS symbol ML) was encountered below this clayey silt layer, and below the silty clay layer in boring 4803, to depths of 23 and 24.2 feet, respectively. The silt is light brown and is typically dry and hard with numerous calcium carbonate nodules and caliche cemented zones. Sandy silt (USCS symbol ML) was encountered below the silt in borings 4803 and 4804 to depths of 33 and 28.3 feet, respectively. The sandy silt is light brown to red, dry, hard, and strongly cemented with calcium carbonate. Silty sand (USCS symbol SP) was found below the sandy silt layer only in boring 4803 to a depth of 37 feet. Sand (USCS symbol SP) was found below this layer, and the sandy silt layer in boring 4804, to the boring completion depths at 40 feet. The sand is red, dry, dense to very dense, and very fine to fine-grained with some caliche cementation. A simplified stick-log format of the boring lithologies is shown on Figure 10-3.

No visual signs of soil contamination were noted during field activities. Strong unidentifiable odors were noted from a depth interval of 13 to 18 feet in boring 4904. However, headspace readings were nondetect for all samples (Table 10-2). Copies of the boring logs are in Appendix B.

10.2.3 Site Topography

The site is level with a thin asphalt pavement and is used as a parking lot. Building 192 is across Argentia Avenue about 100 feet to the southwest of the SWMU, "W" Street is about 50 feet north of the site, and a parking lot for Building 195 is about 50 feet southeast of the site.

10.3 CHEMICAL INVESTIGATION RESULTS

10.3.1 General

Samples were collected as identified in Section 10.2 to comply with permit and compliance agreement requirements. Soil samples were collected from 2 borings (4903 and 4904). Sampling and analyses performed are summarized in Table 10-1. A summary of the analytical results for these soil samples are provided in Table 10-3. For each sample type, the table provides results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

10.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN048-4803-0000 and CAN048-4804-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 10-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC detected in any of the near-surface samples was toluene. Toluene was reported only in the surface sample from boring 4903 (CAN048-4903-0000) at a concentration of 3 μg/kg.

10.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN083-8305-0005, CAN083-8305-0010, CAN083-8305-0015, CAN083-8305-0020, and CAN083-8305-0025 for boring 8305, CAN083-8306-0005, CAN083-8306-0010, CAN083-8306-0015, CAN083-8306-0020, and

CAN083-8306-0025 for boring 8306) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 10-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOC reported was toluene. Toluene was reported in every subsurface sample collected from boring 4903 and from one sample collected from boring 4904. The reported concentrations in boring 4903 samples were CAN048-4903-0005 (1.7 μg/kg), CAN048-4903-0010 (1.8 μg/kg), CAN048-4903-0015 (1.3 μg/kg), CAN048-4903-0020 (2.3 μg/kg), CAN048-4903-0025 (1.5 μg/kg), CAN048-4903-0030 (1.8 μg/kg), CAN048-4903-0035 (1.2 μg/kg), and CAN048-4903-0040 (1.3 μg/kg). Only sample CAN048-4904-0040 from boring 4904 had a reported concentration of toluene at a concentration of 1.5 μg/kg. SVOCs were reported only in three subsurface samples from boring 4904. Bis(2-ethylhexyl)phthalate was reported in samples CAN048-4904-0015, CAN048-4904-0020, and CAN048-4904-0025 at concentrations of 780 μg/kg, 42 μg/kg, and 89 μg/kg, respectively. Fluoranthene, a PAH, was reported in sample CAN048-4904-0015 at a concentration of 210 μg/kg. TRPH was reported only in sample CAN048-4904-0015 at a concentration of 594 mg/kg.

10.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 10-1. The range of results for metals reported in these soil samples are summarized in Table 10-A.

TABLE 10-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	18/18	1,960	4904-0035	16,300	4903-0000
Antimony	0/18	-	-	-	-
Arsenic	18/18	0.56	4903-0040	3.9	4903-0000
Barium	18/18	25.3	4904-0035	2,350	4904-0010
Beryllium	9/18	0.11	4904-0040	0.65	4903-0000
Cadmium	0/18	-	-	-	-
Calcium	18/18	12,800	4904-0030	293,000	4904-0010
Chromium	14/18	1.4	4904-0035	12.2	4903-0000
Cobalt	15/18	1.1	4903-0035	4.7	4904-0000

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Copper	15/18	1.2	4904-0035	8.7	4903-0000
Iron	18/18	1,790	4904-0035	11,500	4903-0000
Lead	18/18	1.2	4903-0015	7.5	4903-0000
Magnesium	18/18	2,010	4904-0035	17,100	4903-0030
Manganese	18/18	19.6	4904-0015	184	4903-0000
Mercury	1/18	0.6	4903-0005	0.6	4903-0005
Nickel	14/18	1.9	4904-0035	14.5	4904-0000
Potassium	18/18	336	4904-0020	2,390	4903-0000
Selenium	0/18	-	-	-	-
Silver	0/18	-	-	-	-
Sodium	2/18	256	4903-0030	348	4903-0025
Thallium	1/18	0.28	4904-0010	0.28	4904-0010
Vanadium	18/18	5.6	4904-0035	23.8	4903-0000
Zinc	18/18	4.2	4904-0025	28.6	4903-0000

10.4 DATA ASSESSMENT

An assessment of the Aboveground Storage Tank (SWMU 48B) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

10.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

10.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). A detailed review of SWMU 48B data is provided in the QCSR.

For the organic analyses, qualification of data was not required based on outlying accuracy parameters. The MS recoveries for antimony, barium, selenium, and thallium were below evaluation criteria, and the MS recovery was above evaluation criteria for magnesium. Antimony and selenium data for all SWMU 48B samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Barium and thallium data for boring 4904 samples were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected magnesium data for all SWMU 48B samples were qualified as estimated **J** to indicate a potential high bias. One MS recovery for manganese was below evaluation criteria, and the second MS recovery for manganese was above evaluation criteria. Additionally for manganese, the RPD for the duplicate analysis was above evaluation criteria. Manganese data were qualified as estimated **J** (detects) or **UJ** (nondetects) for boring 4904 samples to indicate a potential low bias; and for boring 4903 samples, detected manganese results were qualified as estimated **J** to indicate a potential high bias. Also, methylene chloride data were qualified as nondetect **U** for several samples based on blank contamination.

Precision parameters were within evaluation criteria for the organic analyses and for the field duplicate samples. The RPDs for the matrix duplicate analyses were outlying evaluation criteria for barium, calcium, magnesium, and manganese. Associated barium, manganese, and magnesium data were qualified on the basis of MS/MSD recoveries as previously discussed. Calcium data were detected in the associated boring 4904 samples and were qualified as estimated **J**.

10.4.3 Reporting Limits

Reporting limits were raised for several metal analyses. In no case were the RLs raised more than 10 times the nominal RLs. For selenium and thallium analyses, reporting limits were raised due to either matrix interference or dilutions. Selenium and thallium data, which had elevated reporting limits based on the matrix interferences, were qualified estimated **J** (detects) or **UJ** (nondetects). Lead and arsenic analyses for several samples required dilutions due to matrix interferences. Method 6010 analyses required dilutions which elevated the reporting limits due to calcium concentrations above the calibration range.

10.4.4 Summary of Data Usability Limitations

Overall, the data generated for SWMU 48B were determined to meet quality criteria. The elevated RLs were compared to the RBCs and judged not be a limitation to the human health risk screening. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of contamination and to be used for the human health risk screening.

10.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas southeast and south of the location of the former aboveground storage tank (Figure 10-2). One boring, 4904, was located near previous investigation boring 48B-2. The second boring, 4903, was located about 20 feet south of this location. The borings assessed the presence of contamination to the 40-foot depth, 10 feet deeper than the previous investigation borings. A simplified stick-log view of the borings along with a summary of the analytical results is shown on Figure 10-3.

Toluene was reported in every soil sample from boring 4903 at concentrations ranging from a high of 3 μg/kg in the surface sample to a low of 1.2 μg/kg in the 35-foot sample (Figure 10-3 and Table 10-3). Toluene was reported only in the 40-foot sample in boring 4904 at a concentration of 1.5 μg/kg. SVOCs were reported only in the subsurface samples from boring 4904. Bis(2-ethylhexyl)phthalate was reported in the samples at 15 feet (780 μg/kg), 20 feet (42 μg/kg), and 25 feet (89 μg/kg). However, bis(2-ethylhexyl)phthalate is a very common laboratory and field contaminant and it may not be indicative of actual site-related contamination. Fluorene, a PAH, was reported in the 15-foot sample from boring 4904 at a concentration of 210 μg/kg. Although the site is capped with asphalt, it is unlikely that this is the source of the PAH at the 15-foot depth interval. TRPH was detected only in the 15-foot sample from boring 4904 at a concentration of 594 mg/kg.

As shown on Figure 10-3, concentrations of contaminants detected were either at very low levels (toluene) or decreased with depth bis(2-ethylhexyl)phthalate. It does not appear that high levels of contamination are likely at depth or that increasing levels of contamination are present at depth at this SWMU.

Metals that exceeded the UTLs and background concentrations are shown next to the sample interval where they were detected on Figure 10-3. A discussion of these metals detections is provided in Section 10.6.

10.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals of potential concern were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the UTL of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 10-4 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, chromium, cobalt, copper, lead, manganese, and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. Barium, mercury, nickel, thallium, and zinc were considered to exceed background levels and were retained for further evaluation as chemicals of concern. A brief discussion of the background comparison interpretations is given below.

Two of eighteen soil samples contained aluminum at concentrations (10,700 and 16,300 mg/kg) which exceeded the background UTL of 10,540 mg/kg. The maximum detected concentration was the only concentration which also exceeded the range of detected Basewide background concentrations. However, both these concentrations are well below the regional value of 50,000 mg/kg. In addition, it is not likely that the aboveground storage tank which was used to store waste oil is a source of aluminum. Therefore, aluminum was not considered to exceed background levels and was not retained for further evaluation.

Two of eighteen soil samples contained barium at concentrations (712 mg/kg and 2,350 mg/kg) which exceeded the background UTL of 642 mg/kg. The maximum detected concentration also exceeded the regional barium literature value (500 mg/kg) by a factor greater than 4. The maximum detected concentration also exceeded the detected range of background concentrations. Even though barium has been shown to substitute for calcium in caliche (Klein and Hurlbutt 1985) and the high concentrations of barium may be naturally occurring, to be conservative, barium was considered to exceed background levels and was retained for further evaluation.

The maximum detected concentration of cobalt (4.7 mg/kg) exceeded the background UTL of 4.5 mg/kg. However, this concentration was within the detected range of background concentrations and is consistent with literature values for cobalt in the region (3-7 mg/kg). Therefore, cobalt was considered to be within background levels and was not retained for further evaluation.

A UTL for copper could not be calculated due to a large number of nondetects in the background data set; therefore, copper was compared to the background range and literature values. The maximum detected concentration of copper (8.7 mg/kg) was within the range of detected background concentrations and was consistent with the literature value for copper in the region (20 mg/kg). Therefore, copper was considered to be within background levels and was not retained for further evaluation.

The maximum detected concentration of manganese (184 mg/kg) exceeded the background UTL of 164 mg/kg. However, this concentration was within the range of detected background concentrations and was consistent with literature values for manganese (500 mg/kg) in the region. Therefore, manganese was considered to be within background levels and was not retained for further evaluation.

10.7 RISK EVALUATION

10.7.1 Site Conceptual Exposure Model

There are three potentially complete exposure pathways at SWMU 48B: direct contact with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the Base

or at the Base boundary. Potential receptors at the SWMU include Base workers (e.g., military and Base personnel, Base contractors, hypothetical future construction workers, occasional Base visitors) (e.g., families of military personnel, visitors at those sites without restricted access), and residential receptors at the Base boundary downgradient of the SWMU who may use the groundwater. A complete discussion of potentially complete exposure pathways and potential receptors is presented in Section 3.4 and Figure 3-4.

10.7.2 Comparison of Concentrations in Soil to RBCs

Table 10-3 shows a summary of chemicals detected in soil samples at SWMU 48B. Maximum detected soil concentrations of organic compounds and metals which exceeded background levels (Section 10.6) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether a significant release (i.e., that could pose a risk to human health) has occurred at SWMU 48B. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived using accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is given in Section 3.4 and Appendix D.

Table 10-5 shows the comparison of SWMU concentrations to residential soil RBCs. No chemicals detected at SWMU 48B exceeded the RBCs; therefore, no significant human health risk is expected from SWMU 48B.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, toluene, naphthalene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU.

At SWMU 48B, TRPH was detected in one of twenty samples at a maximum concentration of 594 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Toluene and fluoranthene were the only toxic constituents of TRPH detected, and they were very low concentrations. The toluene and fluoranthene concentrations were below the RBCs for residential soil (see Table 10-5), and it is not likely that other TRPH constituents

would contribute significantly to risks at the site. In addition, the contamination is only found at a depth of 15 feet below ground surface (bgs) where exposures are not likely to occur. Finally, since no contamination was detected in samples above 15 feet bgs, it appears that the TRPH and related constituents are actually from the underground storage tank (SWMU 48A) which is located next to this SWMU. In fact, fuel contamination was detected at a depth of 10 to about 20 feet in soil boring 4806 (from the UST evaluation) which is located only approximately 15 feet from soil boring 4904 (from this AST evaluation) where TRPH was detected at a depth of 15 feet.

10.7.3 Evaluation of the Groundwater Pathway

The vertical distribution of the soil contamination was used to evaluate whether chemical releases pose a threat to groundwater. Since the TRPH contamination detected at a depth of 15 feet is considered to be from SWMU 48A, there is no evidence of a release at this SWMU. In addition, the TRPH was not detected below 15 feet bgs indicating that the TRPH is not infiltrating to the groundwater located at approximately 240 feet to 280 feet bgs. The area where the AST was located is currently paved and used as a parking lot so future infiltration is limited.

10.7.4 Conclusion

The results of the soil investigation at SWMU 48B show no evidence that a significant chemical release that would pose an unacceptable human health risk for any potential exposure pathway has occurred at this SWMU. Therefore, no further evaluation of this SWMU is warranted.

10.8 SUMMARY AND RECOMMENDATIONS

Eighteen soil samples were collected and analyzed from two 40-foot-deep soil borings at SWMU 48B. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Six organic compounds and five metals were reported as detected from the site soil samples. However, none of the analytes exceeded RBCs.

High levels of site contaminants or increasing levels of contamination were not found at this SWMU. It appears that the vertical extent of contamination has been adequately assessed and the potential impact to groundwater is considered to be low. Since detected chemicals did not exceed RBCs, it is recommended that no further action is necessary for this SWMU.

TABLE 10-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
ABOVEGROUND STORAGE TANK (SWMU NO. 48B)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 04903	0 - 0.5	CAN049-4903-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN049-4903-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN049-4903-0010		Soil	X	X	X	X	2	1
	8 - 10	CAN049-4903-4962	FD	Soil	X	X	X	X	2	1
	13 - 15	CAN049-4903-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN049-4903-4902	MRD	Soil	X	X	X	X	2	1
	18 - 20	CAN049-4903-0020		Soil	X	X	X	X	2	1
	23 - 25	CAN049-4903-0025		Soil	X	X	X	X	2	1
	28 - 30	CAN049-4903-0030		Soil	X	X	X	X	2	1
	33 - 35	CAN049-4903-0035		Soil	X	X	X	X	2	1
	38 - 40	CAN049-4903-0040		Soil	X	X	X	X	2	1
Boring 04904	0.5 - 2.5	CAN049-4904-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN049-4904-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN049-4904-4961	FD	Soil	X	X	X	X	2	1
	8 - 10	CAN049-4904-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN049-4904-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN049-4904-4901	MRD	Soil	X	X	X	X	2	1
	18 - 20	CAN049-4904-0020		Soil	X	X	X	X	2	1
	23 - 25	CAN049-4904-0025		Soil	X	X	X	X	2	1
	28 - 30	CAN049-4904-0030		Soil	X	X	X	X	2	1
	33 - 35	CAN049-4904-0035		Soil	X	X	X	X	2	1
	38 - 40	CAN049-4904-0040		Soil	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 10-1 for locations of the borings.

TABLE 10-2

FIELD SCREENING DATA
PHASE II RFI
ABOVEGROUND STORAGE TANK (SWMU NO. 48B)

Boring/Sample Number	Date	Time Collected (hrs)	Time of Field Screening	Sample Depth	Field Screening Concentrations (ppm)
CAN049-4904	12/12/94	1445	*	0.5	ND
		1500	*	5.0	ND
		1510	*	10.0	ND
		1525	*	15.0	ND
		1540	*	20.0	ND
		1550	*	25.0	ND
		1600	*	30.0	ND
		1615	*	35.0	ND
		1622	*	40.0	ND
CAN049-4903	12/13/94	0830	*	0.5	ND
		0838	*	5.0	ND
		0846	*	10.0	ND
		0915	*	15.0	ND
		0930	*	20.0	ND
		0942	*	25.0	ND
		0955	*	30.0	ND
		1010	*	35.0	ND
		1024	*	40.0	ND

* Exact time unknown; indicates 1/2 hour after sample collection.
ND = Nondetect

TABLE 10-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48B
CANNON AFB

LOCATOR	CAN049-4903-0000			CAN049-4903-0005			CAN049-4903-0010			CAN049-4903-4962[1]			CAN049-4903-0015			CAN049-4903-0020			CAN049-4903-0025		
LAB SAMPLE NUMBER	0398680001SA			0398680002SA			0398680003SA			0398680010SA			0398680004SA			0398680005SA			0398680006SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	8	11	J	<	12	U	6.7	11	J	7.1	11	J	6.3	11	J	<	12	U	7	11	J
Carbon disulfide	<	5.5	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.8	U	<	5.7	U
Methylene chloride	3	5.5	J	3.3	5.8	J	2.8	5.6	J	3	5.6	J	2.8	5.5	J	3.3	5.8	J	3.2	5.7	J
Toluene	3	5.5	J	1.7	5.8	J	1.8	5.6	J	2.5	5.6	J	1.3	5.5	J	2.3	5.8	J	1.5	5.7	J
Semivolatile Organics (µg/kg)																					
bis(2-Ethylhexyl)phthalate	<	360	U	<	380	U	<	370	U	<	370	U	<	370	U	<	380	U	<	380	U
Fluoranthene	<	360	U	<	380	U	<	370	U	<	370	U	<	370	U	<	380	U	<	380	U
Metals (mg/kg)																					
Aluminum	16300	11		9850	23.2		6440	22.4		7430	22.2		3410	55.3		6840	23.1		10000	11.4	
Arsenic	3.9	0.55		2.4	0.58		1.3	0.56		1.6	0.56		0.69	0.55		0.89	0.58		1.3	0.57	
Barium	389	1.1	J	151	2.3	J	144	2.2	J	131	2.2	J	192	5.5	J	227	2.3	J	152	1.1	J
Beryllium	0.65	0.22		0.43	0.46	J	0.37	0.45	J	0.34	0.44	J	<	1.1	U	<	0.46	U	0.28	0.23	
Calcium	58500	22.1	J	158000	46.5	J	175000	44.9	J	156000	44.4	J	280000	111	J	184000	46.3	J	103000	22.8	J
Chromium	12.2	1.1		6.2	2.3		3.9	2.2		4	2.2		<	5.5	U	4.5	2.3		8.5	1.1	
Cobalt	4.3	1.1		3.2	2.3		2.3	2.2		2.7	2.2		1.4	5.5	J	<	2.3	U	1.8	1.1	
Copper	8.7	2.2		4.4	4.6	J	2.7	4.5	J	2.5	4.4	J	<	11.1	U	2.6	4.6	J	2.2	2.3	J
Iron	11500	11		7190	23.2		4980	22.4		5360	22.2		2140	55.3		3740	23.1		5340	11.4	
Lead	7.5	0.55		4.2	1.2		3.3	1.1		2.8	0.56		1.2	0.55		1.9	0.58		2.4	0.57	
Magnesium	4360	22.1	J	3720	46.5	J	3320	44.9	J	3230	44.4	J	6190	111	J	17000	46.3	J	14000	22.8	J
Manganese	184	1.1	J	82	2.3	J	54.9	2.2	J	57.6	2.2	J	19.8	5.5	J	28.9	2.3	J	31.1	1.1	J
Mercury	<	0.11	U	0.6	0.58		<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U	<	0.11	U
Nickel	10.2	4.4		7.6	9.3	J	8.3	9	J	7.7	8.9	J	4.8	22.1	J	7.9	9.3	J	5.7	4.6	
Potassium	2390	551		1570	1160		1420	1120		1630	1110		397	2770	J	1080	1160	J	1820	569	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 10-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48B
CANNON AFB

LOCATOR	CAN049-4903-0000			CAN049-4903-0005			CAN049-4903-0010			CAN049-4903-4962[1]			CAN049-4903-0015			CAN049-4903-0020			CAN049-4903-0025		
LAB SAMPLE NUMBER	0398680001SA			0398680002SA			0398680003SA			0398680010SA			0398680004SA			0398680005SA			0398680006SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.																					
Sodium	<	551	U	<	1160	U	<	1120	U	<	1110	U	<	2770	U	<	1160	U	348	569	J
Thallium	<	1.1	UJ	<	1.2	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	2.3	UJ	<	2.3	UJ
Vanadium	23.8	1.1		18.8	2.3		13.7	2.2		13.8	2.2		7.9	5.5		19.6	2.3		16.9	1.1	
Zinc	28.6	2.2		18.1	4.6		13.7	4.5		14.2	4.4		6.9	11.1	J	9.5	4.6		10.4	2.3	
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	44.1	U	<	46.5	U	<	44.9	U	<	44.4	U	<	44.3	U	<	46.3	U	<	45.5	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 10-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48B
CANNON AFB

LOCATOR	CAN049-4903-0030			CAN049-4903-0035			CAN049-4903-0040			CAN049-4904-0000			CAN049-4904-0005			CAN049-4904-4961[1]			CAN049-4904-0010		
LAB SAMPLE NUMBER	0398680007SA			0398680008SA			0398680009SA			0397900010SA			0397900011SA			0397900016SA			0397900012SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	6.4	12	J	9.3	11	J	5.5	11	J	14	11		<	12	U	<	12	U	<	11	U
Carbon disulfide	<	5.9	U	1.2	5.5	J	<	5.4	U	<	5.5	U	<	6	U	<	5.9	U	<	5.6	U
Methylene chloride	3.2	5.9	J	3.1	5.5	J	3	5.4	J	4.7	5.5	UJ	<	6	U	1.7	5.9	UJ	1.6	5.6	J
Toluene	1.8	5.9	J	1.2	5.5	J	1.3	5.4	J	<	5.5	U	<	6	U	<	5.9	U	<	5.6	U
Semivolatile Organics (µg/kg)																					
bis(2-Ethylhexyl)phthalate	<	390	U	<	360	U	<	360	U	<	370	U	<	400	U	<	390	U	<	370	U
Fluoranthene	<	390	U	<	360	U	<	360	U	<	370	U	<	400	U	<	390	U	<	370	U
Metals (mg/kg)																					
Aluminum	10700	11.9		7660	10.9		4580	10.8		6540	50		2930	50		2840	59.4		4770	50	
Arsenic	1.1	0.59		1.1	0.55		0.56	0.54		2.2	5	J	1.6	0.5		1.5	1.2		2.7	0.5	
Barium	186	1.2	J	124	1.1	J	43.9	1.1	J	481	5		712	5		1060	5.9		2350	5	
Beryllium	0.28	0.24		0.23	0.22		0.14	0.22	J	<	1	U	<	1	U	<	1.2	U	<	1	U
Calcium	12800	23.7	J	59200	21.8	J	30700	21.5	J	196000	100		250000	100		335000	119		293000	100	
Chromium	6.8	1.2		5.6	1.1		3.6	1.1		3.5	5	J	<	5	U	<	5.9	U	<	5	U
Cobalt	1.8	1.2		1.1	1.1		1.7	1.1		4.7	5	J	<	5	U	<	5.9	U	2.2	5	J
Copper	4.5	2.4		2.4	2.2		1.8	2.2	J	6.2	10	J	<	10	U	3.9	11.9	J	2.1	10	J
Iron	6110	11.9		4720	10.9		3890	10.8		4680	50		2140	50		2390	59.4		3400	50	
Lead	3.2	0.59		2.4	0.55		1.7	0.54		3.1	1		1.5	0.5		1.9	0.59		1.9	0.5	
Magnesium	17100	23.7	J	7110	21.8	J	5030	21.5	J	8880	100		4120	100		4940	119		7960	100	
Manganese	38.7	1.2	J	42.3	1.1	J	34	1.1	J	82.9	5	J	21	5	J	21	5.9	J	33.8	5	J
Mercury	<	0.12	U	<	0.11	U	<	0.11	U	<	0.1	U	<	0.1	U	<	0.12	U	<	0.1	U
Nickel	5.7	4.7		4.8	4.4		4.3	4.3		14.5	20	J	<	20	U	<	23.7	U	<	20	U
Potassium	2100	594		1610	546		914	539		915	2500	J	504	2500	J	<	2970	U	690	2500	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 10-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48B
CANNON AFB

LOCATOR	CAN049-4903-0030			CAN049-4903-0035			CAN049-4903-0040			CAN049-4904-0000			CAN049-4904-0005			CAN049-4904-4961[1]			CAN049-4904-0010		
LAB SAMPLE NUMBER	0398680007SA			0398680008SA			0398680009SA			0397900010SA			0397900011SA			0397900016SA			0397900012SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.																					
Sodium	256	594	J	<	546	U	<	539	U	<	2500	U	<	2500	U	<	2970	U	<	2500	U
Thallium	<	1.2	UJ	<	1.1	UJ	<	1.1	UJ	<	2	U	<	1	U	<	1.2	U	0.28	2	J
Vanadium	19	1.2		10.9	1.1		11.3	1.1		14.6	5		8	5		9.3	5.9		15.9	5	
Zinc	12.5	2.4		9.9	2.2		7.3	2.2		13.2	10		6.9	10	J	5.7	11.9	J	7.5	10	J
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	47.5	U	<	43.7	U	<	43.1	U	<	44.4	U	<	47.9	U	<	47.5	U	<	44.9	U

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J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 10-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48B CANNON AFB

LOCATOR	CAN049-4904-0015			CAN049-4904-0020			CAN049-4904-0025			CAN049-4904-0030			CAN049-4904-0035			CAN049-4904-0040		
LAB SAMPLE NUMBER	0397900013SA			0397900014SA			0397900015SA			0397900017SA			0397900018SA			0398680011SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	13	11		9.2	11	J	5.9	11	J	<	11	U	6.5	11	J	9.1	11	J
Carbon disulfide	<	5.6	U	<	5.7	U	<	5.7	U	<	5.4	U	<	5.3	U	<	5.3	U
Methylene chloride	2	5.6	UJ	<	5.7	U	1.3	5.7	UJ	<	5.4	U	<	5.3	U	2.4	5.3	J
Toluene	<	5.6	U	<	5.7	U	<	5.7	U	<	5.4	U	<	5.3	U	1.5	5.3	J
Semivolatile Organics (µg/kg)																		
bis(2-Ethylhexyl)phthalate	780	370		42	380	J	89	380	J	<	360	U	<	350	U	<	350	U
Fluoranthene	210	370	J	<	380	U	<	380	U	<	360	U	<	350	U	<	350	U
Metals (mg/kg)																		
Aluminum	3480	50		3280	20		3340	20		3540	10.8		1960	10.5		4050	10.6	
Arsenic	1.6	0.5		1	0.5		1.2	0.5		0.99	0.54		0.56	0.53		0.57	0.53	
Barium	609	5		378	2		94.3	2		46	1.1		25.3	1.1		29.3	1.1	J
Beryllium	<	1	U	<	0.4	U	<	0.4	U	0.17	0.22	J	<	0.21	U	0.11	0.21	J
Calcium	214000	100		145000	40		127000	40		28000	21.5		32100	21		32900	21.3	J
Chromium	<	5	U	2	2		2.1	2		2.7	1.1		1.4	1.1		3.1	1.1	
Cobalt	1.9	5	J	1.1	2	J	<	2	U	1.1	1.1		1.2	1.1		1.5	1.1	
Copper	<	10	U	2.8	4	J	2.2	4	J	1.5	2.2	J	1.2	2.1	J	1.5	2.1	J
Iron	1970	50		2060	20		2300	20		3340	10.8		1790	10.5		3320	10.6	
Lead	1.2	0.5		1.5	0.5		1.8	0.5		2.5	0.54		1.6	0.53		1.5	0.53	
Magnesium	11500	100		13300	40		8620	40		4680	21.5		2010	21		4530	21.3	J
Manganese	19.6	5	J	19.9	2	J	22	2	J	26.8	1.1	J	33	1.1	J	37.4	1.1	J
Mercury	<	0.1	U	<	0.1	U	<	0.1	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	<	20	U	<	8	U	3.5	8	J	3.5	4.3	J	1.9	4.2	J	3.5	4.3	J
Potassium	504	2500	J	336	1000	J	584	1000	J	910	538		563	526		824	532	

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J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

(1) Duplicate for preceeding sample number.

TABLE 10-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 48B CANNON AFB

LOCATOR	CAN049-4904-0015			CAN049-4904-0020			CAN049-4904-0025			CAN049-4904-0030			CAN049-4904-0035			CAN049-4904-0040		
LAB SAMPLE NUMBER	0397900013SA			0397900014SA			0397900015SA			0397900017SA			0397900018SA			0398680011SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.																		
Sodium	<	2500	U	<	1000	U	<	1000	U	<	538	U	<	526	U	<	532	U
Thallium	<	2	U	<	1	U	<	1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	18.5	5		18	2		11.5	2		10.3	1.1		5.6	1.1		9.6	1.1	
Zinc	5.1	10	J	4.7	4		4.2	4		5.8	2.2		4.5	2.1		6.4	2.1	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	594	44.9		<	45.5	U	<	45.6	U	<	43	U	<	42.1	U	<	42.6	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

(1) Duplicate for preceeding sample number.

TABLE 10-4

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 48B CANNON AFB
ABOVEGROUND STORAGE TANK

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations (2)	Upper Tolerance Limit (UTL) Background Concentration(3)	Reported Level in Clovis, NM Region (4)	Does Maximum Detected Exceed Background
CAN049-4903-0000	Aluminum	16,300	1,410 - 11,000	10,540	50,000	NO**
CAN049-4903-0000	Arsenic	3.9	0.67 - 28	15.5	6.5	NO
CAN049-4904-0010	Barium	2350	14.5 - 1200	642	500	**YES**
CAN049-4903-0000	Beryllium	0.65	0.17 - 0.77	0.73	1-2	NO
CAN049-4903-0000	Chromium	12.2	4 - 15.4	12.5	30	NO
CAN049-4904-0000	Cobalt	4.7	0.85 - 5.3	4.5	3-7	NO**
CAN049-4903-0000	Copper	8.7	<2 - 18.4	*	20	NO**
CAN049-4903-0000	Lead	7.5	1.1 - 46	25.8	15	NO
CAN049-4903-0000	Manganese	184	22.4 - 216	164	500	NO**
CAN049-4903-0005	Mercury	0.6	<0.1 - <0.12	*	0.032 - 0.085	**YES**
CAN049-4904-0000	Nickel	14.5	1.3 - 9.8	9	15	NO**
CAN049-4904-0010	Thallium	0.28	0.14 - 0.22	*	----	**YES**
CAN049-4903-0000	Vanadium	23.8	5.2 - 28.3	25.3	30-70	NO
CAN049-4903-0000	Zinc	28.6	<4.3 - 27.5	21.9	45	**YES**

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1994) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).

Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1993).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

(4) USGS 1984.

* Data insufficient to calculate UTL of background concentration.

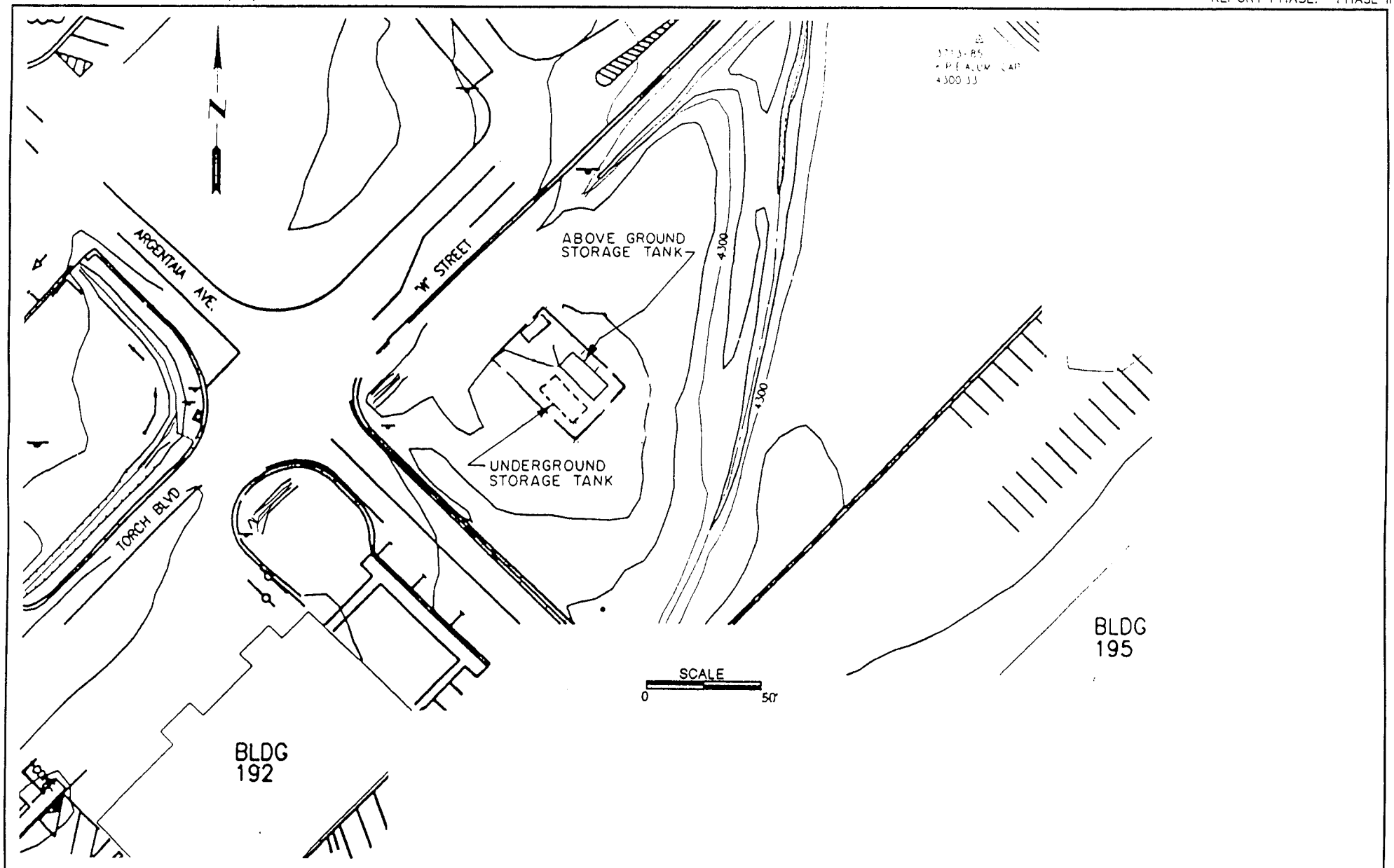
** Maximum concentration within or only slightly above Base-wide background range and within naturally occuriring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 10-5

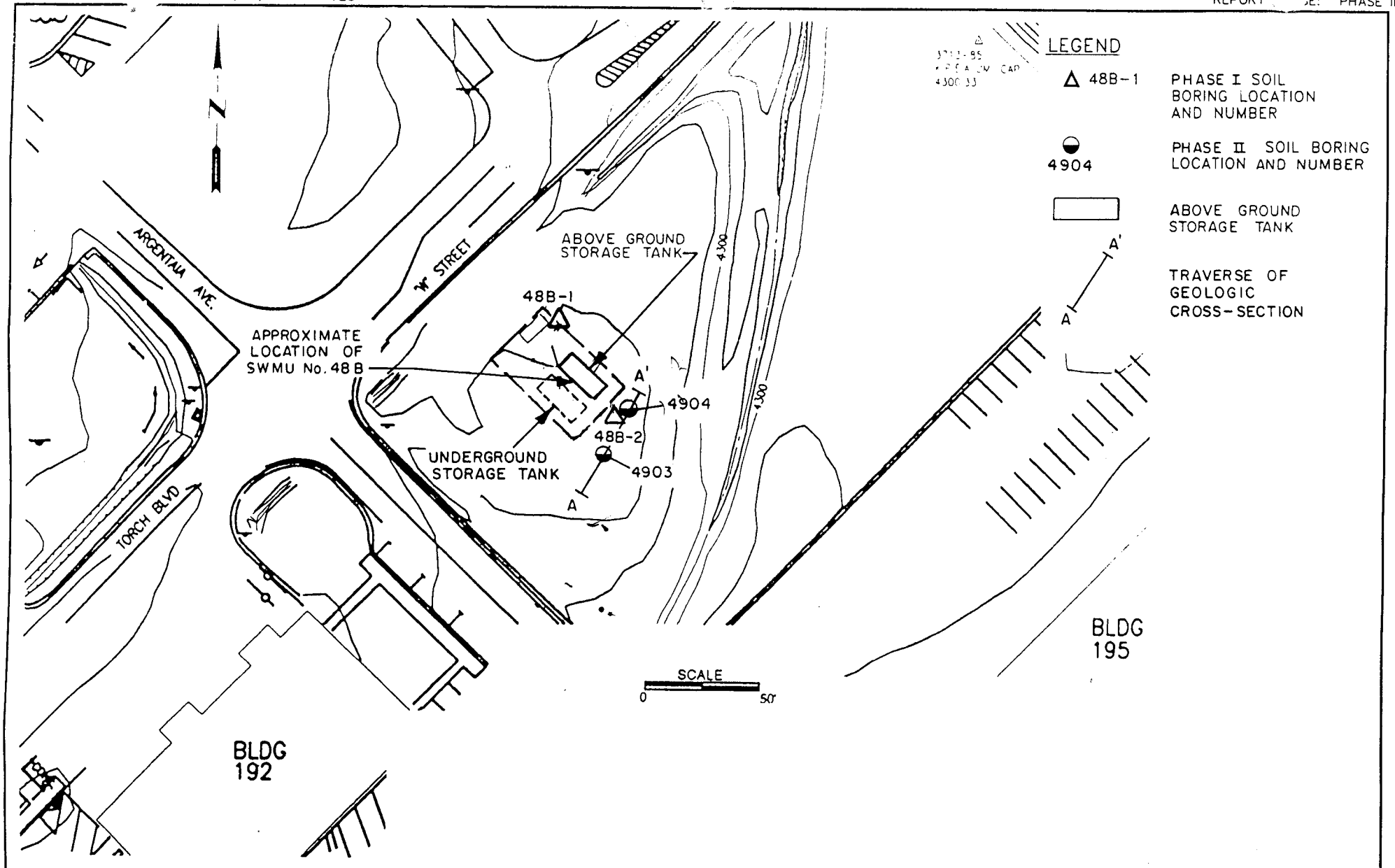
COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SWMU 48B TO RBCs FOR RESIDENTIAL SOIL ABOVEGROUND STORAGE TANK

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?
Acetone	0.014	7,800	NO
Carbon Disulfide	0.0012	7,800	NO
Methylene Chloride	0.0047	85	NO
Toluene	0.003	16,000	NO
Bis(2-ethylhexyl)phthalate	0.78	46	NO
Fluoranthene	0.21	3,100	NO
Barium	2,350	5,500	NO
Mercury	0.6	23	NO
Nickel	14.5	1,600	NO
Thallium	0.28	6.3	NO
Zinc	28.6	23,000	NO

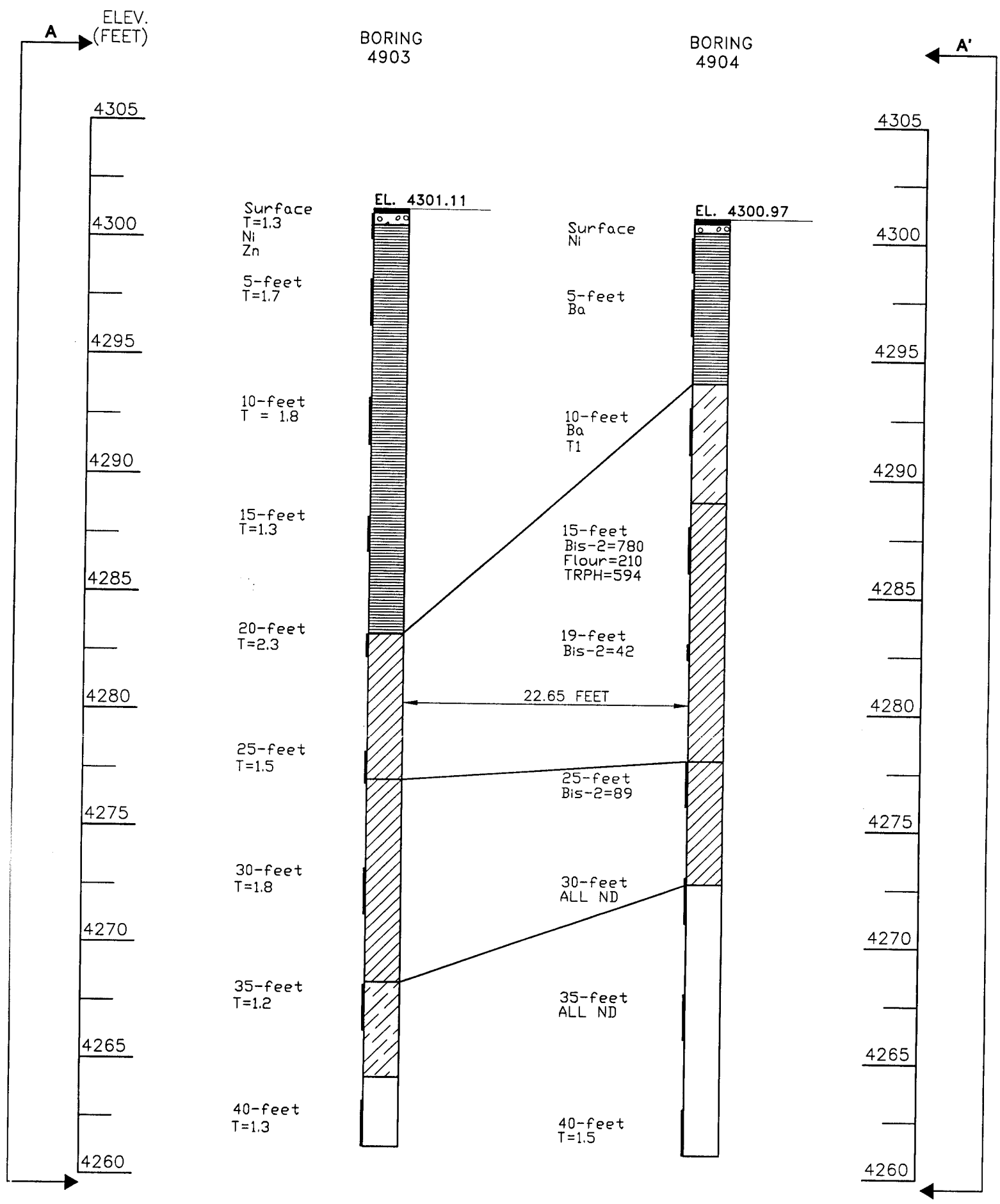
(1) EPA Region III Risk-Based Concentrations for Residential Soil (EPA 1994).



DRN BY SCR	DATE 09/19/94	ABOVE GROUND STORAGE TANKS - SWMU 488 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. C3M11MM
CHK'D BY	REVISIONS: 0		FIG. No. 10-1



DRN BY SCR	DATE 09/19/94	ABOVE GROUND STORAGE TANKS - SWMU 48B SITE PLAN WITH PHASE I & PHASE II BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	10 - 2



SWMU-48B LEGEND

- ASPHALT
- SANDY GRAVEL (GW)(FILL)
- SILTY CLAY (CL)
- SILT (ML)
- CLAYEY SILT (ML)
- SANDY SILT (ML)
- SAND (SP)
- SAMPLED INTERVAL

T=Toluene
Bis-2=Bis(2-ethylhexyl)phthalate
Flour=Flourantheue
TRPH=Total Recoverable Petroleum Hydrocarbous
Ba=Barium
Ni=Nickel
Tl=Thallium
Zn=Zinc
ND=Not Detected
Note: All results are in $\mu g/kg$ except for TRPH (mg/kg). Only those metals that exceeded UTLS and background levels are listed.

SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

SWMU-48B - SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
CANNON AIR FORCE BASE NEW MEXICO

DRN. BY: TBS	DATE: 03/17/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	10-3

11.1 SITE BACKGROUND

11.1.1 Site Description

SWMU No. 83 was a sump located about 90 feet northwest of Building 120 (Figure 11-1). The sump was removed in 1993. A portion of the site of the former sump is presently paved. The sump was constructed in a 12- by 14-foot concrete slab. The actual depth of the former sump is unknown.

11.1.2 Site History

The installation date and initial use of SWMU No. 83 are unknown. The sump was removed in 1993. Historically, the sump received rain water, wash water, and dilute waste oil generated from flight line operations.

11.1.3 Current Use

The sump has been removed and is currently partially paved.

11.1.4 Potential Contaminants

Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals.

11.1.5 Previous Investigations

During the Phase I RFI, three soil borings were drilled and sampled to a depth of 10 feet bgs (LRL 1993) at the site of the former sump to determine whether a release of SWMU-related chemicals had occurred from the sump. The previous boring locations are shown on Figure 11-2. Target analytes for the samples collected included TCL VOCs, cyanide, TAL

metals, and TRPH. TRPH was detected in all three borings at the surface and in Boring Nos. 83-1 and 83-2 at 2.5 and 5 feet. The highest concentration (5,000 ppm) occurred at 2.5 feet in Boring No. 83-2. Aluminum, iron, nickel, potassium, zinc, copper, and manganese were detected in low concentrations at the surface and subsurface samples in all of the borings. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU (LRL 1993).

11.1.6 Phase II Sampling Objectives

The sump at this site has been removed. The Phase I investigation sampled soils to 10 feet bgs. The Phase II investigation included three new soil borings to a depth of 25 feet bgs. Six soil samples were collected for chemical analysis from the surface to the bottom of each boring. Chemical analysis included VOCs, SVOCs, TAL metals, and TRPH.

New data collected during the Phase II investigation were used to complete a screening-level risk evaluation and to characterize the vertical extent of soil contamination. The results of this evaluation were the basis for recommending either further evaluation or no further action.

The overall objective of sampling at the site of the former sump was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the sump which could pose a significant risk to human health or the environment. The analytical data collected from this investigation were used in a health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the former sump. Potential release points include spills at the surface that may have occurred during removal by pumping from the sump and leaks in the sump.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

11.2 FIELD INVESTIGATION AND DATA COLLECTION

11.2.1 Soils Sampling

Two soil borings were drilled and soil samples collected in the area surrounding the presumed location of the former sump. Three borings were initially planned for this SWMU, however, an overhead powerline to which power could not be disconnected prevented drilling the boring planned for the pad at the sump location. The borings northwest and southeast of the pad were drilled in roughly the planned locations (Figure 11-2). The borings were drilled to a total depth of 24.5 to 25 feet. One boring was drilled at each end of the presumed location of the unit. The boring locations were chosen to assess the presence and extent of site-related soil contaminants at the 25-foot depth interval (15 feet below the Phase I RFI soil borings). Phase II RFI boring numbers and sample descriptions are shown in Table 11-1 and on Figure 11-2.

Surface soil samples were collected from 0 to 2.0 feet in boring 8305 and from 0.5 to 2.0 feet in boring 8306. Both borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, 18 to 20 feet, and 23 to 25 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

Since the site at the location of boring 8306 is currently covered by pavement, the surface sampling interval began immediately below the pavement surface.

Soils were field screened for headspace during drilling activities. The headspace results are shown on Table 11-2. Borings 8305 and 8306 contained no visual or field screening (headspace) indications of contamination. No odors were noted during drilling or sampling activities.

11.2.2 Geologic Summary of Boring Logs

Logs from the two Phase II RFI borings show a subsurface lithology consisting of Ogallala Formation sediments in a fining upward sequence. Boring 8306 had a 4-inch-thick asphalt pavement at the surface. Below the asphalt pavement is a 3- to 4-inch layer of sandy gravel fill placed as a foundation for the pavement. Silty clay fill material (USCS symbol CL) with some gravel and some black staining was encountered below this layer in boring 8306 to a depth of 4.2 feet. The same silty clay fill material was encountered from the surface to 3.8 feet in boring 8305. Below the fill layer in both borings, a silty clay alluvium (USCS symbol CL) was found to depths of 17.8 and 18 feet in borings 8305 and 8306, respectively. The silty clay is typically light brown or red, medium plastic, medium stiff to stiff, and moist. Some calcium carbonate and caliche cementation was present in isolated zones. Silt (USCS symbol ML) was encountered below the silty clay layer in both borings to total boring depths of 24.5 and 25 feet in borings 8305 and 8306, respectively. The silt is light brown and is typically dry and hard with numerous calcium carbonate nodules and caliche cemented zones. A simplified view showing the borings in stick-log format is shown on Figure 11-3.

11.2.3 Site Topography

The site is level with a thin asphalt pavement south of the SWMU and bare ground north and west of the SWMU. Building 120 is about 100 feet to the southeast of the SWMU, the flight line is about 150 feet to the south of the SWMU, and Building 3313 is about 100 feet west of the SWMU.

11.3 CHEMICAL INVESTIGATION RESULTS

11.3.1 General

Soil samples were collected from two borings (8305 and 8306). Sampling and analyses performed are summarized in Table 11-1. A summary of the analytical results for these soil samples is provided in Table 11-3. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

11.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN083-8305-0000 and CAN083-8306-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 11-1.

No VOC compounds were detected in any of the samples. Both near-surface samples had reported concentrations of SVOCs in the form of PAHs. The PAHs reported included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Total PAH concentrations in sample CAN083-8306-0000 were the highest at a concentration of 885 μg/kg, followed by sample CAN083-8305-0000 at a concentration of 825 μg/kg. No other SVOC compounds were reported for any of the samples. Petroleum hydrocarbons as TRPH were detected at concentrations of 325 mg/kg, and 127 mg/kg in samples CAN083-8305-0000, CAN083-8306-0000, respectively.

11.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN083-8305-0005, CAN083-8305-0010, CAN083-8305-0015, CAN083-8305-0020, and CAN083-8305-0025 for boring 8305, CAN083-8306-0005, CAN083-8306-0010, CAN083-8306-0015, CAN083-8306-0020, and CAN083-8306-0025 for boring 8306) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 11-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOCs reported were toluene and 2-butanone at concentrations of 1.4 μg/kg and 1.5 μg/kg reported for samples CAN083-8305-0015 and CAN083-8306-0010, respectively. Only one SVOC, phenol, was reported for samples CAN083-8306-0005 and CAN083-8306-0010 at concentrations of 1,700 μg/kg and 59 μg/kg, respectively. No petroleum hydrocarbons as TRPH were reported for any of the subsurface samples.

11.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 11-1. The range of results for metals reported in these soil samples are summarized in Table 11-A.

TABLE 11-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	13/13	4,750	8306-0020	10,800	8305-0000
Antimony	0/13	-	-	-	-
Arsenic	13/13	0.56	8306-0025	2.6	8306-0000
Barium	13/13	75.1	8306-0020	633	8305-0010
Beryllium	10/12	0.31	0306-0020	0.62	8306-0010
Cadmium	1/13	0.46	8306-0025	0.46	8306-0025
Calcium	13/13	8,600	8305-0000	233,000	8305-0020
Chromium	12/13	3.9	8306-0010	11	8305-0000
Cobalt	13/13	1.2	8305-0025	4	8306-0005
Copper	11/12	2.1	8306-0020	8.1	8305-0000
Iron	13/13	3,130	8305-0025	10,200	8305-0000
Lead	13/13	1.5	8305-0020	12.9	8305-0000
Magnesium	12/12	1,790	8305-0000	16,400	8305-0025
Manganese	13/13	27.2	8305-0025	157	8305-0000
Mercury	0/12	-	-	-	-
Nickel	11/12	5	8326-0020	9	8305-0000
Potassium	12/12	852	8305-0020	1,840	8305-0015
Selenium	0/12	-	-	-	-
Silver	0/12	-	-	-	-
Sodium	0/12	-	-	-	-
Thallium	0/12	-	-	-	-
Vanadium	12/12	109	8306-0020	19.8	8305-0000
Zinc	12/12	7.4	8305-0025	23.3	8305-0000

11.4 DATA ASSESSMENT

An assessment of the Site No. 120 (SWMU 83) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

11.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicated that only two borings were drilled at the site instead of the three approved in the Final Work Plan Addendum (W-C 1994). The third boring could not be drilled due to overhead hazards.

11.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). A detailed review of SWMU 83 data is provided in the QCSR.

For the organic analyses, no qualification of data was required based on outlying accuracy parameters. The MS recoveries for antimony, selenium, and thallium were below evaluation criteria, and the MS recovery was above evaluation criteria for barium and lead. Antimony, selenium, and thallium data for all SWMU 83 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected barium and lead data were qualified as estimated **J** to indicate a potential high bias for samples CAN083-8306-0005, CAN083-8306-0010, CAN083-8306-0015, CAN083-8306-0020, and CAN083-8306-0025. Additionally, acetone and methylene chloride data were qualified as nondetect **U** for several samples based on blank contamination.

Precision parameters were within evaluation criteria for the organic analyses and the matrix duplicate samples. For the field duplicate samples CAN083-8306-0010 and CAN083-8306-8561, the results for barium were outlying evaluation criteria. Barium data for the field duplicate samples were qualified as estimated **J**.

11.4.3 Reporting Limits

Reporting limits were raised for several metal analyses. In no case were the RLs elevated by more than 10 times the nominal RL. For selenium and thallium analyses, reporting limits were raised due to either matrix interference or dilutions. Selenium and thallium data, which had elevated reporting limits based on the matrix interferences, were qualified estimated **J** (detects) or **UJ** (nondetects). Lead and arsenic analyses for several samples required dilutions due to matrix interferences or concentrations above the calibration range. Method 6010 analyses required dilutions which elevated the reporting limits due to calcium concentrations above the calibration range.

11.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 83 were determined to meet quality criteria, and the elevated reporting limits were evaluated and judged not to limit the use of the data for the human health risk screening. Target analyte RLs, except thallium, were reported if they were detected below the RBCs. Thallium was reported as nondetect in all the samples (in nine samples at an RL which was below the RBC and in six samples at an RL above the RBC). This was judged not to be a limitation because if thallium was present at SWMU 83 it would have been detected at least once. A review of the field activities indicated the inability to drill and sample the third boring. Based on the data review and other information, including field observations, data which were collected were judged to be acceptable to identify and quantitate target analytes at SWMU 83.

11.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas west and south of the location of the sump (Figure 11-2). Three borings were originally planned for this site, however, due to overhead power line restrictions, only two borings could be drilled in the locations shown on Figure 11-2. One boring, 8305, was located about 20 feet west of the sump, and the second boring, 8306, was located about 10 to 15 feet south of the sump near previous investigation boring 83-2 (Figure 11-2). The borings assessed the presence of contamination to the 25-foot depth, 15 feet deeper than the previous investigation borings. A simplified stick-log view of the borings along with a summary of the analytical results is shown as Figure 11-3.

The only VOC detected was toluene at the 15-foot depth interval in boring 8305 at a concentration of 1.4 μg/kg (Figure 11-3 and Table 11-3). The surface samples from both borings contained reportable concentrations of SVOCs in the form of PAHs (Figure 11-3 and Table 11-3). Total PAH concentrations in the surface samples from borings 8305 and 8306 were 825 μg/kg and 885 μg/kg, respectively. PAHs are common contaminants from asphalt. Boring 8306 is capped with asphalt, which may account for some or all of the PAHs detected there in the surface sample. Boring 8305 is not capped with asphalt, but had similar PAH results, indicating that the PAHs may be site-related. The only non-PAH SVOCs detected were phenol and 2-butanone in subsurface samples from boring 8306. Phenol was detected at the 5- and 10-foot depth intervals in this boring at concentrations of 1,700 μg/kg and 59 μg/kg, respectively. 2-Butanone was detected only in the 10-foot sample at a concentration of 1.5 μg/kg. TRPH was detected only in the surface samples of borings 8305 and 8306 at concentrations of 325 mg/kg and 127 mg/kg, respectively. All soil samples below 15 feet of depth in boring 8305 and below 10 feet of depth in boring 8306 had no reported concentrations of any analytes.

Metals that exceeded the UTLs and background concentrations are shown next to the sample interval where they were detected on Figure 11-3. A discussion of these metal detections is provided in Section 11.6.

11.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals of potential concern were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the UTL of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 11-4 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. A brief discussion of the background comparison interpretations is given below.

The maximum detected concentration of aluminum (10,800 mg/kg) exceeded the background UTL of 10,540 mg/kg. However, this concentration was within in the range of detected Base-wide background concentrations and was consistent with the literature values for aluminum in the region (50,000 mg/kg). Therefore, aluminum was considered to be within background levels and was not retained for further evaluation.

The maximum detected concentration of zinc (23.3 mg/kg) exceeded the background UTL of 21.9 mg/kg. However, this concentration was within the range of detected Base-wide background concentrations and was consistent with the literature values for zinc in the region (45 mg/kg). Therefore, zinc was considered to be within background levels and was not retained for further evaluation.

11.7 RISK EVALUATION

11.7.1 Site Conceptual Exposure Model

There are three potentially complete exposure pathways at SWMU 83: direct contact with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the Base or at the Base boundary. Potential receptors at the SWMU include Base workers (e.g., military and Base personnel, Base contractors, hypothetical future construction workers, occasional Base visitors) (e.g., families of military personnel, visitors at those sites without restricted access), and residential receptors at the Base boundary downgradient of the SWMU who may use the groundwater. A complete discussion of potentially complete exposure pathways and potential receptors is presented in Section 3.4 and Figure 3-3.

11.7.2 Comparison of Concentrations in Soil to RBCs

Table 11-3 shows a summary of chemicals detected in soil samples at SWMU 83. Maximum detected soil concentrations of organic compounds and metals which exceeded background levels (Section 11.6) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether a significant release (i.e., that could pose a risk to human health) has occurred at SWMU 83. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived using accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is given in Section 3.4 and Appendix D.

This site is partially paved with asphalt. Samples from boring 8306 were collected from beneath the asphalt; therefore, PAHs detected in the surface soil may be related to the asphalt and not SWMU 83 activities. However, the surface sample from Boring 8305 also contained PAHs at concentrations similar to boring 8306 and may be site-related. To be conservative, the highest detected PAH concentrations were used to estimate potential risk at this SWMU.

Table 11-5 shows the comparison of SWMU concentrations to residential soil RBCs. Benzo(a)pyrene was the only chemical detected at a concentration (0.12 mg/kg) which slightly exceeded the residential soil RBC of 0.088 mg/kg. The potential carcinogenic risk from this concentration is 1.4×10^{-6}. The estimated risk is within EPA target risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) for exposure to chemicals released from a hazardous waste site (EPA 1990a, 1990b, 1991a, 1992a). This potential risk is based on residential exposure assumptions; however, SWMU 83 is a sump located in an industrial area of the Base. This area is likely to remain an industrial area; therefore, using residential RBCs significantly overestimates likely risks at this SWMU. The maximum detected concentration of benz(a)pyrene (0.12 mg/kg) did not exceed the industrial soil RBC of 0.39 mg/kg. Therefore, no chemicals were detected at concentrations which are likely to pose a potentially significant human health risk based on the most likely future land use scenario for SWMU 83.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, toluene,

naphthalene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU.

At SWMU 83, TRPH was detected in only two of fifteen samples at a maximum concentration of 325 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Benzo(a)pyrene was the only toxic constituent of TRPH that was detected at a concentration exceeding the RBC for residential soil (see Table 11-5), and its concentration was below the RBC for industrial soil indicating that no risk is likely for the given use of the site. In addition, it is not likely that the other TRPH constituents would contribute significantly to risks at the site. Finally, the site is mostly paved which significantly limits exposures to soil.

11.7.3 Evaluation of the Groundwater Pathway

The vertical distribution of soil contamination was used to evaluate whether a release could pose a threat to groundwater. Contaminants (other than common lab contaminants) were essentially detected only in surface soil. This indicates that contaminants are not infiltrating and being transported to the groundwater located at approximately 240 feet to 280 feet bgs. The area where the sump was located is now partially paved so future infiltration will be limited.

11.7.4 Conclusion

The results of the soil investigation at SWMU 83 shows that no chemical release that poses an unacceptable health risk for any potential exposure pathway has occurred at this SWMU. Therefore, no further evaluation of this SWMU is warranted.

11.8 SUMMARY AND RECOMMENDATIONS

Twelve soil samples were collected from the two 25-foot soil borings drilled at this SWMU. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Fourteen organic compounds (nine of them are PAHs), and one metal were reported in the SWMU soil samples.

Toluene was detected in only one sample at a depth of 15 feet. PAHs and TRPH were detected only in the surface samples. Other non-PAH SVOCs were detected, but only at the 5- and 10-foot depths in one boring. There were no detected COCs below 15 feet in either boring. The vertical distribution of contaminants has been adequately defined, and potential impact to groundwater is considered low. Only one compound, benzo(a)pyrene, slightly exceeded RBCs. However, the estimated health risk due to this compound is between the EPA's target risk range of 10^{-4} to 10^{-6}. Because no unacceptable health risk exists, it is recommended that no further evaluation of the SWMU is necessary.

TABLE 11-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
SUMP - SITE NO. 120 (SWMU NO. 83)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 08305	0 - 2	CAN083 -8305-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN083 -8305-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN083 -8305-0010		Soil	X	X	X	X	2	1
	8 - 10	CAN083 -8305-8362	FD	Soil	X	X	X	X	2	1
	13 - 15	CAN083 -8305-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN083 -8305-8302	MRD	Soil	X	X	X	X	2	1
	18 - 20	CAN083 -8305-0020		Soil	X	X	X	X	2	1
	23 - 25	CAN083 -8305-0025		Soil	X	X	X	X	2	1
Boring 08306	0.5 - 2	CAN083 -8306-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN083 -8306-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN083 -8306-0010		Soil	X	X	X	X	2	1
	8 - 10	CAN083 -8306-8361	FD	Soil	X	X	X	X	2	1
	13 - 15	CAN083 -8306-0015		Soil	X	X	X	X	2	1
	13 - 15	CAN083 -8306-8301	MRD	Soil	X	X	X	X	2	1
	18 - 20	CAN083 -8306-0020		Soil	X	X	X	X	2	1
	23 -25	CAN083 -8306-0025		Soil	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 11-1 for locations of the borings.

TABLE 11-2

FIELD SCREENING DATA
PHASE II RFI
SUMP - SITE NO. 120 (SWMU NO. 83)

Boring/Sample Number	Date	Time Collected (hrs)	Time of Field Screening	Sample Depth	Field Screening Concentrations (ppm)
CAN-083-8305	12/13/94	1420	*	2.0	ND
		1430	*	5.0	ND
		1436	*	10.0	ND
		1448	*	15.0	ND
		1500	*	20.0	ND
		1512	*	25.0	ND
CAN-083-8306	12/13/94	1250	*	2.0	ND
		1305	*	5.0	ND
		1315	*	10.0	ND
		1326	*	15.0	ND
		1340	*	20.0	ND
		1350	*	25.0	ND

* Exact time unknown; indicates 1/2 hour after sample collection.
ND = Nondetect

TABLE 11-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 083 CANNON AFB

LOCATOR	CAN083-8305-0000			CAN083-8305-0005			CAN083-8305-0010			CAN083-8305-8362[1]			CAN083-8305-0015			CAN083-8305-0020		
LAB SAMPLE NUMBER	0398670001SA			0398670002SA			0398670003SA			0398670008SA			0398670004SA			0398670005SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	3.4	11	J	<	11	U	3.1	11	J	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	2.1	5.4	J	1.9	5.5	J	4.2	5.6	J	<	5.6	U	3.6	5.6	J	4.5	5.7	J
Toluene	<	5.4	U	<	5.5	U	<	5.6	U	<	5.6	U	1.4	5.6	J	<	5.7	U
Semivolatile Organics (µg/kg)																		
Benzo(a)anthracene	64	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	78	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	120	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(g,h,i)perylene	58	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Chrysene	84	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Fluoranthene	160	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Indeno(1,2,3-cd)pyrene	58	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Phenanthrene	73	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Phenol	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Pyrene	130	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)																		
Aluminum	10800	10.8		8450	11.1		7980	22.6		7210	22.6		7570	11.3		5530	57.3	
Arsenic	3.2	0.54		2.4	0.55		2.6	0.56		2.7	0.56		2	1.1		1	0.57	
Barium	92.6	1.1	J	83.8	1.1	J	633	2.3	J	454	2.3	J	90.8	1.1		234	5.7	J
Beryllium	0.44	0.22		0.41	0.22		0.54	0.45		0.37	0.45	J	0.45	0.23		<	1.1	U
Cadmium	<	0.54	U	<	0.55	U	<	1.1	U	<	1.1	U	<	0.56	U	<	2.9	U
Calcium	8660	21.5		95400	22.2		135000	45.2		132000	45.2		80900	22.6		233000	115	
Chromium	11	1.1		7.3	1.1		5.3	2.3		3.7	2.3		6.4	1.1		<	5.7	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 11-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 083
CANNON AFB

LOCATOR	CAN083-8305-0000			CAN083-8305-0005			CAN083-8305-0010			CAN083-8305-8362[1]			CAN083-8305-0015			CAN083-8305-0020		
LAB SAMPLE NUMBER	0398670001SA			0398670002SA			0398670003SA			0398670008SA			0398670004SA			0398670005SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.																		
Cobalt	3.8	1.1		3.1	1.1		2.8	2.3		2.8	2.3		3.4	1.1		3.4	5.7	J
Copper	8.1	2.2		5.2	2.2		4.6	4.5		4.1	4.5	J	4.4	2.3		<	11.5	U
Iron	10200	10.8		7200	11.1		6470	22.6		6000	22.6		6990	11.3		4040	57.3	
Lead	12.9	2.7		4.7	0.55		4.9	0.56		5.5	0.56		5.1	0.56		2.2	0.57	
Magnesium	1790	21.5		2430	22.2		4120	45.2		3860	45.2		4000	22.6		5830	115	
Manganese	157	1.1		85.6	1.1		106	2.3		95.1	2.3		116	1.1		40.3	5.7	
Nickel	9	4.3		8.7	4.4		5.9	9	J	5.5	9	J	7.3	4.5		<	22.9	U
Potassium	1800	539		1430	554		1400	1130		1210	1130		1840	565		852	2860	J
Vanadium	19.8	1.1		15.9	1.1		17.1	2.3		16.4	2.3		19.5	1.1		14.4	5.7	
Zinc	23.3	2.2		17.3	2.2		16	4.5		14.6	4.5		17	2.3		8.9	11.5	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	325	43.1		<	44.3	U	<	45.2	U	<	45.2	U	<	45.2	U	<	45.8	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 11-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 083 CANNON AFB

LOCATOR	CAN083-8305-0025			CAN083-8306-0000			CAN083-8306-0005			CAN083-8306-0010			CAN083-8306-8361[1]		
LAB SAMPLE NUMBER	0398670006SA			0398670010SA			0398710016SA			0398710015SA			0398670009SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	12	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	12	U	<	11	U	<	11	U	1.5	11	J	<	11	U
Methylene chloride	<	5.8	U	<	5.7	U	<	5.7	U	<	5.7	U	<	5.7	U
Toluene	<	5.8	U	<	5.7	U	<	5.7	U	<	5.7	U	<	5.7	U
Semivolatile Organics (µg/kg)															
Benzo(a)anthracene	<	380	U	85	380	J	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	<	380	U	120	380	J	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	<	380	U	160	380	J	<	370	U	<	370	U	<	380	U
Benzo(g,h,i)perylene	<	380	U	75	380	J	<	370	U	<	370	U	<	380	U
Chrysene	<	380	U	99	380	J	<	370	U	<	370	U	<	380	U
Fluoranthene	<	380	U	120	380	J	<	370	U	<	370	U	<	380	U
Indeno(1,2,3-cd)pyrene	<	380	U	68	380	J	<	370	U	<	370	U	<	380	U
Phenanthrene	<	380	U	48	380	J	<	370	U	<	370	U	<	380	U
Phenol	<	380	U	<	380	U	1700	370		59	370	J	<	380	U
Pyrene	<	380	U	110	380	J	<	370	U	<	370	U	<	380	U
Metals (mg/kg)															
Aluminum	5290	23.1		8240	11.4		6810	11.4		8790	22.7		7230	22.8	
Arsenic	1.1	0.58		2.6	1.1		2.4	1.1		1.5	0.57		2.2	0.57	
Barium	133	2.3	J	207	1.1	J	102	1.1		538	2.3	J	1360	2.3	J
Beryllium	<	0.46	U	0.45	0.23		0.49	0.23		0.62	0.45		0.57	0.46	
Cadmium	<	1.2	U	<	0.57	U	<	0.57	U	<	1.1	U	<	1.1	U
Calcium	180000	46.2		72000	22.9		75400	22.7		161000	45.4		173000	45.7	
Chromium	5.2	2.3		7.4	1.1		6.2	1.1		3.9	2.3		4.1	2.3	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceeding sample number.

TABLE 11-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 083 CANNON AFB

LOCATOR	CAN083-8305-0025			CAN083-8306-0000			CAN083-8306-0005			CAN083-8306-0010			CAN083-8306-8361[1]		
LAB SAMPLE NUMBER	0398670006SA			0398670010SA			0398710016SA			0398710015SA			0398670009SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.															
Cobalt	1.2	2.3	J	3.2	1.1		4	1.1		2.7	2.3		2	2.3	J
Copper	3.5	4.6	J	6.6	2.3		5.7	2.3		3.8	4.5	J	4	4.6	J
Iron	3130	23.1		7530	11.4		6640	11.4		5280	22.7		4660	22.8	
Lead	1.5	0.58		7.5	0.57		6	0.57	J	4.9	0.57	J	5.4	0.57	
Magnesium	16400	46.2		2660	22.9		2360	22.7		4970	45.4		4860	45.7	
Manganese	27.2	2.3		123	1.1		86.1	1.1		71.8	2.3		68.1	2.3	
Nickel	7.2	9.2	J	8.1	4.6		8.9	4.5		8.3	9.1	J	5.8	9.1	J
Potassium	883	1160	J	1330	571		1370	568		1440	1140		1240	1140	
Vanadium	17.1	2.3		15.9	1.1		14.7	1.1		12.1	2.3		11.5	2.3	
Zinc	7.4	4.6		18.2	2.3		15.1	2.3		14.3	4.5		11.6	4.6	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	<	46.2	U	127	45.7		<	45.4	U	<	45.4	U	<	45.7	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceeding sample number.

TABLE 11-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 083 CANNON AFB

LOCATOR	CAN083-8306-0015			CAN083-8306-0020			CAN083-8306-0025		
LAB SAMPLE NUMBER	0398710014SA			0398710013SA			0398710012SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)									
Acetone	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.6	U	4.5	5.5	J	<	5.6	U
Toluene	<	5.6	U	<	5.5	U	<	5.6	U
Semivolatile Organics (µg/kg)									
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	370	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U
Chrysene	<	370	U	<	370	U	<	370	U
Fluoranthene	<	370	U	<	370	U	<	370	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	370	U
Phenanthrene	<	370	U	<	370	U	<	370	U
Phenol	<	370	U	<	370	U	<	370	U
Pyrene	<	370	U	<	370	U	<	370	U
Metals (mg/kg)									
Aluminum	6480	11.2		4750	11.1		7440	11.1	
Arsenic	0.96	2.2	J	0.67	2.2	J	0.56	2.2	J
Barium	620	1.1	J	75.1	1.1	J	377	1.1	J
Beryllium	0.42	0.22		0.31	0.22		0.4	0.22	
Cadmium	<	0.56	U	<	0.55	U	0.46	0.56	J
Calcium	86400	22.4		85700	22.2		62300	22.3	
Chromium	4.7	1.1		4	1.1		5.3	1.1	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review. A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceeding sample number.

TABLE 11-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 083 CANNON AFB

LOCATOR	CAN083-8306-0015			CAN083-8306-0020			CAN083-8306-0025		
LAB SAMPLE NUMBER	0398710014SA			0398710013SA			0398710012SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.									
Cobalt	2.6	1.1		1.8	1.1		2	1.1	
Copper	2.9	2.2		2.1	2.2	J	2.7	2.2	
Iron	5030	11.2		3830	11.1		5540	11.1	
Lead	3.8	1.1		2.8	1.1	J	2.8	1.1	J
Magnesium	2940	22.4		3080	22.2		4520	22.3	
Manganese	67.9	1.1		41.3	1.1		50.9	1.1	
Nickel	6.5	4.5		5	4.4		6	4.5	
Potassium	1670	560		1280	555		1780	556	
Vanadium	11.1	1.1		10	1.1		12.9	1.1	
Zinc	12.6	2.2		8.8	2.2		13.3	2.2	
TRPH (mg/kg)									
Total Recoverable Petroleum Hydrocarbons	<	44.8	U	<	44.4	U	<	44.5	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review. A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

(1) Duplicate for preceeding sample number.

TABLE 11-4

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 83 CANNON AFB
SUMP SITE NO. 120

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations (2)	Upper Tolerance Limit (UTL) Background Concentration(3)	Reported Level in Clovis, NM Region (4)	Does Maximum Detected Exceed Background
CAN083-8305-0000	Aluminum	10,800	1,410 - 11,000	10,540	50,000	NO**
CAN083-8305-0000	Arsenic	3.2	0.67 - 28	15.5	6.5	NO
CAN083-8305-0010	Barium	633	14.5 - 1200	642	500	NO
CAN083-8306-0010	Beryllium	0.62	0.17 - 0.77	0.73	1-2	NO
CAN083-8306-0025	Cadmium	0.46	<0.51 - 4.2	*	----	YES
CAN083-8305-0000	Chromium	11	4 - 15.4	12.5	30	NO
CAN083-8306-0005	Cobalt	4	0.85 - 5.3	4.5	3-7	NO
CAN083-8305-0000	Copper	8.1	<2 - 18.4	*	20	NO
CAN083-8305-0000	Lead	12.9	1.1 - 46	25.8	15	NO
CAN083-8305-0000	Manganese	157	22.4 - 216	164	500	NO
CAN083-8305-0000	Nickel	9	1.3 - 9.8	9	15	NO
CAN083-8305-0000	Vanadium	19.8	5.2 - 28.3	25.3	30-70	NO
CAN083-8305-0000	Zinc	23.3	<4.3 - 27.5	21.9	45	NO**

(1) All units inmg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1994) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).

Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1993).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

(4) USGS 1984.

* Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occuriring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 11-5

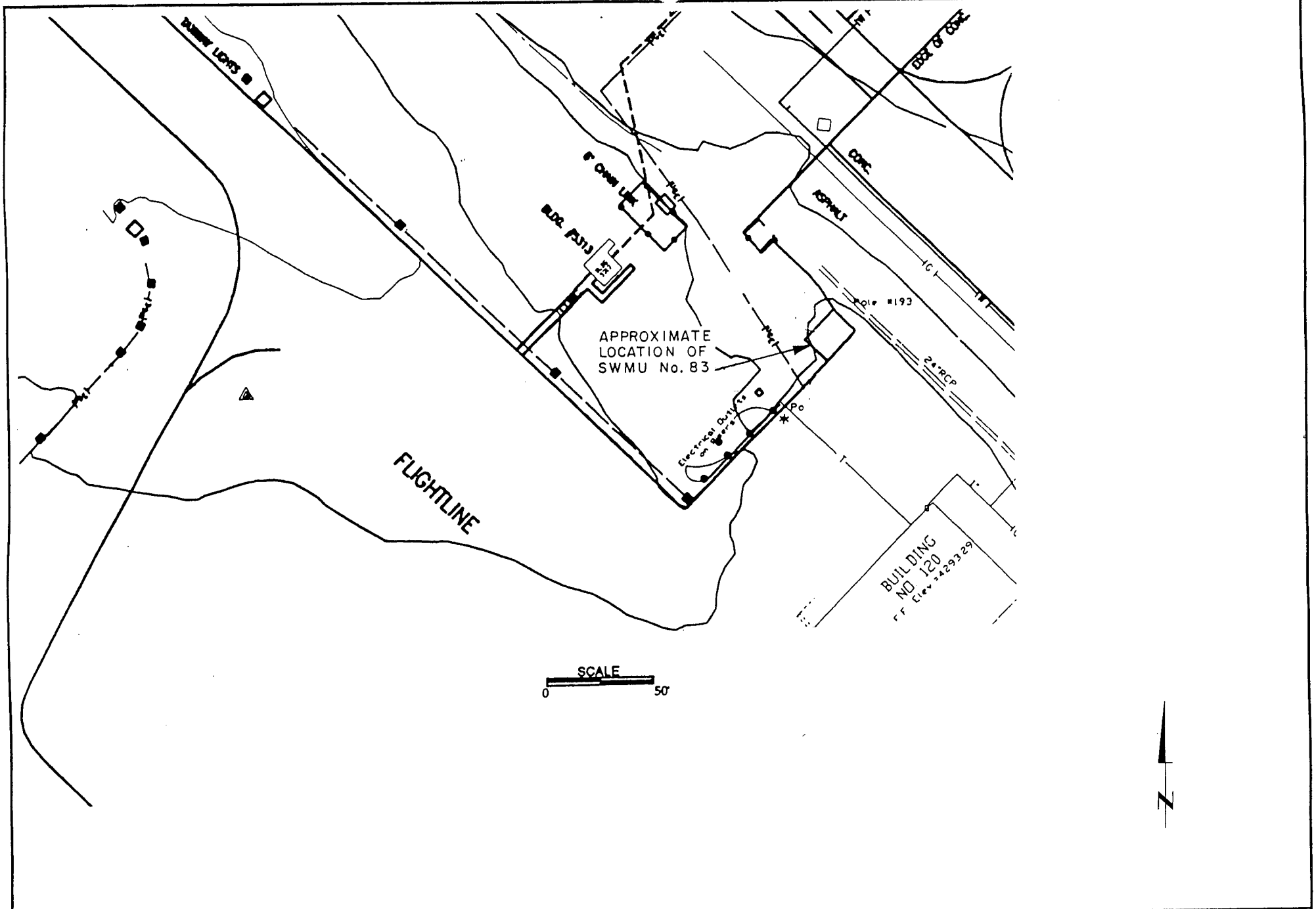
COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SWMU 83 TO RBCs FOR RESIDENTIAL SOIL SUMP SITE NO. 120

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Estimated Risk	Risk Type	Industrial Soil Risk-based Concentration(2) (mg/kg)	Exceeds RBC?
Acetone	0.0034	7,800	NO				
2-Butanone (MEK)	0.0015	47,000	NO				
Methylene Chloride	0.0045	85	NO				
Toluene	0.0014	16,000	NO				
Benzo(a)anthracene	0.085	0.88	NO				
Benzo(a)pyrene	0.12	0.088	YES	1.36×10^{-6}	Carcinogenic	0.39	NO
Benzo(b)fluoranthene	0.16	0.88	NO				
Benzo(g,h,i)perene	0.075	0.88	NO				
Chrysene	0.099	88	NO				
Fluoranthene	0.16	3,100	NO				
Indeno(1,2,3-cd)pyrelene	0.068	NA(a)					
Phenanthrene	0.073	NA(a)					
Phenol	1.7	47,000	NO				
Pyrene	0.13	2,300	NO				
Cadmium	0.46	39	NO				

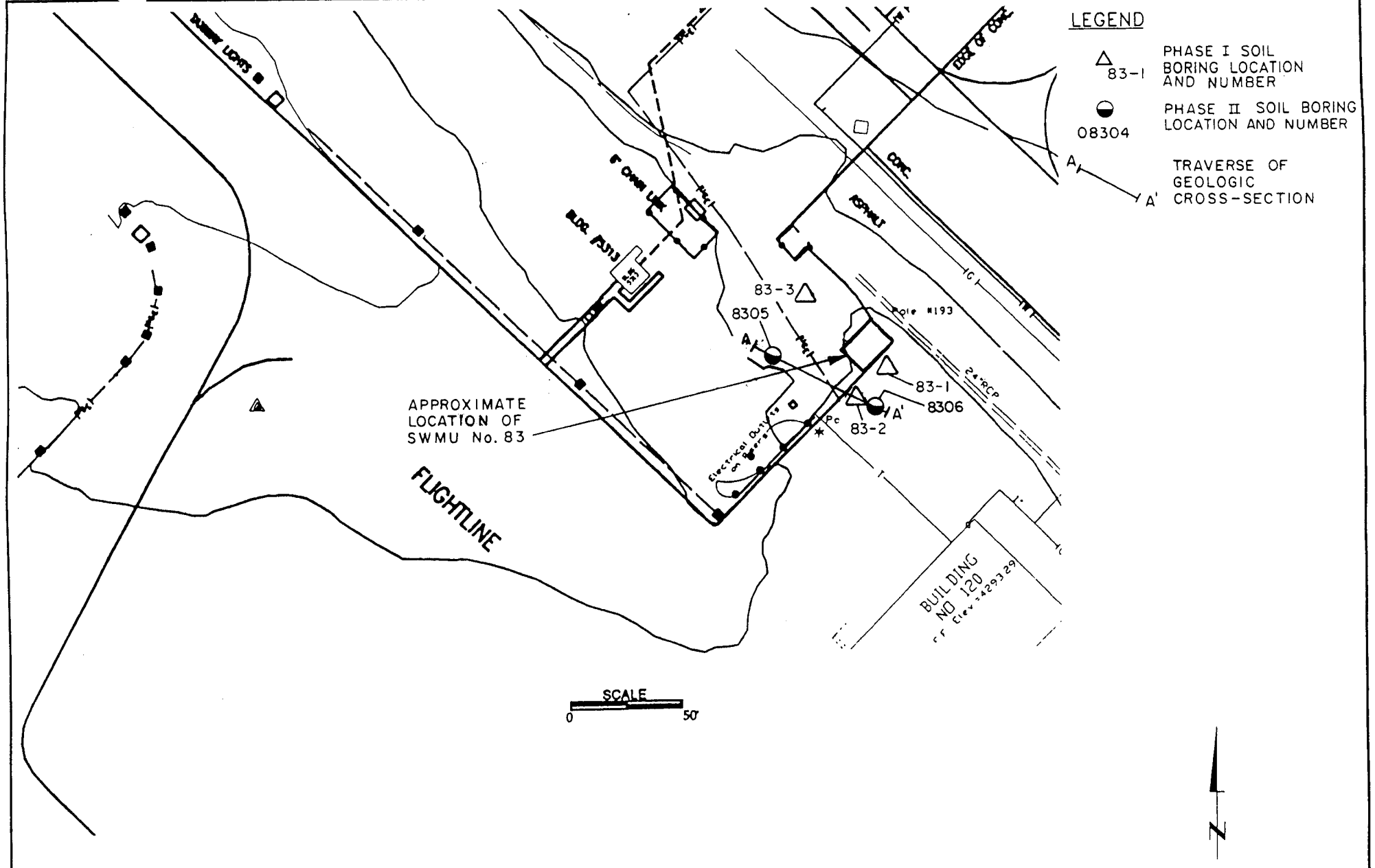
(1) EPA Region III Risk-Based Concentrations for Residential Soil (EPA 1994).

(2) EPA Region III Risk-Based Concentrations for Industrial Soil (EPA 1994).

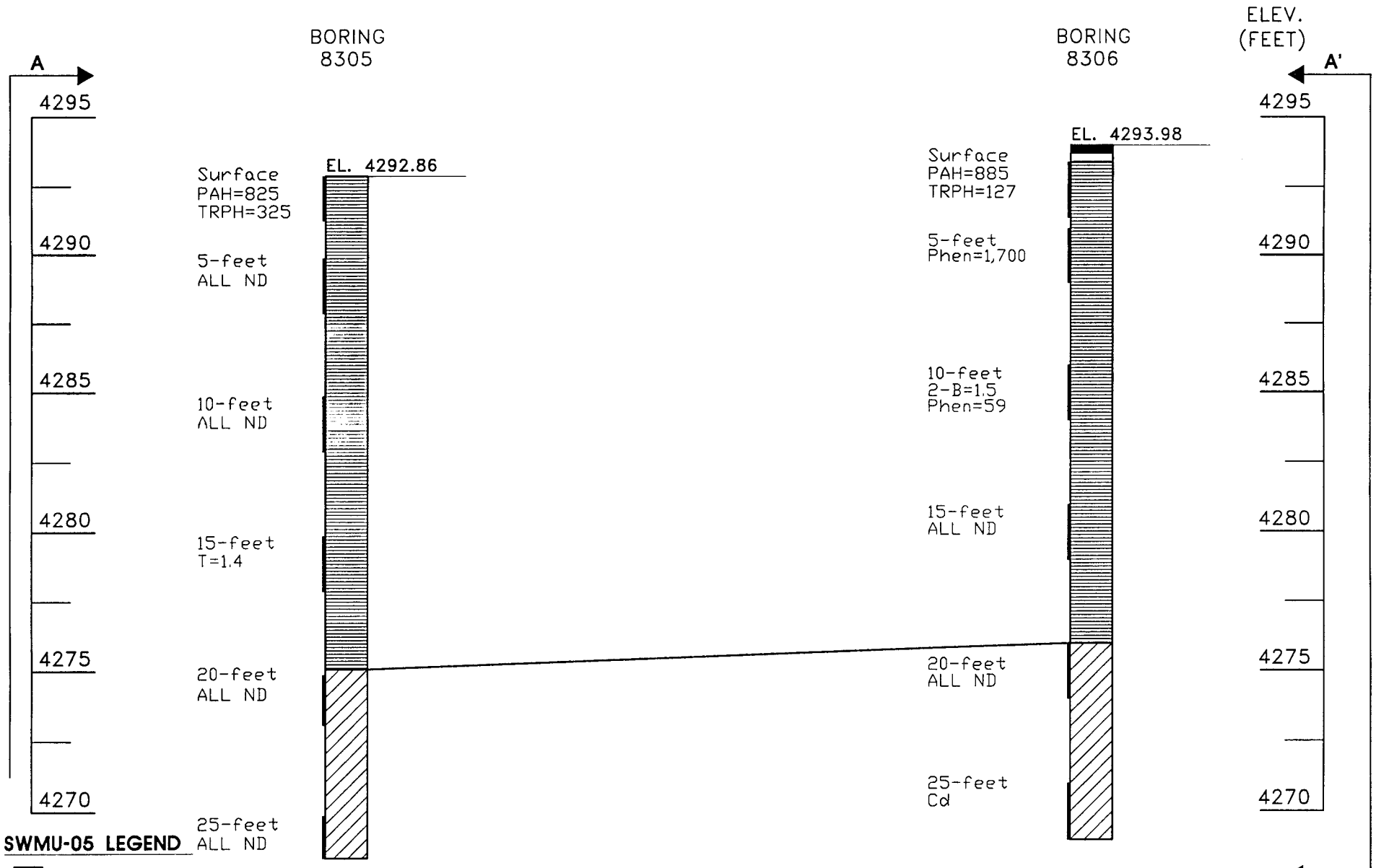
(a) Not Applicable: EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.



DRN BY: CJG	DATE: 06/16/94	SUMP – SWMU 83 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY:	REVISION: 0		FIG. NO. II-1



DRN BY: CJG	DATE: 06/16/94	SUMP - SWMU 83 SITE PLAN WITH PHASE I & PHASE II BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 11-2
CHK'D BY:	REVISION: 0			



SWMU-05 LEGEND

- ASPHALT
- SANDY GRAVEL (GW)(FILL)
- SILTY CLAY (CL)
- SILT (ML)
- SAMPLED INTERVAL

T=Toluene
PAH=Polycyclic Aromatic Hydrocarbons
Phen=Phenol
2-B=2-Butanone (MEK)
TRPH=Total Recoverable Petroleum Hydrocarbons
Cd=Cadmium
ND=Not Detected
Note: All results reported in $\mu g/kg$ except for TRPH (mg/kg)
Only those metals that exceeded UTLs and background levels are listed

SCALE: 1" = 5' HORIZONTAL
1" = 10' VERTICAL

SWMU-83 – SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
CANNON AIR FORCE BASE NEW MEXICO

DRN BY: TBS	DATE: 03/17/95	PROJECT NO.	FIG. NO.
CHK'D BY:	REVISION: 0	C3M11MM	11-3

12.0
EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING AREA - SWMU NO. 108

12.1 SITE BACKGROUND

12.1.1 Site Description

SWMU No. 108 is the Explosive Ordnance Disposal (EOD) Training Area located on the southeast corner of the Base directly west of the Fire Department Training Area (Figure 12-1). The area is circular in plan with a circumference of about 200 feet. The perimeter of the area is defined by a 1-foot-high earthen berm. Within the limits of the berm, the area is about 2 to 3 feet below surrounding grades and slopes downward toward the center. The area is routinely graded to remove surface vegetation and debris from explosives.

12.1.2 Site History

The area has been active since the early 1970s. The area is used to train Base personnel in the safe use of smoke bombs and large firecrackers used to simulate fires and explosions during military exercises.

12.1.3 Current Use

The SWMU remains an active facility.

12.1.4 Potential Contaminants

Potential contaminants include organic compounds, explosives, and metals.

12.1.5 Previous Investigations

During the Phase I RFI, five soil borings were drilled and sampled to a depth of 10 feet bgs (LRL 1993) at the site of the EOD Training Area to determine whether a release of SWMU-related chemicals had occurred from the training activity. The previous boring locations are

shown on Figure 12-2. The samples collected were analyzed for priority metals, cyanide, sulfide, total solids, and resistivity. Nickel was detected marginally above background in Boring Nos. 108-1, 108-2, and 108-5 at the surface. The cyanide data was rejected because the reported percent recoveries (%Rs) for the matrix spike analyses were less than 30 percent. The reactivity data was rejected because the samples were analyzed for total cyanide and sulfide rather than reactive cyanide and sulfide. No total sulfides were detected in any of the samples. Results of a risk assessment indicated minimal or no risk to human health or the environment from this SWMU (LRL 1993).

12.1.6 Phase II Sampling Objectives

The Phase I investigation sampled soils to 10 feet bgs, and some analytical data were rejected. The Phase II investigation will include five soil borings to a depth of 20 feet bgs. Five soil samples will be collected for chemical analysis from the surface to the bottom of each boring. Chemical analysis will include VOCs, SVOCs, TAL metals, TRPH, and explosives.

New data collected during the Phase II investigation were used to complete a screening-level risk evaluation and to characterize the vertical extent of soil contamination. The results of this evaluation were the basis for recommending either further evaluation or no further action.

The overall objective of sampling at the site of the EOD Training Area was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of the training operations which could pose a significant risk to human health or the environment. The analytical data collected from this investigation were used in a health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the EOD Training Area.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

12.2 FIELD INVESTIGATION AND DATA COLLECTION

12.2.1 Soils Sampling

Five soil borings were drilled and soil samples collected at the EOD Training Area. One boring was drilled near each of the five borings drilled and sampled during the Phase I RFI. The borings were drilled to a total depth of 19.5 to 20 feet. The boring locations were chosen to assess the presence and extent of site-related soil contaminants at the 20-foot depth interval (10 feet below the Phase I RFI soil borings). Phase II RFI boring numbers and sample descriptions are shown in Table 12-1 and on Figure 12-2.

Surface soil samples from all borings were collected from 0 to 0.5 feet. All borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, and 18 to 20 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1
- Explosives by EPA Method 8330

Soils were field screened for headspace during drilling activities. The headspace results are shown on Table 12-2. No field screening (headspace) or visual indications of contamination were observed while drilling and sampling the Phase II soil borings. No odors were noted during drilling or sampling activities.

12.2.2 Geologic Summary of Boring Logs

Logs from the five Phase II RFI borings show a subsurface lithology consisting of fine-grained Ogallala Formation sediments. All Phase II RFI borings at the SWMU encountered a 5- to 6-inch layer of silty clay (USCS symbol CL) at the surface. This silty clay is reddish-brown, low plastic, and dry. This layer may represent a disturbed surface zone from site

activities such as grading. Below the surface layer of silty clay, and to the termination depths of all borings, a clayey silt (USCS symbol ML) was encountered. The clayey silt is reddish-brown, dry, loose to medium dense and contains some caliche and caliche cemented zones. Calcium carbonate nodules are also dispersed throughout the clayey silt. The borings are shown in simplified stick-log format on Figure 12-3.

12.2.3 Site Topography

The site is level and is in an area of bare ground between a former taxiway and a former north-south runway.

12.3 CHEMICAL INVESTIGATION RESULTS

12.3.1 General

Samples were collected as identified in Section 12.2 to comply with permit and compliance agreement requirements. Soil samples were collected from five borings (1806 through 1810). Sampling and analyses performed are summarized in Table 12-1. A summary of the analytical results for these soil samples is provided in Table 12-3. For each sample type, the table provides results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

12.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN108-1806-0000, CAN108-1807-000, CAN108-1808-0000, CAN108-1809-0000, and CAN108-1810-0000) were analyzed for VOCs, SVOCs, metals, TRPH, and explosives as indicated in Table 12-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, no VOCs, SVOCs, or TRPH were reported for any of the near-surface samples.

12.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN108-1806-0005, CAN108-1806-0010, CAN108-1806-0015, and CAN108-1806-0020 for boring 1806, CAN108-1807-0005, CAN108-1807-0010, CAN108-1807-0015, and CAN108-1807-0020 for boring 1807, CAN108-1808-0005, CAN108-1808-0010, CAN108-1808-0015, and CAN108-1808-0020 for boring 1808, CAN108-1809-0005, CAN108-1809-0010, CAN108-1809-0015, and CAN108-1809-0020 for boring 1809, and CAN108-1810-0005, CAN108-1810-0010, CAN108-1810-0015, and CAN108-1810-0020 for boring 1810) were analyzed for VOCs, SVOCs, metals, TRPH, and explosives as indicated in Table 12-1.

Other than acetone and methylene chloride, which were qualified nondetected after they were determined to be laboratory contaminants, the only VOCs reported were toluene and 2-butanone in samples CAN108-1809-0010 and CAN108-1809-0015, respectively, at concentrations of 1.4 μg/kg and 1.9 μg/kg, respectively. No SVOCs, explosives, or TRPH were reported for any of the samples.

12.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 12-1. The range of results for metals reported in these soil samples are summarized in Table 12-A.

TABLE 12-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	25/25	2,300	1809-0005	14,200	1807-0000
Antimony	1/25	5.1	1810-0010	5.1	1810-0010
Arsenic	25/25	1.2	1810-0020	3.7	1809-0015
Barium	25/25	55.1	1807-0020	5,940	1806-0005
Beryllium	20/25	0.24	1807-0020	0.74	1807-0000
Cadmium	0/25	-	-	-	-
Calcium	25/25	2,590	1808-0000	263,000	1810-0020
Chromium	22/25	2.7	1806-0005	12.8	1807-0000
Cobalt	18/25	1.2	1807-0020	5.2	1807-0000
Copper	22/25	1.7	1807-0005	9.7	1807-0000

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Iron	25/25	1,880	1809-0005	13,000	1807-0000
Lead	25/25	1.2	1810-0020	11.7	1810-0000
Magnesium	25/25	1,480	1808-0000	6,220	1810-0020
Manganese	25/25	26.4	1810-0020	257	1810-0000
Mercury	0/25	-	-	-	-
Nickel	23/25	4	1809-0020	60.8	1807-0005
Potassium	24/25	365	1809-0005	2,930	1810-0015
Selenium	1/25	1.1	1808-0019	1.1	1808-0019
Silver	1/25	0.49	1810-0000	4.9	1810-0000
Sodium	0/25	-	-	-	-
Thallium	6/25	0.11	1806-0000	0.19	1807-0000
Vanadium	25/25	6.7	1809-0005	36.4	1809-0015
Zinc	24/25	5.3	1809-0005	32.4	1807-0000

12.4 DATA ASSESSMENT

An assessment of the EOD Training Area (SWMU 108) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

12.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

12.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). A detailed review of SWMU 108 data is provided in the QCSR.

For the organic analyses, no qualification of data was required based on outlying accuracy parameters. The MS recoveries for antimony and selenium were below evaluation criteria, and the MS recoveries were above evaluation criteria for barium, lead, and manganese. Antimony and selenium data were qualified for all SWMU 108 samples as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected barium and manganese data for samples CAN108-1809-1862, CAN108-1809-0000, CAN108-1809-0005, CAN108-1809-0010, CAN108-1809-0015, and CAN108-1809-0020 were qualified as estimated **J** to indicate a potential high bias. Detected lead data for boring 1806, 1807, and 1808 samples were qualified as estimated **J** to indicate a potential high bias. Additionally, acetone and methylene chloride and bis(2-ethylhexyl)phthalate data were qualified as nondetect **U** for several samples based on blank contamination.

Precision parameters were within criteria for the organic analyses. For the field duplicate samples CAN108-1808-0000 and CAN108-1808-1861, the results for aluminum data were outlying evaluation criteria, and the aluminum data were qualified as estimated **J**. The RPDs for the matrix duplicate analyses were outlying evaluation criteria for aluminum, barium, iron, lead, and manganese. Aluminum, barium, iron, and manganese data were qualified as estimated **J** for the samples from boring 1809, and lead data were qualified as estimated **J** for samples from boring 1810.

12.4.3 Reporting Limits

Reporting limits were raised for several metal analyses. In no cases were the RLs elevated by more than 10 times the nominal RL. For selenium and thallium analyses, reporting limits were raised due to either matrix interference or dilutions. Selenium and thallium data, which had elevated reporting limits based on the matrix interferences, were qualified estimated **J** (detects) or **UJ** (nondetects). Lead analyses for several samples required dilutions due to matrix interferences or concentrations above the calibration range. Method 6010 analyses required dilutions which elevated the reporting limits due to calcium concentrations above the calibration range.

12.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 108 were determined to meet quality criteria, and the elevated reporting limits did not limit the use of the data for the human health risk screening because either the RLs were below the RBCs or the laboratory would report estimated concentrations below the RBCs (if present). Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of contamination and to be used for the risk screening.

12.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas near previous investigation borings and other areas to provide adequate site coverage (Figure 12-3). Borings 1806 and 1809 were located near previous investigation borings 108-2 and 108-3, respectively. Borings 1807 and 1808 were located in the northern part of the site, while boring 1810 was located in the southern part of the site. The boring samples were used to assess the presence of contamination to the 20-foot depth, 10 feet deeper than the previous investigation borings. Simplified boring logs, along with a summary of the analytical results, are shown in stick-log format on Figure 12-3.

Toluene and 2-butanone were the only VOCs reported in any of the soil samples collected. The 10-foot sample in boring 1809 had a reported concentration of toluene at 1.4 μg/kg (Figure 12-3). 2-Butanone was reported in the 15-foot sample from boring 1809 at a concentration of 1.9 μg/kg. Explosives, SVOCs, or TRPH were not detected in any of the samples collected.

Metals that exceeded the UTLs and background concentrations are shown next to the sample interval where they were detected on Figure 12-3. A discussion of these metals detections is provided in Section 12.6.

12.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals of potential concern were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the UTL of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 12-4 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, chromium, cobalt, copper, lead, silver, and thallium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. Antimony, barium, manganese, nickel, selenium, vanadium, and zinc exceeded background levels and were retained for further evaluation as chemicals of concern. A brief discussion of the background comparison interpretations is given below.

Three of twenty-five soil samples contained aluminum at concentrations (12,000 to 14,200 mg/kg) which exceeded the background UTL of 10,540 mg/kg. These concentrations also slightly exceeded the maximum detected Base-wide background concentration of 11,000 mg/kg. However, these concentrations were all well below the regional value for aluminum (50,000 mg/kg). Therefore, aluminum was not considered to exceed background levels and was not retained for further evaluation.

Four of twenty-five soil samples contained barium at concentrations (661 mg/kg to 5,940 mg/kg) which exceeded the background UTL of 642 mg/kg. These concentrations also exceeded the regional barium literature value (500 mg/kg) by a maximum factor of 12. The maximum detected concentration also exceeded the detected range of Base-wide background concentrations. Even though barium has been shown to substitute for calcium in caliche (Klein and Hurlbutt 1985) and the high concentrations of barium may be naturally occurring,

to be conservative, barium was considered to exceed background levels and was retained for further evaluation.

The maximum detected concentration of beryllium (0.74 mg/kg) slightly exceeded the background UTL of 0.73 mg/kg. However, this concentration was within the detected range of Base-wide background concentrations and is consistent with literature values for beryllium values for the region. Therefore, beryllium was considered to be within background levels and was not retained for further evaluation.

The maximum detected concentration of chromium (12.8 mg/kg) slightly exceeded the background UTL of 12.5 mg/kg. However, this concentration was within the detected range of Base-wide background concentrations and was consistent with literature values for chromium in the region. Therefore, chromium was considered to be within background levels and was not retained for further evaluation.

The maximum detected concentration of cobalt (5.2 mg/kg) exceeded the background UTL of 4.5 mg/kg. However, this concentration was within the detected range of Base-wide background concentrations and is consistent with literature values for cobalt in the region. Therefore, cobalt was considered to be within background levels and was not retained for further evaluation.

A UTL for copper could not be calculated due to a large number of nondetects in the Base-wide background data set; therefore, this comparison was not done for copper. Instead, the maximum detected concentration (9.7 mg/kg)was compared to the range of detected background concentrations and to literature values. As Table 12-4 shows, the maximum detected concentration was within the range of detected Base-wide background concentrations and was consistent with the literature value for copper in the region (20 mg/kg). Therefore, copper was considered to be within background levels and was not retained for further evaluation.

12.7 RISK EVALUATION

12.7.1 Site Conceptual Exposure Model

There are three potentially complete exposure pathways at SWMU 108: direct contact with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the Base or at the Base boundary. Potential receptors at the SWMU include Base workers (e.g., military and Base personnel, Base contractors, hypothetical future construction workers, occasional Base visitors) (e.g., families of military personnel, visitors at those sites without restricted access) and residential receptors at the Base boundary downgradient of the SWMU who may use the groundwater. A complete discussion of potentially complete exposure pathways and potential receptors is presented in Section 3.4 and Figure 3-5.

12.7.2 Comparison of Concentrations in Soil to RBCs

Table 12-3 shows a summary of chemicals detected in soil samples at SWMU 108. Maximum detected soil concentrations of organic compounds and metals which exceeded background levels (Section 12.6) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether a significant release (i.e., that could pose a risk to human health) has occurred at SWMU 108. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived using accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is given in Section 3.5 and Appendix D.

Table 12-5 shows the comparison of SWMU concentrations with residential soil RBCs. Barium was the only chemical detected at a concentration (5,940 mg/kg) which exceeded the RBC (5,500 mg/kg). The potential noncarcinogenic hazard quotient from this concentration is 1.08 (5,940/5,500) which is a negligible increase above the target hazard quotient of 1.0. In addition, this concentration is well below the industrial soil RBC of 72,000 mg/kg. Therefore, the maximum concentration does not exceed acceptable levels for the likely use of the site. In addition, there is no apparent source of barium at this SWMU, and the high concentration was detected at a depth of 5 feet bgs while concentrations at the surface and at 10 feet in the same boring were not elevated. Therefore, even though this concentration was considered to exceed background, the barium is probably naturally-occurring. In

conclusion, no chemicals, including barium were detected at concentrations likely to pose an unacceptable human health risk at SWMU 108.

The only compounds that contribute significantly to the HI (i.e., that are within an order of magnitude of the residential RBC) are antimony, barium, and manganese. These chemicals do not have the same target organs, so their potential toxic effects are not additive. Antimony and manganese have HQs of less than 1.0. Therefore, barium is the only compound at this site which could potentially pose an unacceptable human health risk. Additionally, the HQs were determined using residential RBCs instead of industrial RBCs, which is a more likely exposure scenario for this site. Since none of the detected concentrations exceeded industrial RBCs (or even approach the industrial RBCs), the additive potential HQ will not exceed 1.0, and no unacceptable human health effects are expected at the site.

12.7.3 Evaluation of the Groundwater Pathway

The vertical distribution of soil concentrations was used to evaluate whether a release could pose a threat to groundwater. Since no chemicals were detected at concentrations of concern, and since there was essentially no contamination in the subsurface soil, it can be concluded that chemicals will not be transported to groundwater at significant concentrations.

12.7.4 Conclusions

The results of the soil investigation show no evidence of a chemical release at SWMU 108 that could pose an unacceptable human health risk. Therefore, no further evaluation of this SWMU is warranted.

12.8 SUMMARY AND RECOMMENDATIONS

Twenty-five soil samples were collected and analyzed from the five soil borings drilled at SWMU 108. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Four organic compounds and SWMU metals were reported as detected in the soil samples.

Only two organic compounds, toluene and 2-butanone, were reported in SWMU soil samples. These compounds were detected at low concentrations and at the 10- to 15-foot-depth intervals. No other organic compounds (including explosives) or TRPH were reported for SWMU soil samples. The vertical distribution of site contaminants has been adequately defined, and potential impact to groundwater is considered low. The only analyte to exceed RBCs, barium, resulted in an estimated hazard quotient that exceeded the recommended hazard quotient by an insignificant amount. Since there is no unacceptable health risk posed by any chemicals detected, it is recommended that no further evaluation of the SWMU is necessary.

TABLE 12-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING AREA (SWMU NO. 108)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters					Sample Containers	
					VOCs	SVOCs	Metals	TRPH	EXPL	4 oz. jars	16 oz. jars
Boring 01806	0 - 0.5	CAN108-1806-0000		Soil	X	X	X	X	X	2	1
	0 - 0.5	CAN108-1806-1802	MRD	Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1806-0005		Soil	X	X	X	X	X	2	1
	8 - 10	CAN108-1806-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN108-1806-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN108-1806-0020		Soil	X	X	X	X	X	2	1
Boring 01807	0 - 0.5	CAN108-1807-0000		Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1807-0005		Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1807-1801	MRD	Soil	X	X	X	X	X	2	1
	8 - 10	CAN108-1807-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN108-1807-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN108-1807-0020		Soil	X	X	X	X	X	2	1
Boring 01808	0 - 0.5	CAN108-1808-0000		Soil	X	X	X	X	X	2	1
	0 - 0.5	CAN108-1808-1861	FD	Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1808-0005		Soil	X	X	X	X	X	2	1
	8 - 10	CAN108-1808-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN108-1808-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN108-1808-0020		Soil	X	X	X	X	X	2	1
Boring 01809	0 - 0.5	CAN108-1809-0000		Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1809-0005		Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1809-1862	FD	Soil	X	X	X	X	X	2	1
	8 - 10	CAN108-1809-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN108-1809-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN108-1809-0020		Soil	X	X	X	X	X	2	1

TABLE 12-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING AREA (SWMU NO. 108)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters					Sample Containers	
					VOCs	SVOCs	Metals	TRPH	EXPL	4 oz. jars	16 oz. jars
Boring 01810	0 - 0.5	CAN108-1810-0000		Soil	X	X	X	X	X	2	1
	0 - 0.5	CAN108-1810-6005	MS/MSD	Soil	X	X	X	X	X	2	1
	3 - 5	CAN108-1805-0005		Soil	X	X	X	X	X	2	1
	8 - 10	CAN108-1810-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN108-1810-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN108-1810-0020		Soil	X	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 12-1 for locations of the borings.

TABLE 12-2

FIELD SCREENING DATA
PHASE II RFI
EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING AREA (SWMU NO. 108)

Boring/Sample Number	Date	Time Collected (hrs)	Time of Field Screening	Sample Depth	Field Screening Concentrations (ppm)
CAN108-1806	12/9/94	1105	1137	0.5	ND
		1110	1147	5.0	ND
		1126	1204	10.0	ND
		1147	1222	15.0	ND
		1214	1228	20.0	ND
CAN108-1807	12/9/94	1005	1034	0.5	ND
		1014	1046	5.0	ND
		1025	1052	10.0	ND
		1035	1104	15.0	ND
		1050	1128	20.0	ND
CAN108-1808	12/9/94	0840	0920	0.5	ND
		0908	0921	5.0	ND
		0918	0944	10.0	ND
		0930	1010	15.0	ND
		0950	1020	20.0	ND
CAN108-1809	12/9/94	1410	1446	0.5	ND
		1420	1500	5.0	ND
		1435	1509	10.0	ND
		1447	1515	15.0	ND
		1500	1535	20.0	ND
CAN108-1810	12/11/94	0949	1015	0.5	ND
		0957	1034	5.0	ND
		1006	1040	10.0	ND
		1016	1050	15.0	ND
		1028	1102	20.0	ND

ND = Nondetect

TABLE 12-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 108
CANNON AFB

LOCATOR	CAN108-1806-0000			CAN108-1806-0005			CAN108-1806-0010			CAN108-1806-0015			CAN108-1806-0020			CAN108-1807-0000		
LAB SAMPLE NUMBER	0397350001SA			0397350002SA			0397350003SA			0397350004SA			0397350005SA			0397350006SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.5	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.6	U
Toluene	<	5.5	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.6	U
Metals (mg/kg)																		
Aluminum	10400	11.1	J	5890	22	J	9680	22.4	J	5330	11.3	J	5340	22.3	J	14200	11.3	J
Antimony	<	6.6	UJ	<	13.2	UJ	<	13.4	UJ	<	6.8	UJ	<	13.4	UJ	<	6.8	UJ
Arsenic	2.5	0.55		2.3	0.55		1.8	0.56		3.2	0.56		1.6	0.56		3	0.56	
Barium	85.6	1.1		5940	2.2		677	2.2		125	1.1		661	2.2		107	1.1	
Beryllium	0.69	0.22		0.45	0.44		0.47	0.45		0.45	0.23		<	0.45	U	0.74	0.23	
Calcium	2720	22.2		192000	43.9		135000	44.8		69900	22.6		155000	44.6		3050	22.6	
Chromium	10.8	1.1		2.7	2.2		7.1	2.2		6.5	1.1		3.6	2.2		12.8	1.1	
Cobalt	4.4	1.1		<	2.2	U	2.8	2.2		2.3	1.1		<	2.2	U	5.2	1.1	
Copper	8.6	2.2		3.2	4.4	J	4.3	4.5	J	3.9	2.3		<	4.5	U	9.7	2.3	
Iron	11000	11.1		4010	22		7130	22.4		5300	11.3		3630	22.3		13000	11.3	
Lead	10	1.1	J	3.3	0.55	J	4.4	0.56	J	5.5	0.56	J	2.1	0.56	J	9.9	2.8	
Magnesium	1750	22.2		4130	43.9		5080	44.8		3580	22.6		3840	44.6		2260	22.6	
Manganese	191	1.1		63.9	2.2		88.3	2.2		48.8	1.1		29	2.2		243	1.1	
Nickel	11.6	4.4		7.2	8.8	J	9.3	9		6.9	4.5		4.8	8.9	J	12.5	4.5	
Potassium	1790	554		864	1100	J	2070	1120		1630	564		937	1110	J	2200	564	
Selenium	<	0.55	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	0.56	U
Silver	<	1.1	U	<	2.2	U	<	2.2	U	<	1.1	U	<	2.2	U	<	1.1	U
Thallium	0.11	0.55	J	<	1.1	UJ	<	1.1	UJ	0.14	1.1	UJ	<	1.1	UJ	0.19	0.56	J
Vanadium	19.9	1.1		12.4	2.2		18.4	2.2		28.6	1.1		13.4	2.2		22.4	1.1	
Zinc	23.4	2.2		10.6	4.4		18.9	4.5		10.4	2.3		9.2	4.5		32.4	2.3	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceeding sample number.

TABLE 12-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 108
CANNON AFB

LOCATOR	CAN108-1807-0005			CAN108-1807-0010			CAN108-1807-0015			CAN108-1807-0020			CAN108-1808-0000			CAN108-1808-1861[1]			CAN108-1808-0005		
LAB SAMPLE NUMBER	0397350007SA			0397350008SA			0397350009SA			0397350010SA			0397350012SA			0397350011SA			0397350013SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	3.6	11	J
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.4	U	<	5.4	U	<	5.6	U	<	5.4	U	<	5.5	U	<	5.6	U	<	5.4	U
Toluene	<	5.4	U	<	5.4	U	<	5.6	U	<	5.4	U	<	5.5	U	<	5.6	U	<	5.4	U
Metals (mg/kg)																					
Aluminum	6480	21.5	J	3970	10.9		3630	11.1	J	3380	10.9	J	7900	11.1	J	15300	11.2	J	8480	21.5	J
Antimony	<	12.9	UJ	<	6.5	U	<	6.7	UJ	<	6.5	UJ	<	6.7	UJ	<	6.7	UJ	<	12.9	UJ
Arsenic	2	0.54		2.2	0.54		2.1	0.56		2.2	0.54		2.7	0.55		2.8	0.56		2.2	0.54	
Barium	578	2.2		171	1.1		105	1.1		55.1	1.1		94	1.1		96	1.1		763	2.2	
Beryllium	<	0.43	U	0.37	0.22		0.28	0.22		0.24	0.22		0.58	0.22		0.68	0.22		0.53	0.43	
Calcium	167000	43.1		60100	21.8		58200	22.2		64900	21.7		2590	22.2		2470	22.3		172000	43.1	
Chromium	<	2.2	U	3.8	1.1		3.7	1.1		3.5	1.1		8.7	1.1		12.6	1.1		5.6	2.2	
Cobalt	<	2.2	U	1.8	1.1		1.9	1.1		1.2	1.1		4.5	1.1		4.6	1.1		2.7	2.2	
Copper	1.7	4.3	J	3.5	2.2		3.9	2.2		2	2.2	J	7.8	2.2		8.3	2.2		3.8	4.3	J
Iron	4270	21.5		4090	10.9		3770	11.1		4110	10.9		9320	11.1		12900	11.2		5590	21.5	
Lead	4.6	0.54	J	5.6	0.54	J	6.3	0.56	J	3.4	1.1	J	10.8	1.1	J	12.3	1.1	J	5.7	0.54	J
Magnesium	3380	43.1		2490	21.8		3120	22.2		2000	21.7		1480	22.2		2070	22.3		3720	43.1	
Manganese	49.3	2.2		75	1.1		97.8	1.1		32.5	1.1		208	1.1		215	1.1		98.1	2.2	
Nickel	60.8	8.6		7	4.4		5.3	4.4		5	4.3		9.2	4.4		12.3	4.5		8.3	8.6	J
Potassium	1050	1080	J	1090	545		1130	555		963	543		1380	554		2150	558		1320	1080	
Selenium	<	1.1	UJ	<	1.1	UJ	<	0.56	UJ	<	0.54	UJ	<	1.1	UJ	<	0.56	UJ	<	1.1	UJ
Silver	<	2.2	U	<	1.1	U	<	1.1	U	<	1.1	U	<	1.1	U	<	1.1	U	<	2.2	U
Thallium	<	1.1	UJ	<	1.1	UJ	<	0.56	U	<	1.1	UJ	0.14	0.55	J	0.19	0.56	J	<	1.1	UJ
Vanadium	11.1	2.2		17.6	1.1		15.8	1.1		18.3	1.1		20.3	1.1		21.6	1.1		13.4	2.2	
Zinc	12.3	4.3		10.5	2.2		9.4	2.2		6.9	2.2		20.1	2.2		30.5	2.2		15.2	4.3	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceeding sample number.

TABLE 12-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 108
CANNON AFB

LOCATOR	CAN108-1808-0010			CAN108-1808-0015			CAN108-1808-0019			CAN108-1809-0000			CAN108-1809-0005			CAN108-1809-1862[1]		
LAB SAMPLE NUMBER	0397350014SA			0397350015SA			0397350016SA			0397370002SA			0397370003SA			0397370001SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U
Methylene chloride	<	5.4	U	<	5.5	U	<	5.5	U	<	5.6	U	1.3	5.8	J	<	5.8	U
Toluene	<	5.4	U	<	5.5	U	<	5.5	U	<	5.6	U	<	5.8	U	<	5.8	U
Metals (mg/kg)																		
Aluminum	6480	10.8	J	8990	10.9	J	6230	22.2	J	6910	11.1	J	2300	57.8	J	3350	23.1	J
Antimony	<	6.5	UJ	<	6.6	UJ	<	13.3	UJ	<	6.7	UJ	<	34.7	UJ	<	13.8	UJ
Arsenic	1.5	0.54		1.6	0.55		1.9	0.55		2.1	0.56		1.6	0.58		1.6	0.58	
Barium	303	1.1		74	1.1		122	2.2		115	1.1	J	407	5.8	J	528	2.3	J
Beryllium	0.33	0.22		0.4	0.22		<	0.44	U	0.55	0.22		<	1.2	U	0.43	0.46	J
Calcium	93200	21.6		56400	21.8		187000	44.3		18900	22.2		240000	116		229000	46.1	
Chromium	4.8	1.1		7.9	1.1		4.5	2.2		7.3	1.1		<	5.8	U	1.6	2.3	J
Cobalt	2.1	1.1		1.9	1.1		<	2.2	U	4.3	1.1		<	5.8	U	1.8	2.3	J
Copper	3	2.2		4.1	2.2		2.3	4.4	J	7.8	2.2		<	11.6	U	2.4	4.6	J
Iron	5210	10.8		7000	10.9		4500	22.2		7390	11.1	J	1880	57.8	J	2240	23.1	J
Lead	4.2	1.1	J	5.2	0.55	J	3.4	0.55	J	10.3	1.1		2.8	0.58		2.7	0.58	
Magnesium	3320	21.6		4310	21.8		4070	44.3		1590	22.2		2660	116		2780	46.1	
Manganese	69.5	1.1		72.7	1.1		31	2.2		197	1.1	J	29	5.8	J	43.1	2.3	J
Nickel	6.3	4.3		7.1	4.4		6.3	8.9	J	8.6	4.4		<	23.1	U	4.1	9.2	J
Potassium	1520	540		2210	546		1380	1110		1430	555		365	2890	J	<	1150	U
Selenium	<	1.1	UJ	<	1.1	UJ	1.1	0.55	UJ	<	1.1	UJ	<	1.2	UJ	<	1.2	UJ
Silver	<	1.1	U	<	1.1	U	<	2.2	U	<	1.1	U	<	5.8	U	<	2.3	U
Thallium	<	1.1	UJ	<	1.1	U	<	1.1	UJ	0.16	0.56	J	<	1.2	UJ	<	1.2	UJ
Vanadium	12.6	1.1		15.1	1.1		14.3	2.2		17.9	1.1		6.7	5.8		10.8	2.3	
Zinc	13.5	2.2		16.7	2.2		10.7	4.4		18	2.2		5.3	11.6	J	6.1	4.6	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceeding sample number.

TABLE 12-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 108 CANNON AFB

LOCATOR	CAN108-1809-0010			CAN108-1809-0015			CAN108-1809-0020			CAN108-1810-0000			CAN108-1810-0005		
LAB SAMPLE NUMBER	0397370004SA			0397370005SA			0397370006SA			0397760001SA			0397760002SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U	8.4	11	J	<	11	U	<	11	U	5.9	11	J
2-Butanone (MEK)	<	11	U	1.9	11	J	<	11	U	<	11	U	<	11	U
Methylene chloride	3.6	5.7	J	<	5.7	U	<	5.5	U	2.2	5.5	J	2.3	5.6	J
Toluene	1.4	5.7	J	<	5.7	U	<	5.5	U	<	5.5	U	<	5.6	U
Metals (mg/kg)															
Aluminum	4380	11.4	J	5160	11.4	J	5720	22.1	J	12000	11		6920	11.2	
Antimony	<	6.8	UJ	<	6.9	UJ	<	13.3	UJ	<	6.6	UJ	<	6.7	UJ
Arsenic	2.1	0.57		3.7	0.57		2.8	0.55		1.6	0.55		1.6	0.56	
Barium	153	1.1	J	70.1	1.1	J	95.2	2.2	J	88.4	1.1		100	1.1	
Beryllium	0.34	0.23		0.4	0.23		0.35	0.44	J	0.58	0.22		0.35	0.22	
Calcium	59500	22.8		45200	22.9		136000	44.2		2830	22		74000	22.3	
Chromium	3.7	1.1		6.5	1.1		4.4	2.2		11.2	1.1		5.8	1.1	
Cobalt	2.8	1.1		2	1.1		<	2.2	U	5.1	1.1		3.2	1.1	
Copper	2.8	2.3		3.6	2.3		1.7	4.4	J	8.5	2.2		4.6	2.2	
Iron	4140	11.4	J	5750	11.4	J	4680	22.1	J	11100	11		6170	11.2	
Lead	6.7	0.57		6	0.57		2.9	0.55		11.7	1.1	J	4.4	0.56	J
Magnesium	3750	22.8		2870	22.9		3030	44.2		2000	22		2110	22.3	
Manganese	75.5	1.1	J	36.5	1.1	J	36	2.2	J	257	1.1		91.2	1.1	
Nickel	6.4	4.6		5.3	4.6		4	8.8	J	10	4.4		5.9	4.5	
Potassium	1320	570		1740	572		1200	1110		2250	550		1420	558	
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	1.1	U	<	1.1	U	<	2.2	U	0.49	1.1	J	<	1.1	U
Thallium	<	0.57	U	<	0.57	U	0.12	1.1	J	<	0.55	U	<	0.56	U
Vanadium	20.7	1.1		36.4	1.1		20.2	2.2		18.3	1.1		12.1	1.1	
Zinc	9.4	2.3		10.1	2.3		10.3	4.4		28.4	2.2		15.5	2.2	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceeding sample number.

TABLE 12-3

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 108 CANNON AFB

LOCATOR	CAN108-1810-0010			CAN108-1810-0015			CAN108-1810-0020		
LAB SAMPLE NUMBER	0397760003SA			0397760004SA			0397760005SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)									
Acetone	4.1	12	J	<	11	U	9.1	11	J
2-Butanone (MEK)	<	12	U	<	11	U	<	11	U
Methylene chloride	2.5	5.9	J	2.5	5.7	J	3	5.6	J
Toluene	<	5.9	U	<	5.7	U	<	5.6	U
Metals (mg/kg)									
Aluminum	5460	11.8		12400	23		5300	56.4	
Antimony	5.1	7.1	J	<	13.8	UJ	<	33.8	UJ
Arsenic	2.4	0.59		2	0.57		1.2	0.56	
Barium	457	1.2		620	2.3		327	5.6	
Beryllium	0.36	0.24		0.46	0.46		<	1.1	U
Calcium	110000	23.6		137000	46		263000	113	
Chromium	5.1	1.2		7.2	2.3		<	5.6	U
Cobalt	4.4	1.2		2	2.3	J	<	5.6	U
Copper	4.3	2.4		4.1	4.6	J	<	11.3	U
Iron	5660	11.8		8140	23		3360	56.4	
Lead	7.2	0.59	J	5.5	1.1		1.2	0.56	
Magnesium	4190	23.6		5560	46		6220	113	
Manganese	117	1.2		50.6	2.3	J	26.4	5.6	J
Nickel	7.7	4.7		8.2	9.2	J	<	22.5	U
Potassium	1460	589		2930	1150		<	2820	U
Selenium	<	1.2	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	1.2	U	<	2.3	U	<	5.6	U
Thallium	<	0.59	U	<	1.1	UJ	<	1.1	UJ
Vanadium	18.6	1.2		22.4	2.3		19.1	5.6	
Zinc	12.5	2.4		17.7	4.6		<	11.3	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review. A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

(1) Duplicate for preceeding sample number.

TABLE 12-4

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 108 CANNON AFB
EOD TRAINING AREA

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations (2)	Upper Tolerance Limit (UTL) Background Concentration(3)	Reported Level in Clovis, NM Region (4)	Does Maximum Detected Exceed Background
CAN108-1807-0000	Aluminum	14,200	1,410 - 11,000	10,540	50,000	NO**
CAN108-1810-0010	Antimony	5.1	<4.9 - <13	*	<1	YES
CAN108-1809-0015	Arsenic	3.7	0.67 - 28	15.5	6.5	NO
CAN108-1806-0005	Barium	5940	14.5 - 1200	642	500	YES
CAN108-1807-0000	Beryllium	0.74	0.17 - 0.77	0.73	1-2	NO**
CAN108-1807-0000	Chromium	12.8	4 - 15.4	12.5	30	NO**
CAN108-1807-0000	Cobalt	5.2	0.85 - 5.3	4.5	3-7	NO**
CAN108-1807-0000	Copper	9.7	<2 - 18.4	*	20	NO**
CAN108-1810-0000	Lead	11.7	1.1 - 46	25.8	15	NO
CAN108-1810-0000	Manganese	257	22.4 - 216	164	500	YES
CAN108-1807-0005	Nickel	60.8	1.3 - 9.8	9	15	YES
CAN108-1808-0019	Selenium	1.1	<0.21 - 124	*	0.15-0.3	YES
CAN108-1810-0000	Silver	0.49	<0.87 - 0.93	*	----	NO
CAN108-1807-0000	Thallium	0.19	0.14 - 0.22	*	----	NO
CAN108-1809-0015	Vanadium	36.4	5.2 - 28.3	25.3	30-70	YES
CAN108-1807-0000	Zinc	32.4	<4.3 - 27.5	21.9	45	YES

(1) All units in mg/kg.
(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1994) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).
Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1993).
(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.
(4) USGS 1984.
* Data insufficient to calculate UTL of background concentration.
** Maximum concentration within or only slightly above Base-wide background range and within naturally occuriring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 12-5

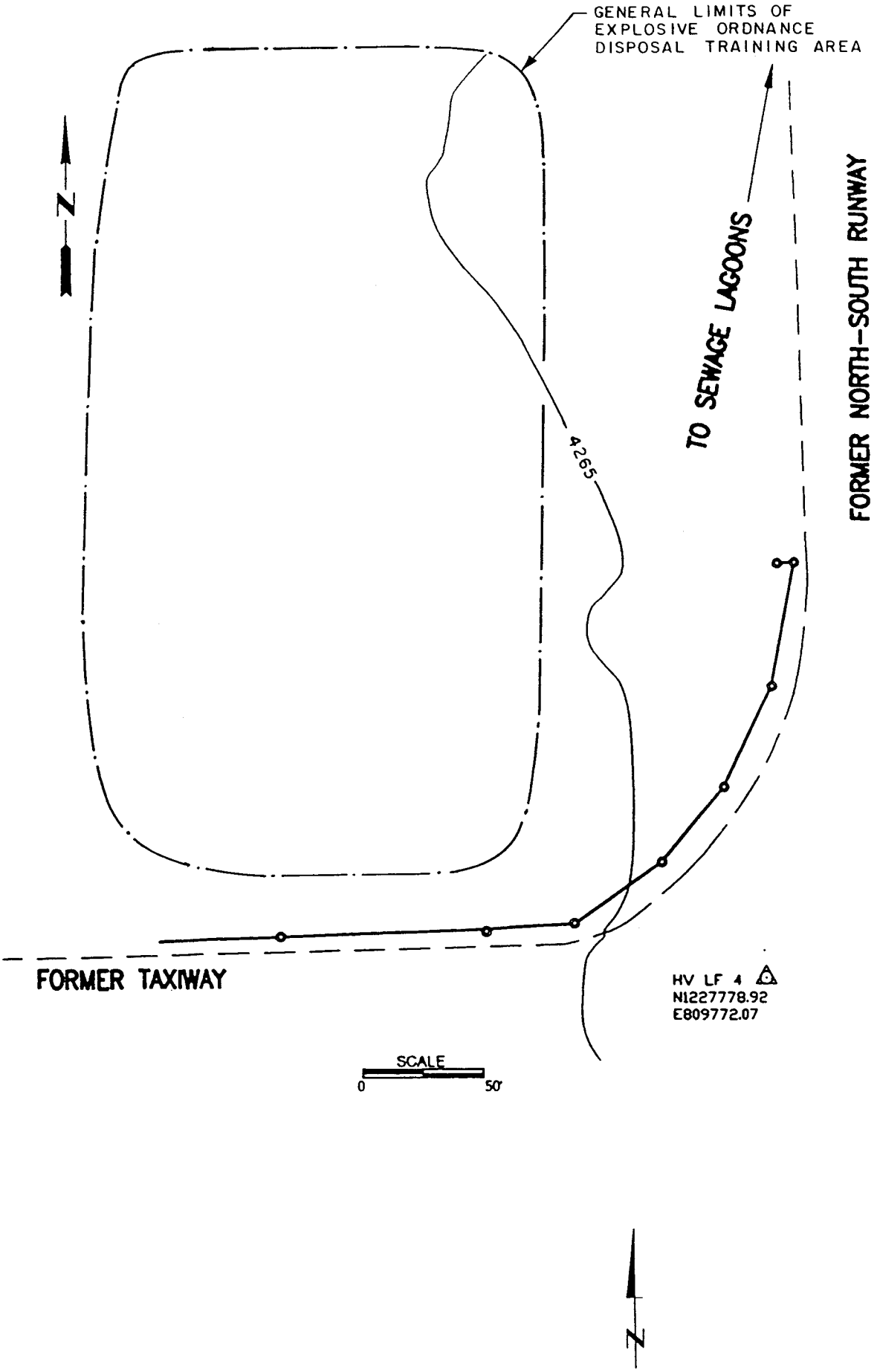
COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SWMU 108 TO RBCs FOR RESIDENTIAL SOIL EOD TRAINING AREA

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Estimated Risk	Risk Type	Industrial Soil Risk-Based Concentration(2) (mg/kg)	Exceeds RBC?
Acetone	0.0091	7,800	NO				
2-Butanone (MEK)	0.0019	47,000	NO				
Methylene Chloride	0.0036	85	NO				
Toluene	0.0014	16,000	NO				
Antimony	5.1	31	NO				
Barium	5940	5,500	YES	1.08 [a]	Noncarcinogenic	72,000	NO
Manganese	257	390	NO				
Nickel	60.8	1,600	NO				
Selenium	1.1	390	NO				
Vanadium	36.4	550	NO				
Zinc	32.4	23000	NO				

(1) EPA Region III Risk-Based Concentrations for Residential Soil (EPA 1994).

(2) EPA Region III Risk-Based Concentrations for Industrial Soil (EPA 1994).

(a) "Estimated Risk" for noncarcinogens is stated as a hazard quotient (HQ = concentration/RBC)



DRN BY: CJG	DATE: 06/16/94	EXPLOSIVE ORDINANCE DISPOSAL(EOD) TRAINING AREA – SWMU 108 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
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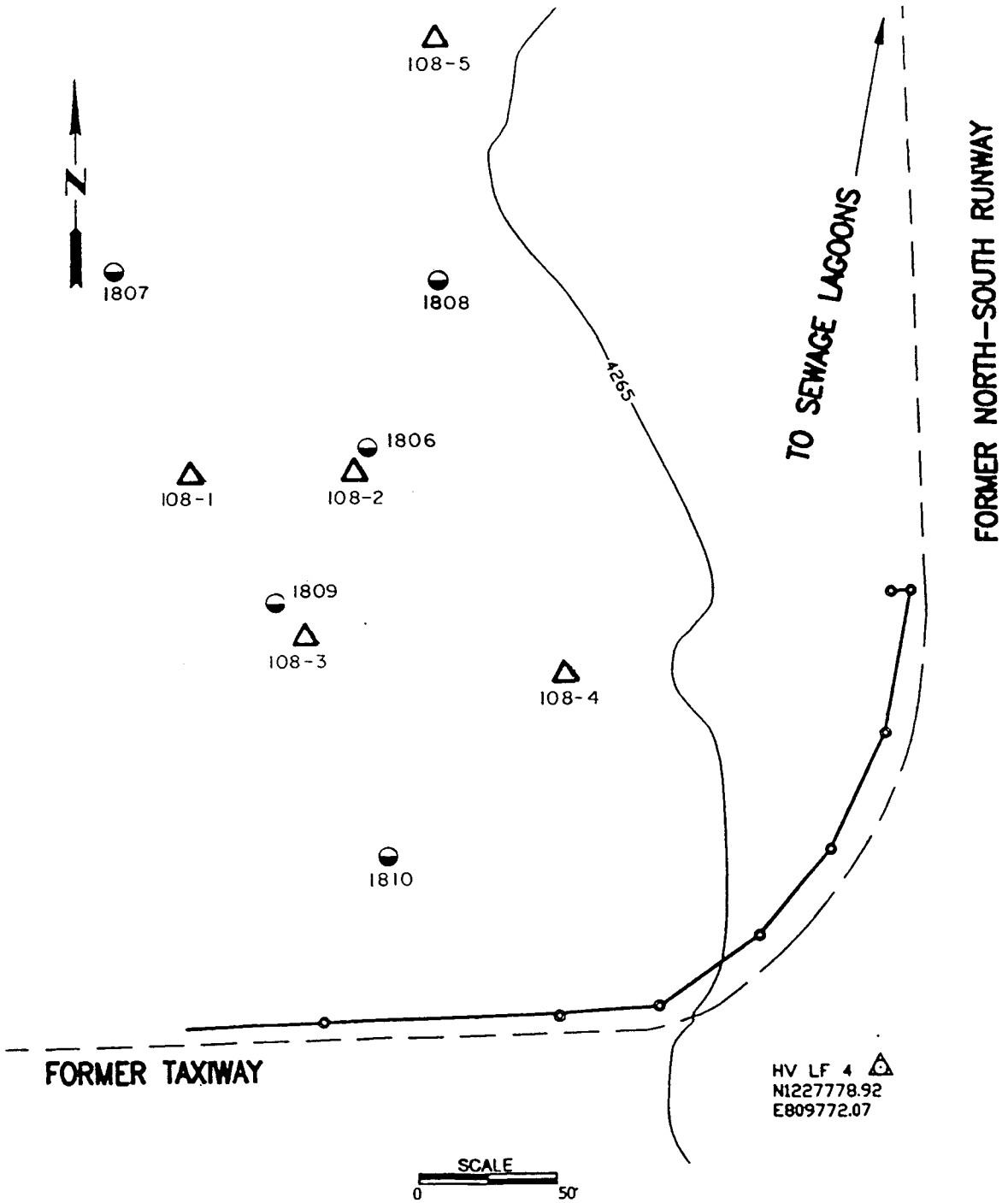

LEGEND

108-1 PHASE I SOIL BORING LOCATION AND NUMBER

1807 PHASE II SOIL BORING LOCATION AND NUMBER

N

DRN BY: CJG	DATE: 06/16/94	EXPLOSIVE ORDINANCE DISPOSAL(EOD) TRAINING AREA – SWMU 108 SITE PLAN WITH PHASE I & PHASE II BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 12-2
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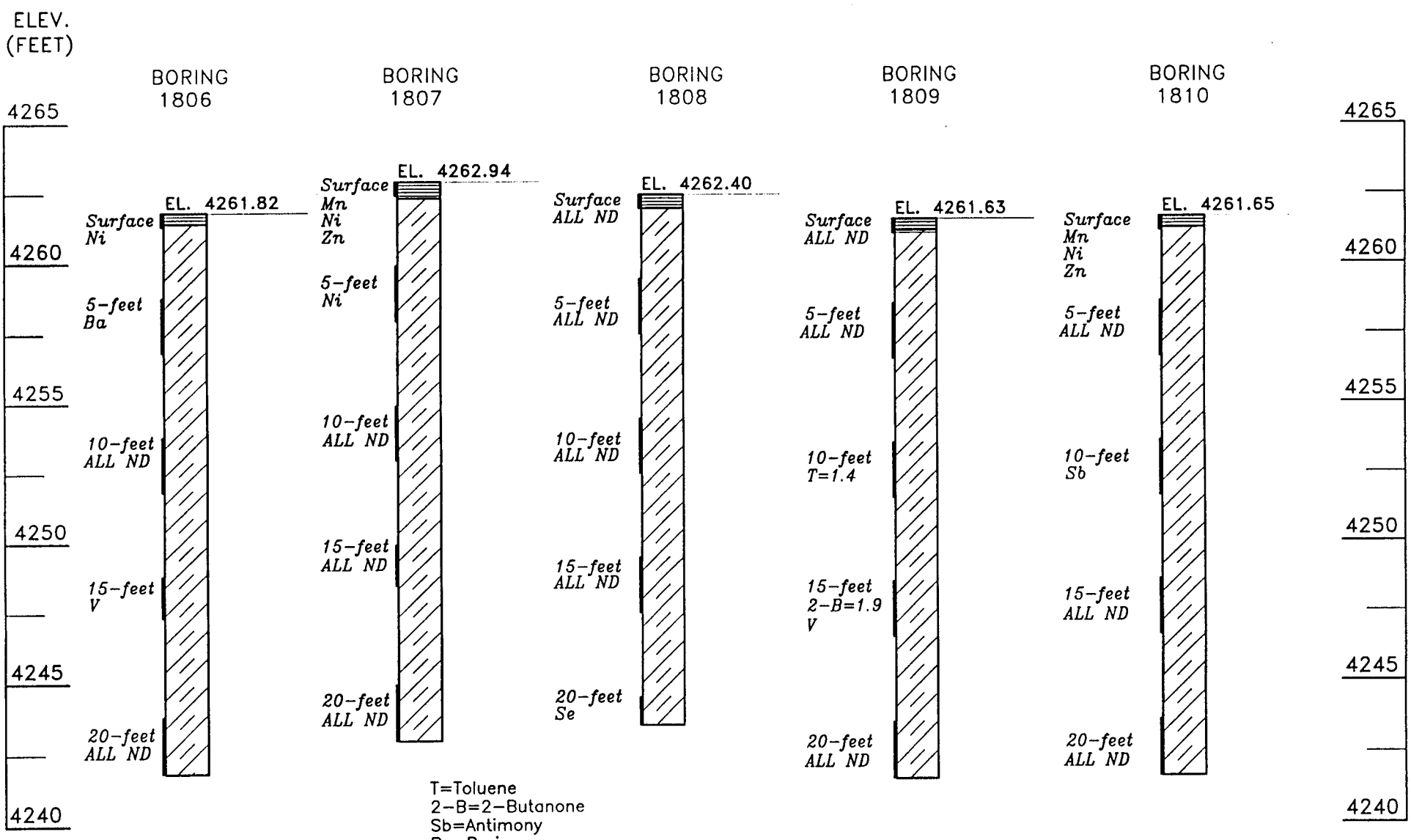

SWMU-108 LEGEND

- SILTY CLAY (CL)(FILL)
- CLAYEY SILT (ML)
- SAMPLED INTERVAL

T=Toluene
2-B=2-Butanone
Sb=Antimony
Ba=Barium
Mn=Manganese
Ni=Nickel
Se=Selenium
V=Vanadium
Zn=Zinc
ND=Not Detected
Note: All results are in µg/kg except for TPH (mg/kg). Only those metals that exceeded UTLS and background levels are listed.

SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

SWMU-108 – SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS CANNON AIR FORCE BASE NEW MEXICO			
DRN BY: TBS	DATE: 03/17/95	PROJECT NO.	FIG. NO.
CHK'D BY:	REVISION: 0	C3M11MM	12-3

13.0
SUMMARY OF RECOMMENDATIONS

The seven SWMUs in the Appendix II group investigated under the Phase II RFI, as a whole, do not appear to be seriously contaminated. Table 13-A shows a summary of the recommendations made for each SWMU.

TABLE 13-A

SWMU No.	Recommendation
003	NFA
005	NFA
016	NFA[1]
48A	~~NFA~~ CMS
48B	NFA
083	NFA
108	NFA

NFA = No Further Action

(1) No Further Action based on Phase I results. No sampling could be completed during the Phase I RFI because of new construction.

14.0
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FINAL RFI REPORT

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31, 55, 77, 93, 97, 103, 127

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RCRA FACILITY INVESTIGATION

APPENDIX III
SWMUS - PHASE II

CANNON AIR FORCE BASE, NEW MEXICO

W-C

Prepared for
Cannon Air Force Base
27 CES/CEVR
Environmental Flight

November 1997

W-C Project C3M11MM

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GLOSSARY OF TERMS

ACC	Air Combat Command
AFB	Air Force Base
AGE	Aerospace Ground Equipment
ARAS	Applicable or Relevant and Appropriate Standard
bgs	below ground surface
B.P.	Before Present
BRA	Baseline Risk Assessment
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CEC	Cation Exchange Capacities
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineering Squadron
CEV	Civil Engineering Environmental Flight
CMS	Corrective Measures Study
CO_2	Carbon dioxide
COC	Chemicals of concern **or** chain of custody
CRQL	Contract Required Quantitation Limit
DMP	Data Management Plan
DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
FS	Feasibility Study
GRO	Gasoline Range Organics
HQ	Hazard Quotient
HSA	Hollow-stem auger
HSWA	Hazardous and Solid Waste Management Act
IRP	Installation Restoration Program
LNAPL	Light Nonaqueous-Phase Liquids
MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
MS	Matrix spike

MSD	Matrix spike duplicate
MSL	Mean sea level
NMED	New Mexico Environment Department
NWR	National Wildlife Refuge
OVA	Organic vapor analyzer
OWS	Oil/water separator
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethane
POL	Petroleum Oil and Lubricants
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
QES	Quanterra Environmental Services
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RPD	Relative percent difference
SCEM	Site Conceptual Exposure Model
SDWA	Safe Drinking Water Act
SMCLs	Secondary Maximum Contaminant Levels
SOP	Standard Operating Procedure
SVOC	Semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TBC	To Be Considered
TCL	Target Compound List
TCO	Total chromatographable organics
T/E	Threatened/endangered
TFW	Tactical Fighter Wing

TPH	Total petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	Unified Soil Classification
UST	Underground storage tank
UTL	Upper tolerance limit
VOC	Volatile organic compound
VSI	Visual Site Inspection
W-C	Woodward-Clyde
WQCCR	Water Quality Control Commission Regulations

UNITARY ABBREVIATIONS

cm	centimeter
cm/sec	centimeters per second
cm/yr	centimeters per year
ft	feet
gpm	gallons per minute
gal/feet	gallon per feet
hr	hour
km/hr	kilometers per hour
kg	kilogram
L/min	liters per minute
m/yr	meters per year
mg	milligram
mg/kg	milligrams per kilograms
mg/L	milligrams per liter
m^3/m	cubic meters per meter
mph	miles per hour
ppm	parts per million

UNITARY ABBREVIATIONS (Continued)

%R	percent recoveries
μg/kg	micrograms per kilogram
yr or y	year

EXECUTIVE SUMMARY

Cannon Air Force Base has been in operation for more than 50 years as a military air base. Through the course of these operations, numerous aircraft and equipment maintenance processes have been conducted, and the Air Force is currently investigating the potential that some of these operations may have contaminated the environment. Cannon AFB operates in compliance with the terms of a RCRA Permit issued jointly by the United States EPA and the State of New Mexico. This permit includes a listing of three groups of Solid Waste Management Units (SWMUs) that have been identified as Appendix I, II, and III SWMUs. A Phase I RCRA Facility Investigation (RFI) was completed by Woodward-Clyde (W-C) in 1993 on 16 of the group of SWMUs listed in Appendix III of the permit. This Phase II RFI is directed at 7 of these SWMUs, and is being completed as required by the terms of the permit.

Woodward-Clyde (W-C) has completed the Phase I and Phase II RFIs under contract with the U.S. Army Corps of Engineers (USACE), Omaha District. The RFI was designed to fulfill specific requirements under RCRA, and in so doing, it also fulfills basic requirements under CERCLA. Prior to initiating the field sampling activities W-C submitted work plans covering the description of work and supplementing the work plans prepared by Cannon AFB Environmental Flight. These work plans were reviewed by the USACE and Cannon AFB Environmental Flight and approved with revisions as complying with the terms and scope of the EPA approved documents.

The Phase I RFI field investigation was completed during August and September of 1993, and it consisted of sampling surface and subsurface soils and at one site surface water and lake sediment. The Phase I fieldwork also included collection of additional mapping data, and a field survey of the sampling points. Base personnel were interviewed to develop background information on operations, both currently and historically, for each of the subject sites. The samples were transported to Quanterra Environmental Services (QES) (formerly known as ENSECO Rocky Mountain Analytical Laboratories) for chemical testing which was completed in mid-October 1993. The Phase II RFI field investigation was completed during November and December of 1994, and it consisted of sampling surface and subsurface soils at six sites,

lake sediment sampling at one site, and groundwater sampling at one site. Samples were analyzed by QES. The Phase II investigation fieldwork also included a field survey of the sampling points.

The Phase I sampling rationale was developed to collect samples in the locations and depths likely to be the most heavily contaminated at each facility. The Phase II sampling rationale was developed to gather information to further assess the vertical and horizontal extent of site contamination at 7 of the Phase I SWMUs. The Phase II data were compared to the Phase I data. Where the maximum Phase II result exceeded maximum Phase I results, the data was used in a screening-level risk evaluation using EPA Region III Risk-Based Concentrations (RBCs). These RBCs are very conservative (generally comparable to an added cancer risk of one in ten million). The comparisons to Phase I data and/or RBCs were used to either support the original conclusions or to recommend further evaluation for the SWMUs.

The SWMUs in the Appendix III list investigated under this Phase II RFI are as follows:

Site	SWMU Number
AGE Maintenance Shop	31
Oil/Water Sep #5121	93
Oil/Water Sep #4095	127
Lead/Acid Battery Area	55
CE Container Storage Area	77
Wastewater Playa Lake	103
Landfill 25 Monitoring Well K	97

The remaining Appendix III SWMUs are to be investigated under the oil/water separator management plan under a separate project.

The USACE Scope of Services outlined the required chemical tests in accordance with the EPA approved work plan. Testing was in accordance with EPA SW-846 methodology, and the analyte list at each SWMU was selected from the following groups on the basis of the potential contamination indicated by the past and current operations at each SWMU.

- Target Compound List (TCL) volatile organic compounds
- Semivolatile organic compounds
- Target Analyte List (TAL) metals
- Total petroleum hydrocarbons (TPH)
- Total recoverable petroleum hydrocarbons (TRPH)
- Pesticides/PCBs
- Herbicides
- Total lead

Laboratory analytical data was validated in accordance with USACE and EPA guidance as outlined in the Quality Assurance Project Plan, and the validated data is the basis for the recommendations.

The following sections discuss for each SWMU the contamination found (if any), the results of the screening level risk evaluation, and the recommendations resulting from the evaluation.

SWMU NO. 31 - AGE MAINTENANCE PAD

The Aerospace Ground Equipment (AGE) Maintenance Pad is a paved area outside to the southeast of Building 186. The area is used for maintenance of ground equipment associated with the Base aircraft operations. Potential contaminants include JP-4, mineral and synthetic oils, and diesel fuel.

Nine additional soil samples were collected and analyzed from three 10-foot-deep soil borings at SWMU 31 during the Phase II RFI. Results of the analytical testing were compared to the Phase I results to determine whether any analytes exceeded Phase I concentrations. Several chemicals slightly exceeded the Phase I concentrations; however, only dibenzo(a,h)anthracene exceeded the residential soil RBC. The Phase I BRA showed that this chemical posed no unacceptable health risk at higher concentrations than were detected during the Phase II RFI.

The majority of site contaminants were detected in surface soils during both the Phase I and Phase II investigations. Potential impact to groundwater is considered to be low. Because there is no unacceptable human health risk from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 93 - OWS NO. 5121

SWMU 93 was an OWS with a leach well serving Power Check Pad 5121. It was removed in 1988 when Building 5121 was demolished. Facility 5123 has been constructed over the former location of Building 5121, and the sampling for this effort has been adjacent to Building 5123 in the vicinity formerly occupied by the OWS and the leach field. Potential contaminants include JP-4 fuel, petroleum and synthetic lubricating oils, greases, solvents, and, metals.

Nine soil samples were collected and analyzed from three 10-foot-deep soil borings at SWMU 93 during the Phase II RFI. Maximum detected concentrations were compared to Phase I results. If any Phase II results exceeded Phase I results, maximum concentrations were compared to background levels and RBCs. Two metals and three organic compounds exceeded Phase I concentrations. However, none of the metals or organic compounds exceeded RBCs.

The Phase II sampling results confirmed that contamination was present mainly in the surface and near-surface samples at the SWMU. The vertical distribution of site contaminants appears to be well defined, and the potential impact to groundwater is considered to be low. Because there are no unacceptable health risks associated with the site, it is recommended that no further investigation is necessary for this SWMU.

SWMU NO. 127 - SAND TRAP AND LEACH FIELDS AT THE POL WASH RACK

SWMU 127 is a sand trap at the POL Wash Rack and the old and new leach fields that have received and now receive wastewater from the wash rack. There is a new OWS in a concrete vault in the line that was built in 1991. The vault was visually inspected at the premobilization visit. There was no evidence of any oil spillage or leakage. The OWS is not defined as a part of SWMU 127. The wash rack is used to wash fuel trucks used to fuel aircraft on the flight line. The potential contaminants include JP-4 fuel, grease, and motor oils.

Seventy-one soil samples were collected and analyzed from six 60-foot and two 10-foot soil borings at SWMU 127 during the Phase II RFI. Maximum detected concentrations were

compared to Phase I results to assess whether any Phase II results exceeded Phase I results. If any Phase II results did exceed Phase I results, the maximum detected concentrations were compared to background levels and RBCs.

Phase II sampling results confirmed that contamination is mainly confined to shallow soils. However, TRPH was detected at depth in several borings. TRPH was not detected in any of the soil samples at the maximum depth of the borings, 60 feet. Eight metals detected during the Phase II investigation exceeded background ranges, six of these metals exceeded the Phase I results. Seventeen organic compounds also exceeded the concentrations detected during the Phase I investigation. Only one compound, dibenzo(a,h)anthracene, exceeded residential soil RBCs. However, the risk posed from this chemical is within the EPA target risk range of 10^{-6} to 10^{-4}.

Because there are no unacceptable health risks posed by any of the chemicals detected at this SWMU, it is recommended that no further investigation of the SWMU is necessary.

SWMU NO. 55 - LEAD ACID BATTERY ACCUMULATION SITE

SWMU 55 is an area located in the northernmost corner of the fenced motorpool compound. It is used to store used lead acid motor vehicle batteries on pallets for eventual disposal. The potential contaminants include lead and sulfuric acid.

Fifteen soil samples were collected and analyzed from three 20-foot soil borings at SWMU 55 during the Phase II RFI. Maximum concentrations were compared to Phase I results, background levels, and RBCs. Again, the highest concentration for lead was found in the surface soils at the SWMU. VOC, SVOC, and TRPH contamination detected was also confined to surface or shallow subsurface soils. Three metals exceeded background, but none of these exceeded RBCs. Five organic compounds, all PAHs, exceeded residential RBCs, and two of these compounds exceeded industrial RBCs. However, the estimated risks from these chemicals were all within the EPA target risk range of 1×10^{-6} to 1×10^{-4}. The PAHs are also likely a result of the asphalt paving at the site and may not be site-related contaminants.

The vertical distribution of site contaminants appears to be well defined and potential impact to groundwater is considered to be low. Because no unacceptable health risks exist from any

of the chemicals detected at the SWMU, it is recommended that no further investigation of this SWMU is necessary.

SWMU NO. 77 - CIVIL ENGINEERING CONTAINER STORAGE AREA

SWMU 77 is a fenced area, paved with concrete, that is used to store miscellaneous material, drums, transformers, and other supplies. The potential contaminants include waste oil, solvents, aviation fuel, waste paint materials, PCBs, and pesticides.

Twenty-five soil samples were collected from five soil borings to 20 feet of depth during the Phase II RFI. Samples were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, and TRPH. Results of the Phase II chemical analyses were compared to Phase I results. If any Phase II concentrations exceeded Phase I concentrations, maximum detected concentrations were compared to background levels and RBCs.

The results of the Phase II investigation show that contamination is confined mainly to the top 5 feet of the soil at the SWMU. Eight metals exceeded background levels in the Phase II soil samples. Of these eight metals, six exceeded the Phase I concentrations. Nine organic compounds also exceeded Phase I concentrations. Of the analytes that exceeded Phase I concentrations, only one metal (manganese) and one organic compound (Aroclor-1260) exceeded residential RBCs.

The estimated risk (hazard quotient) for manganese was 1.1 Although this slightly exceeds the recommended hazard quotient of 1.0, the residential exposure assumptions are conservative, and there is likely no actual risk from this analyte. The estimated risk from Aroclor-1260 was 2×10^{-6}, which is within the EPA target risk range of 1×10^{-6} to 1×10^{-4}. The vertical extent of contamination appears to be defined, and potential impact to groundwater is considered low. Since there is no unacceptable health risk from any of the chemicals detected, it is recommended that no further investigation of this SWMU is necessary.

SWMU NO. 103 - WASTEWATER PLAYA LAKE

SWMU 103 is a natural playa that has been used to receive drainage from sanitary and industrial sewers basewide since the early history of the Base. Portions of the effluent have been treated, and the Playa Lake now receives the overflow from two aeration lagoons. The Playa Lake is used by a nearby farmer for irrigation.

Ten sediment samples from five hand-augered borings in lake sediment to depths of 5 feet and thirty soil samples collected from five soil borings around the perimeter of the Playa Lake to a depth of 10 feet were collected and analyzed. The sediment and soil samples were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, and TRPH. Phase II results were compared to Phase I results, background levels, and RBCs if necessary to assess potential risks posed by chemicals at the SWMU.

Low concentrations of VOCs, SVOCs, and pesticides were detected in the lake sediments. The shallow soil borings surrounding the Playa Lake also contained relatively low concentrations of VOCs, SVOCs, pesticides, and one PCB (Aroclor-1248) mainly in the surface and shallow subsurface soil. Ten metals detected exceeded background ranges. Four of these metals and seventeen organic compounds exceeded the Phase I concentrations. Only one metal (manganese) exceeded residential RBCs, and only one organic compound (Aroclor-1248) exceeded residential and industrial RBCs. However, the estimated risk from Aroclor-1248 was within EPA's target risk range of 10^{-6} to 10^{-4}. The hazard index for manganese (2.3) exceeded the recommended hazard quotient of 1. However, this concentration was detected in a sample under the Playa Lake where residential exposures are unlikely to occur.

Since no unacceptable health risks are expected from any of the chemicals detected at the SWMU, and the vertical distribution of contaminants does not indicate a potential threat to groundwater at the SWMU, it is recommended that no further investigation is necessary.

SWMU NO. 97 - LANDFILL 25 MONITORING WELL K

SWMU 97 is a landfill occupying approximately 29 acres within the boundary of Cannon AFB in the east-central portion of the Base (Figure 2-7). Landfill No. 25 is nearly rectangular-shaped in plan with overall dimensions of about 650 feet by 1,950 feet. The site

is bounded by the road leading to the ordnance area to the north, the road leading to the north side of the Playa Lake to the south, the ordnance area to the east, and Perimeter road to the west. The landfill has been active since about 1945. The date that disposal stopped is unknown. After World War II, temporary buildings and runways were demolished and disposed of at the landfill. The site presently consists of piles of rubble covered with weeds, shrubs, and trees. The height of the rubble piles over most of the site are about 3 to 4 feet above natural grades and reach a maximum of about 14 to 15 feet above natural grades at the north end. The rubble includes large pieces of concrete mix with wood, exterior asbestos tiles, metal and asbestos/cement pipe, and asphalt mixed with soil.

Monitoring Well MW-0K was sampled for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, TPH, and TRPH to assess the impact of SWMU-related contaminants on the groundwater downgradient of the landfill (No. 25).

Toluene, carbon disulfide, and 2-methylphenol were detected in the groundwater sample from this monitoring well. Only carbon disulfide exceeded RBCs by a sufficient amount to pose a potential health risk. The estimated hazard index (1.7) indicates that unacceptable health effects may occur. It is suspected that the carbon disulfide may be a field contaminant. For this reason, it is recommended that one additional groundwater sample be collected to confirm the results of the Phase II sampling and to fully assess the impact to groundwater from Landfill No. 25.

SUMMARY OF RECOMMENDATIONS

SWMU NUMBER	RECOMMENDATION
31	NFA
93	NFA
127	NFA
55	NFA
77	NFA
103	NFA
97	FE

NOTE: The key to column 2 above is as follows:

- NFA = No Further Action
- FE = Further Evaluation

1.0
INTRODUCTION

1.1 BACKGROUND AND AUTHORITY

Cannon Air Force Base (AFB) is a permitted RCRA facility operating in accordance with the terms of a permit issued jointly by the United States Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) effective October 3, 1989. This permit sets forth the conditions within which Cannon AFB can be operated as a hazardous waste facility. The authority for regulation of hazardous waste activities at Cannon AFB through this permit is derived from the Federal Resource Conservation and Recovery Act (RCRA) and its reauthorization in the form of the Hazardous and Solid Waste Amendments of 1984 (HSWA) as well as the New Mexico Hazardous Waste Management Act.

A portion of this permit governs the investigation and, where required, the implementation of corrective measures to mitigate the effects on the environment, of releases of petroleum products and other chemicals that may have been released from various Solid Waste Management Units (SWMUs) at the Base. One hundred twenty-eight SWMUs were identified at Cannon AFB during the RCRA Facility Assessment completed in 1988 for the EPA by A. T. Kearney. Seventy-three of the SWMUs were identified for further investigation and were divided into three groups (Appendix I through III). Appendix I and Appendix II SWMUs have been investigated under other programs. Sixteen of the Appendix III SWMUs were the subject of the Phase I RCRA Facility Investigation (RFI) Report. Seven of these Appendix III SWMUs were further investigated and are the subject of this Phase II RFI report.

These regulatory considerations notwithstanding, the United States Air Force (USAF) has in place an independent program to manage its waste generation and disposal activities. Compliance with the terms of the RCRA Permit is a portion of the overall environmental management program at Cannon AFB.

This RFI was authorized and funded by the USAF through the United States Army Corps of Engineers (USACE).

1.2 PURPOSE AND SCOPE OF REPORT

The purpose of the RFI is to obtain the data necessary to characterize the nature and extent of contamination to the degree necessary to support recommendations for further studies to identify corrective measures alternatives for each SWMU or to recommend "no further action" if warranted. The data collected during the RFI will be used to determine whether a significant release has occurred at a SWMU and to evaluate human health and ecologic risks. The data quality objective process is used to ensure that data of sufficient quantity and quality are collected to achieve this purpose.

The scope of this RFI has been specified by the USACE on behalf of the USAF to require the contractor to address 7 of the 16 SWMUs listed in Appendix III of the RCRA Permit at Cannon AFB. The field investigation has been limited to soil, sediment, and groundwater sampling in the areas of potential releases from each SWMU. No background samples were collected, since the previous work involved an extensive base-wide collection of background data for inorganic materials. Soil borings were advanced, and in some cases sediment samples and groundwater samples were collected, at appropriate locations adjacent to and within each SWMU and soil samples were collected for the purpose of determining the degree of contamination, if any, that existed in the soil.

The scope includes identification of significant exposure pathways and chemicals of concern and a risk screening to determine whether a significant risk to human health is posed by contaminants at each site.

The RFI status of the Appendix III SWMUs investigated under the Phase II RFI, along with the other Appendix III SWMUs, are listed in Table 1-1.

1.3 CANNON AFB OPERATIONAL HISTORY

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the City of Clovis. The Base is situated on approximately 4,320 acres of land. The vicinity map of Cannon AFB is shown on Figure 1-1, and the site map of Cannon AFB is shown on Figure 1-2. Off-Base facilities include the Melrose Bombing Range.

Cannon AFB dates to 1929, when Portair Field was established on the site. Portair Field was a civilian passenger terminal for early commercial transcontinental flights. In 1942, the Army Air Corps took control of the civilian airfield, and it became known as the Clovis Army Air Base. In early 1945, the Base was renamed Clovis Army Air Field. Flying, bombing, and gunnery classes continued through the end of World War II. By mid-1946, however, the airfield was placed on a reduced operational status and flying activities decreased. The installation was deactivated in May 1947. The types of aircraft stationed at Cannon AFB from 1942 to 1947 included B-17, B-24, and B-29 heavy bombers.

The Base was reassigned to the Tactical Air Command in July 1951. The first unit, the 140th Fighter-Bomber Wing, arrived in October of that year. The airfield was formally reactivated in November 1951 as Clovis Air Force Base. Between 1952 and 1957, the 50th and 388th Fighter-Bomber Wings were activated, and, upon their transfer, were replaced by the 312th and 474th Groups. Predominant aircraft stationed at Cannon AFB from 1951 to 1957 included the P-51 "Mustang" fighter and the F-86 "Sabre" fighter jet.

In June 1957, the Base became a permanent installation and was renamed Cannon Air Force Base in honor of the late General John K. Cannon, a former commander of the Tactical Air Command. In October 1957, the 312th and 474th Fighter-Bomber Groups were redesignated tactical fighter wings and the 832nd Air Division was activated to oversee their activities.

In 1959, the 312th Tactical Fighter Wing (TFW) was deactivated and replaced at Cannon AFB by the 27th TFW. In December 1965, the Base's mission changed to that of a replacement training unit, and the 27th TFW became the largest such unit in the Tactical Air Command. The predominant aircraft stationed at Cannon AFB from 1957 to 1965 was the F-100 "Super Sabre" fighter jet.

The 832nd Air Division was deactivated in July 1975, leaving the 27th TFW the principal Air Force unit at Cannon AFB. In early 1981, the 27th TFW was designated a Rapid Deployment Joint Task Force member.

The primary mission of Cannon AFB has remained relatively unchanged since 1965; i.e., to develop and maintain an F-111 tactical fighter wing capable of day, night, and all-weather combat operations and to provide replacement training of combat aircrews for tactical

organizations worldwide. Aircraft stationed at Cannon AFB since 1965 include the F-100 "Super Sabre" fighter jet (1957-1969), the F-111A (1969), the F-111E (1969-1971) and the F-111D (1971-present). There are approximately 70 F-111D aircraft assigned to Cannon AFB. The total work force on Cannon AFB numbers approximately 4,000, which includes 3,500 military and 450 civil service.

In 1992, Cannon AFB became part of the Air Combat Command (ACC) as the result of the overall realignment of Air Force Commands and the ongoing downsizing of the U. S. Military.

1.4 PREVIOUS INVESTIGATIONS

Prior to this RFI, investigative activities completed at Cannon AFB include the following:

- IRP Records Search - CH2M Hill - 1983
- Preliminary Review/VSI Report - RCRA Facility Assessment - A.T. Kearney - 1987
- RCRA Facility Investigation Work Plan for 27 SWMUs - Lee Wan and Associates, Inc. - 1990
- RI Investigation - Appendix I SWMUs - W-C - 1991-1992 (18 SWMUs called "First Third")
- RFI (Phase I) - Landfills 1 and 2 - W-C - 1992-1993
- RFI (Phase I) - Appendix II SWMUs - through USACE, Albuquerque, NM - 1993
- RFI (Phase I) - Appendix III SWMUs - W-C - 1993

Concurrently with the RFI on Appendix III SWMUs, W-C is completing Phase II RFI activities on Appendix III SWMUs, at the Old Entomology Rinse Area and at Landfill 5,

under separate task orders. Investigations are also being completed at Landfills 3 and 4 and at Landfill 25.

1.5 ORGANIZATION OF REPORT

The report is organized as shown in the table of contents, reporting activities and recommendations essentially in the order they were completed. The discussion of results and recommendations for each individual SWMU are presented (one site per section) in Sections 6.0 through 12.0, and the recommendations are recapped in summary form in Section 13.0.

TABLE 1-1

LIST OF APPENDIX III SWMUs AND RFI STATUS

SWMU Number	Site	Status*	
		Phase I	Phase II
31	AGE Maintenance Shop	Yes	NFA
46	Oil/Water Separator #196	Yes	REM95
47	Oil/Water Separator #494	Yes	REM95
51	Oil/Water Separator #375	Yes	REP95
57	Oil/Water Separator #379	Yes	REP95
61	Oil/Water Separator #5077a	Yes	REM95
62	Oil/Water Separator #5077b	Yes	REM95
63	Oil/Water Separator #5077c	Yes	REM95
70	Oil/Water Separator #326	Yes	REM*
72	Oil/Water Separator #390[1,2]	No	No
90	Oil/Water Separator #5114[3]	No	No
91	Recovered Fuel Tank #5114	No	No
92	Oil/Water Separator #5120	Yes	REM95
93	Oil/Water Separator #5121	Yes	NFA
94	Oil/Water Separator #5144	Yes	REM95
127	Oil/Water Separator #4095	Yes	NFA
55	Lead/Acid Battery Area	Yes	NFA
77	CE Container Storage Area	Yes	NFA
103	Wastewater Playa Lake	Yes	NFA
97	Landfill 25 Monitoring Well	Yes	FE
112	Oil/Water Separator #2336	No	No
128	Oil/Water Separator Near Tank #4095 (#2) and Leach Field	No	No
AOC "A"	MOGAS Spill[5]	No	No
AOC "B"	JP-4 Fuel Spill[6]	No	No
AOC "C"	Blown Capacitor Site[7]	No	No

NFA - Phase II RFI completed; no Further Action.
REP95 - No Phase II RFI was completed; however, the OWS is to be removed, inspected, and replaced in 1995.
REM95 - No Phase II RFI was completed; however, the OWS is to be removed and inspected in 1995.
REM* - A pilot bioventing study is being executed. The oil/water separator will be reviewed following the completion of this study.
FE - Further Evaluation.
* Indicates whether or not a Phase I and/or Phase II RFI was completed.

TABLE 1-1

LIST OF APPENDIX III SWMUs AND RFI STATUS

[1] = Oil/Water Separator replaced 2,000-gallon JP-4 UST No. 390 in 14 Jan 91 according to UST Program records.

[2] = Based on records from this project; recommend NFA.

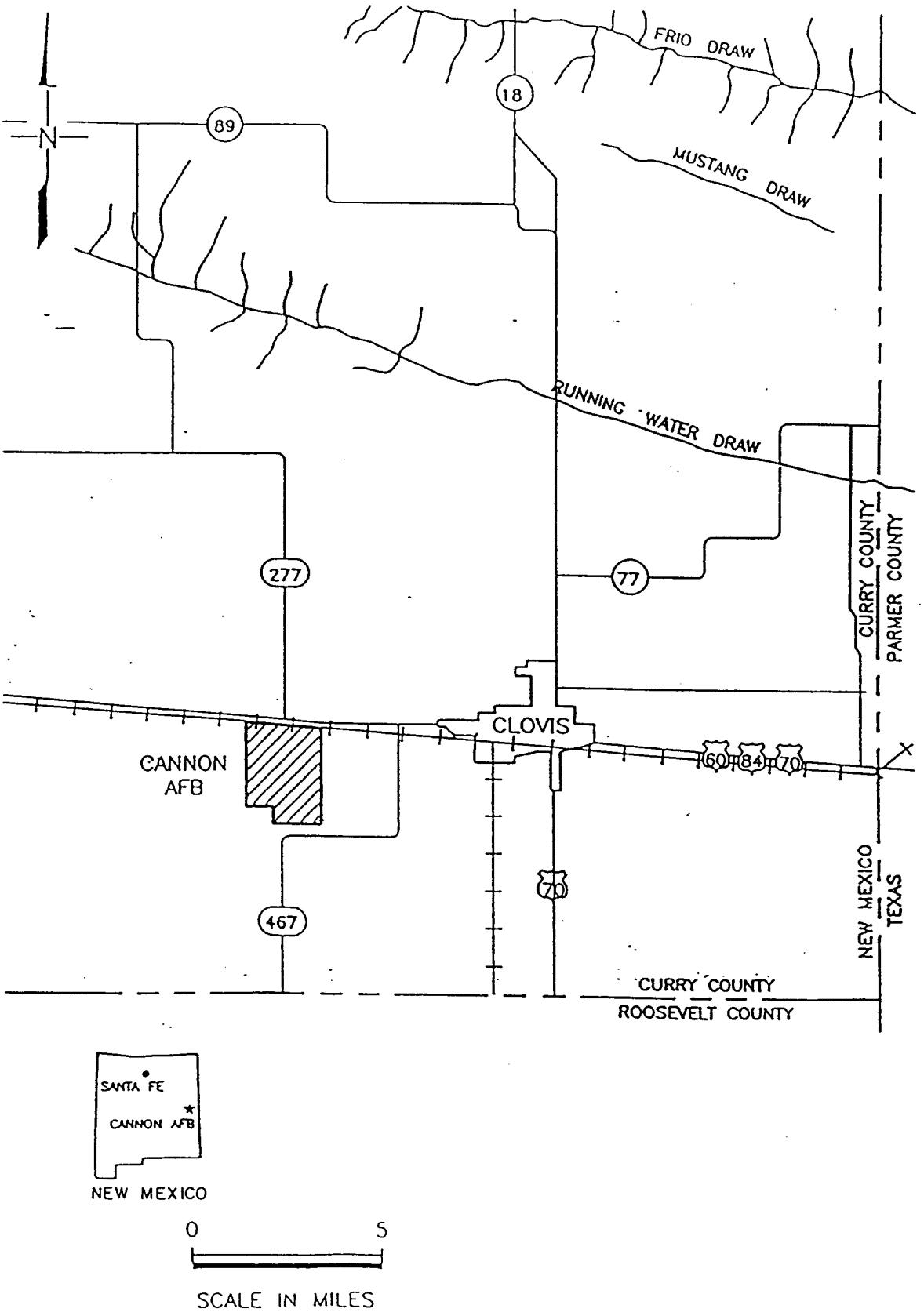
[3] = SWMU 90 investigated under SD-11 investigation. 2,000-gallon JP-4 storage UST and OWS removed in 1991 under EPA approved removal action.

[4] = Phase I investigation diverted pending start of Phase II in CY95.

[5] = Identified as IRP Site 19 during the IRP Phase I investigation.

[6] = Identified as IRP Site 18 during the IRP Phase I investigation.

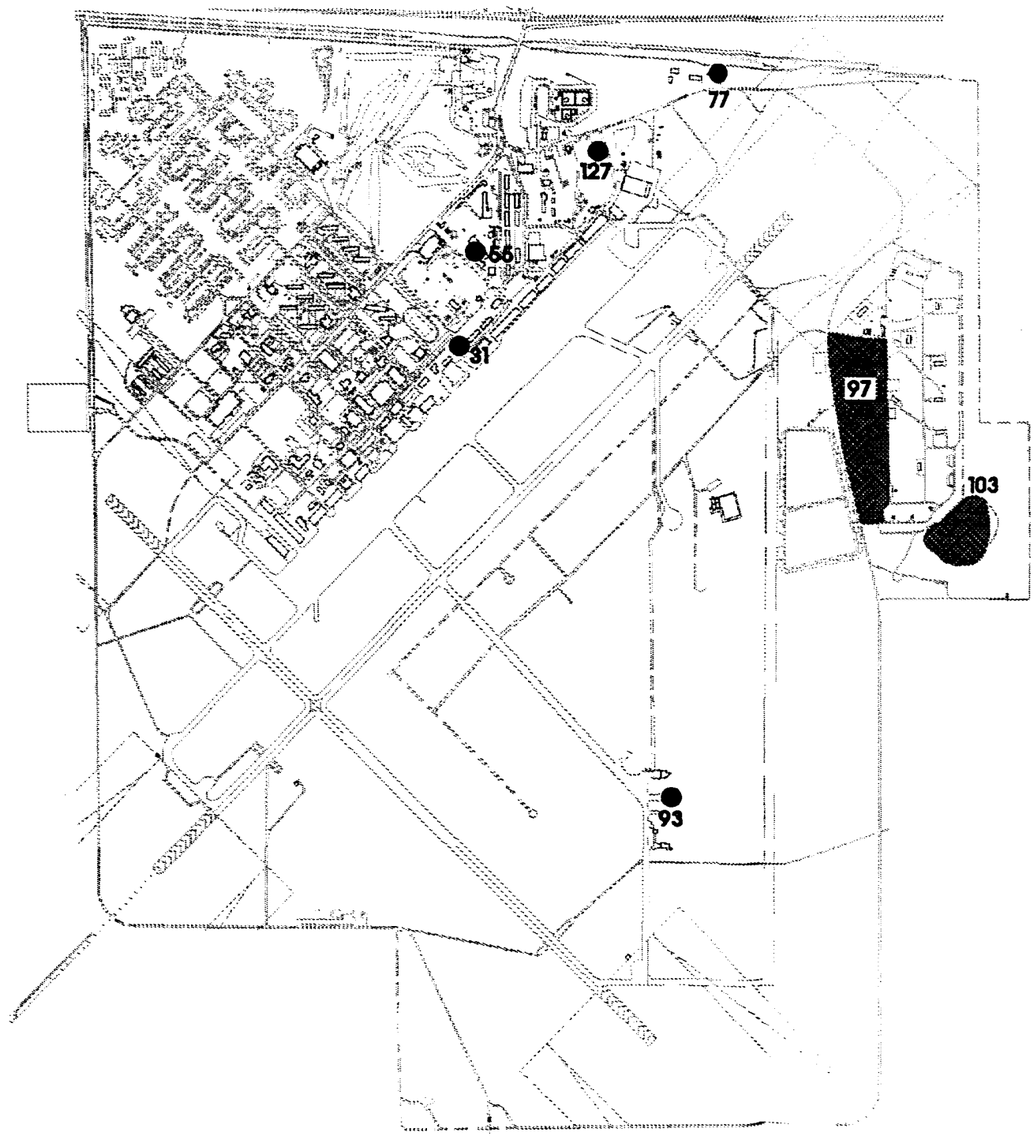
[7] = Identified as IRP Site 10 during the IRP Phase I investigation.



DRN BY SCR	DATE 06/21/94	REGIONAL MAP CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11QQ	1-1

CAD FILE: DWG 03/12/1995 17:15 REPORT ASE: LF3 & 4 RFI

REPORT PHASE: PHASE II
03/23/1995 12:08
C3M11M15.DWG



LEGEND

3 ●	SOILD WASTE MANAGEMENT UNIT (SWMU) LOCATION AND NUMBER

SWMU No.	DESIGNATED AREA
31	AGE MAINTENANCE SHOP PAD
55	LEAD ACID BATTERY ACCUMULATION POINT
77	CIVIL ENGINEERING CONTAINER STORAGE AREA
93	OIL/WATER SEPARATOR No. 5121
97	LANDFILL No. 25
103	WASTEWATER PLAYA LAKE
127	SAND TRAP AND LEACH FIELDS AT THE POL WASHRACK

N

2000 1000 0 2000

SCALE IN FEET

DRN. BY: CJG	DATE: 08/16/93	SITE PLAN AND LOCATION OF INVESTIGATED SWMU SITES CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D. BY:	REVISION: 0		FIG. NO. 1-2

2.0
CANNON AFB FACILITY DESCRIPTION

2.1 SETTING - PHYSICAL GEOGRAPHY

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince. The Llano Estacado is a nearly flat plain sloping gently (10 to 15 feet per mile) to the east and southeast. Elevations in the eastern New Mexico portion of the Llano Estacado exceed 4,000 feet above mean sea level (msl). In the vicinity of Cannon AFB, elevations range from 4,250 feet to 4,350 feet above msl.

The most prominent geomorphic features in the vicinity of Cannon AFB are blowouts and broad, widely spaced valleys. Less common landforms are relict sand dunes located along the northern side of the Portales Valley south of the Base. Relict dunes are not found on or near Cannon AFB.

Blowouts are broad shallow depressions which form as the result of soil erosion by wind. Blowouts commonly collect surface runoff from small to moderate sized drainage areas. During periods of rainfall, runoff collects in blowouts to form ephemeral playa lakes. Playas have no external surface drainage. Water is lost by infiltration to the soil and evaporation; without recharge, playa lakes persist for only a few days or weeks. Three playas are located within the Base, and several more are found to the north and east of the Base.

Stream valleys tend to be fairly broad and widely spaced. Streams are ephemeral and drainages are poorly developed. No streams exist on or near Cannon AFB. Running Water Draw and Frio Draw, located about 10 and 20 miles, respectively, north of Cannon AFB, are the nearest streams. These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals (W-C 1994).

2.2 DEMOGRAPHICS AND LAND USE NEAR CANNON AFB

Cannon AFB is located just south of U.S. Highway 60-84 in a farming and ranching area (Figure 1-1). The majority of the land surrounding Cannon AFB is productive, irrigated farmland or grassland. The major crops are wheat, sorghum, sugar beets, corn, cotton, alfalfa, barley, and peanuts. The land is also used for cattle grazing, both beef and dairy, and Clovis is considered the "Cattle Capital of the Southwest." There were 32,767 people living in Clovis in 1990, while the Cannon AFB population was estimated to be 4,650 in 1990 (W-C 1994).

2.3 CLIMATOLOGY

The climate of east-central New Mexico is classified as tropical semi-arid, with summer temperature and precipitation maxima. Average monthly temperatures range from a January low of 12°C (39°F) to a July high of 26°C (78°F). Extreme daily temperatures range from -24°C (-11°F) to 41°C (106°F) (Lee Wan and Associates 1990). Average monthly precipitation ranges from 1 cm (0.4 inches) in winter to 6.9 cm (2.7 inches) in July (W-C 1994). The maximum recorded 24-hour rainfall is 12.2 cm (4.8 inches), which occurred in August. Rainfall occurs on eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 41 cm (16 inches). The mean annual evapotranspiration rate is 181.4 cm/yr (71.4 inches/yr) (Lee Wan and Associates 1990). Prevailing winds are from the west at an average of 5 km/hr (3.1 mph) during fall, winter, and spring. During the summer, winds are from the south at an average of 3.7 km/hr (2.3 mph).

The atmosphere around the area of Cannon AFB is generally well mixed. The seasonal and annual average mixing heights can vary from 400 meters in the morning to 4,000 meters in the afternoon. The afternoon mixing heights are typically greater during the spring and fall seasons. The morning mixing heights are usually low, due to nighttime heat loss from the ground, producing surface-based temperature inversions. After sunrise, these inversions break up, and solar heating of the earth's surface causes vertical mixing in the atmosphere.

Dust is frequently entrained into the atmosphere in this region of the country because of gusty winds and the semiarid climate. The Texas Panhandle-eastern New Mexico area is considered

the worst area in the United States for windblown dust. Occasionally, this windblown dust is of sufficient quantity to restrict visibility. Most of the seasonal dust storms occur in March and April, when the wind speeds are typically high (average 5 km/hr) (W-C 1994).

2.4 GEOLOGY

The near-surface stratigraphic units of interest at Cannon AFB are the Late Miocene-Late Pliocene-age Ogallala Formation and the Early Triassic Dockum Group as shown in Figure 2-1.

The Dockum Group consists of three formations. The stratigraphically lowest unit is the Santa Rosa Sandstone. Overlying the Santa Rosa Sandstone are the Chinle and Redonda Formations. The Chinle and Redonda Formations are composed mainly of red shales with lesser interbedded sands, and are known locally as "redbeds." The top of the Dockum Group is marked by an erosional nonconformity having relief of up to several hundred feet (Lee Wan and Associates 1990).

Overlying the Dockum Group redbeds is the Ogallala Formation. The Ogallala Formation extends from eastern New Mexico and Colorado into Texas, Oklahoma, Kansas, Nebraska, and South Dakota. Drillers' logs from Cannon AFB indicate that the Ogallala Formation varies from 360 feet to 415 feet in thickness. The incised upper surface of Triassic redbeds strongly influences Ogallala thickness. Stream valleys in the post-Triassic nonconformity are deep and trend dominantly east-west. Ogallala thickness may thus vary significantly over short north-south distances.

The Ogallala is erosionally truncated to the south along the abandoned Portales Valley, to the west along the Pecos River Valley, and to the north in a series of ephemeral stream valleys. The Ogallala Formation extends more than 125 miles to the east before terminating as an escarpment in Briscoe County, Texas. Springs and seeps are common along the erosional margins of the Ogallala.

The Ogallala dips gently and monoclinally to the southeast in the vicinity of Cannon AFB. As reported in Lee Wan and Associates (1990), data suggest that some Quaternary warping may have occurred; however, most of the structures are well to the northwest and southwest

of Cannon AFB. No faults or buried structural lineaments are known in the vicinity of Cannon AFB.

The Ogallala Formation is composed of unconsolidated poorly sorted gravel, sand, silts, and clays. The Base of the Ogallala is generally marked by a gravel, cobble, and boulder deposit. This basal member contains sediments derived from igneous and sedimentary rocks transported from the mountains to the west. The Ogallala Formation was laid down by stream and overbank deposits formed within coalescing alluvial fans. These fans form a broad pediment along the eastern flank of the Rocky Mountains. As is typical of alluvial deposits, Ogallala internal stratigraphy varies vertically and horizontally over short distances.

Except where strongly cemented by calcium carbonate (caliche), the sediments of the Ogallala are loose and friable. Authigenic and allogenic clays are found as a trace to abundant matrix mineral (Lee Wan and Associates 1990). As reported by Lee Wan and Associates (1990), five zones have been distinguished within the Ogallala of east central New Mexico on the basis of clay minerals. Smectites (montmorillonites) and attapulgite (with sepeotite) are the dominant clays throughout the Ogallala. Illite is a lesser, but persistent clay, as is kaolinite. Smectite is a swelling clay, causing deep cracks to form in dry surface soils. Smectite in particular and, to a lesser extent, attapulgite and illite, are clays with moderate to high cation exchange capacities (CEC). The formation as a whole should therefore have a relatively high CEC, which should inhibit the migration of charged contaminants, and especially ionic forms of metals.

Caliche is a major feature of the Ogallala Formation, occurring as nearly continuous to discontinuous layers throughout. A generalized geologic section at Cannon AFB is shown in Figure 2-1. Caliche is hard, white to pale tan on fresh surfaces, weathering to gray, and has a chalky appearance. Caliche forms as calcium carbonate, leached from overlying sediments, and precipitates in the pore space of the host sediments. Precipitation is caused by the evaporation of downward percolating water. The caliche may thus mark the position of ancient vadose zones. As reported in Lee Wan and Associates (1990) radiocarbon dates for the upper "climax" caliche range from ~27,000 yrs. Before Present (B.P.) to ~42,000 yrs. B.P.

Caliche is relatively soluble in acidic water (pH < 7) or in waters containing dissolved CO_2. The top surface of the upper "climax" caliche in fresh outcrop shows solution etching.

The Ogallala has numerous continuous to discontinuous caliche layers throughout its thickness. The uppermost caliche, termed the "climax" caliche, is pisolitic (Lee Wan and Associates 1990). The pisolites are thought to have formed as the caliche was repeatedly chemically-weathered and brecciated during Pleistocene pluvials and later recemented during drier intervals. This upper caliche outcrops around playas and the bounding escarpments of the Ogallala, and is locally termed "caprock." The "climax" caliche is typically 3 to 5 feet thick. Caliches which occur lower in the Ogallala are platy and harder. Caliche may be thin or absent below playas (W-C 1994).

2.5 HYDROGEOLOGY

The lower portion of the Ogallala Formation is the primary regional aquifer for both potable and irrigation water. No deeper aquifers are utilized in the vicinity of Cannon AFB. The Ogallala aquifer is part of the High Plains Aquifer which extends continuously from Wyoming and South Dakota into New Mexico and Texas. In east central New Mexico, the Ogallala aquifer rests on Dockum Group redbeds, which serve as the basal confining layer. The Ogallala is a water table, or unconfined, aquifer (Lee Wan and Associates 1990). The Ogallala aquifer has a southeasterly regional gradient of about 13 feet/mile. Well yields vary from less than one gallon per minute (gpm) in thin silts and sands, and up to 1,600 gpm in thick sands and gravels (Lee Wan and Associates 1990). Water quality is generally good, with hardness and fluorides being somewhat high (Lee Wan and Associates 1990).

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet, and is influenced by the configuration of the erosional nonconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7.5 feet/mile (Lee Wan and Associates 1990). Figure 2-2 shows water table elevation contours for 1984. Flow within the saturated zone may be influenced by the configuration of the top of the Dockum Group. Yields in tests of Cannon AFB water wells have ranged from 776 l/min (205 gpm) to 4,353 l/min (1150 gpm). Specific capacities range from 0.14 m^3/m (11.4 gal/feet) to 0.35 m^3/m (27.9 gal/feet) (Lee Wan and Associates, 1990).

Very rough estimates of hydraulic conductivity were made from well pump tests in water wells 5 and 9 (Figure 2-3) using the Theis equation. An estimate of hydraulic conductivity for water well 8 was based on water level recovery data using the Bouwer and Rice approach (Lee Wan and Associates 1990). The data used in these calculations were obtained to evaluate pump rates, efficiency, and well yield, and were not intended for use in calculating aquifer properties. The results of these calculations should therefore be considered as first approximations.

Hydraulic conductivity values for water wells 5 and 9 were found to be approximately 2.0×10^{-3} cm/sec. Calculations for water well 8 result in a hydraulic conductivity of 2.0×10^{-2} cm/sec. In addition, slug tests were done on MW-O and MW-N by Woodward-Clyde in February 1995. Estimated hydraulic conductivities from these slug tests were 3×10^{-3} for both wells (W-C 1995). These estimates appear to be low when compared to published hydraulic conductivity data for sands and gravels. As reported in Lee Wan and Associates (1990) a groundwater flow velocity of about 45 m/yr (150 feet/yr) has been estimated. This calculates out to a hydraulic conductivity of approximately 1.0×10^{-1} cm/sec. Again, this appears to be low when compared with published data (Freeze and Cherry 1979).

The presence of interstitial clays may account for both the variability and low values of hydraulic conductivities. Boring logs from Cannon AFB IRP projects and published reports (Lee Wan and Associates 1990) indicated that interstitial and interstratified clays are abundant in the Ogallala Formation.

Recharge to the Ogallala is primarily through precipitation. As reported in Lee Wan and Associates (1990), a recharge rate of 0.5 inches/year as calculated using the Theis equation. Lee Wan and Associates (1990) reported that the recharge rate may be as much as 1.0 inches/yr. Due to the high evapotranspiration rate and low precipitation, recharge probably occurs only during heavy rainfall events in which the infiltration capacity of the soil is exceeded and runoff occurs, or during cool months when precipitation exceeds evapotranspiration. Excess runoff flows to playas, and the presence of water in playas may allow deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and thin or nonexistent caliche layers directly below, playas. Caliche is soluble in acidic rain waters, and is leached over time to form percolation pathways.

Discharge from the Ogallala occurs through well pumping and springs along the eroded margins. Spring discharge does not occur on or near Cannon AFB. Domestic and irrigation water wells are common on and around the Base, however. The rate of discharge exceeds the rate of recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. A decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico for the period from the 1930s to 1980. Lee Wan and Associates (1990), states "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry Co., New Mexico to Crosby Co., Texas."

The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water. Numerous wells are found in the Cannon AFB area, most of which provide only irrigation water (Figure 2-3).

The Ogallala will continue to be used as the primary source of potable and irrigation water for eastern New Mexico. The New Mexico State Engineer designated Curry County as a Water Basin in 1989. This designation allows for regulation of water rights, usage, and well drilling (W-C 1994).

2.6 SOILS

Soils in the vicinity of Cannon AFB are classified as SM to SC under the Unified Classification Systems, and as aridisols (calciorthids) under the Soil Conservation Service Comprehensive Soil Classification System. The following summary is based on the Soil Conservation Service Curry County Soil Survey as reported in Lee Wan and Associates (1990).

The most common soil type on the Base is the Amarillo fine sandy loam, 0 to 2 percent slope phase (map symbol Ab Figure 2-4). This soil consists of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths below 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The Amarillo fine sandy loam is present on all relatively flat surfaces at the Base, but is also found on slopes associated with playas (map symbol Ac).

Clovis fine sandy loams, 0-2 percent slope phase (map symbol Cb) and 2-5 percent slope phase (map symbol Cc), are very similar to Amarillo fine sandy loams. In the Clovis soils, the depth to the calcic C horizon ranges from 28 to 56 inches. The depth to caliche exceeds 56 inches. Clovis and Amarillo fine sandy loams occur in close association.

In a few limited areas, particularly along the steeper slopes around playas, Mausker fine sandy loam, 0 to 2 percent slope phase (map symbol Ma), and 2 to 5 percent phase (map symbol M6) are found. Mausker fine sandy loams have no B horizons and are very calcareous. The calcic C horizon is within 2 feet of the surface.

The A and B horizons of Amarillo and Clovis fine sandy loams are rapidly to moderately permeable. Mausker fine sandy loam A and Ac horizons are rapidly permeable. Permeabilities in calcic B and C horizons are moderate (Lee Wan and Associates 1990).

2.7 BACKGROUND SOIL AND WATER QUALITY

The natural soils in the vicinity of Cannon AFB are alkaline and rich in metals in general. Typically high concentrations of aluminum, iron, magnesium, Manganese, and potassium combine with elevated levels of many other metals in the natural soils. Calcium is naturally present in the soils at levels up to nearly 200,000 mg/kg. Tightly cemented layers of "caliche" are present in several horizons in the natural soils and the Ogallala aquifer below.

The uppermost groundwater aquifer is the Ogallala, and the groundwater is more than 200 feet deep. The groundwater from the lower portions of the aquifer is used for drinking water and irrigation and industrial applications. No deeper aquifers are utilized in the vicinity of Cannon AFB. The water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985).

The background levels of inorganic compounds in soil at Cannon AFB are presented in Table 2-2 in the form of a mean value and statistical information on the ranges encountered for each element.

The general water quality from the Ogallala aquifer over a broad region is presented in Table 2-3, and water quality data for samples from production wells and monitoring wells within the bounds of Cannon AFB are presented in Table 2-4.

These tables of background data have been adapted from a draft report by Woodward-Clyde dated March 1994 entitled "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon Air Force Base, Clovis, New Mexico". This report summarizes background data for soil and groundwater from numerous past investigations in the vicinity.

The mean values and upper tolerance limits (UTLs) presented in Table 2-2 are the background levels used in the screening of soil chemical results for this RFI. In addition to comparison to the UTL of the base-wide background data (which is necessarily from a limited data set), other sources of naturally-occurring metals concentrations, such as USGS (1984), were considered when determining whether metals concentrations are within background levels.

2.8 BIOLOGICAL RESOURCES

Land adjacent to Cannon AFB is primarily used for agriculture, and there is little natural vegetation remaining in the area. The wildlife species that are common to agricultural areas throughout the region include bobwhite quail and pheasant. There are a few playa lakes in the area; these are used by upland game for cover, by waterfowl for resting and feeding, and by wildlife in general for drinking. Nearby riverbeds also provide water sources during rainy seasons. During periods of low rainfall, the riverbeds are dry (W-C 1994).

2.8.1 Plant Resources

The climate of the Base area is considered to be semiarid. The thin layer of topsoil in the vicinity of Cannon AFB is sandy loam, which is highly susceptible to wind erosion. The undisturbed natural vegetation is mostly shortgrass prairie, including blue grama grassland and mixed grama grassland vegetation types, which have moderately fast recovery rates.

Much of the study area has been previously cleared for agricultural crops. The predominant land use of the region is rangeland, primarily for cattle grazing. In general, moderately grazed rangeland areas of the types occurring in the project area are highly productive in terms of both forage quality and quantity. The rangeland in the vicinity may support up to 15 to 20 head of cattle per section, depending on the rainfall. Large trees do not uniformly exist in the vicinity of the range except where planted around buildings and other structures on the Base. Woodlands composed of large shrubs and small trees are confined to riparian areas and playa lakes in the vicinity (W-C 1994).

The following plants are candidate species for the Federal List of Endangered and Threatened Wildlife and Plants and are found within a 50-mile radius of Cannon AFB: chatterbox orchid (*Epipactus gigantea*), spiny aster (*Aster harridus*), Whittmans milkvetch (*Asragalus witmanil*), dune unicorn plant (*Proboscidea sabulosa*), and the tall plains spruce (*Eupjorbia strictior*). The dune unicorn plant is also on the state endangered plant species list. No federally protected endangered plants are known to be present on the Base (Lee Wan and Associates 1990).

2.8.2 Wildlife Resources

The eastern New Mexico area contains many nongame wildlife species that are typical of the High Plains. Most of these species are distributed widely throughout the western United States. Species diversity is low in most habitats because of the low vegetation diversity. Most amphibian species are associated with riparian habitats and playa lakes. Reptiles are found in all terrestrial habitat types but are most abundant in scrub/grasslands. Nocturnal rodents are the most abundant members of the small mammal community.

Grasslands on the High Plains support a variety of seed-eating sparrows and other ground-dwelling birds, both as residents and migrants. Raptors (hawks and owls) are relatively abundant in all habitats in the region. Insectivorous and tree-nesting species are most abundant in riparian areas. Shorebirds and waterbirds and migratory waterfowl in general utilize the rivers, playa lakes, and reservoirs of the region.

Two National Wildlife Refuges (NWRs) are located on the periphery of the Base area. The Grulla and Muleshoe NWRs are within 30 miles of Cannon AFB. These areas provide high-quality habitat for migratory and breeding waterfowl.

Big-game species in the area include mule deer, white-tailed deer, pronghorn, and barbary sheep. Pronghorn are the most abundant game animal in the area. Several species of upland game, such as quail, ring-necked pheasant, and turkey are common in the area. Reservoirs (Ute Lake, Conchas Lake, and Clayton Lake) and playa lakes are important waterfowl habitats in the region. Numerous species of native and introduced fish inhabit the rivers and perennial streams, and the reservoirs support recreational fishing of warm-water species such as walleye, crappie, channel catfish, largemouth bass, and bluegill.

As determined by the regional office of the U.S. Fish and Wildlife Service, two federally listed endangered animal species, the bald eagle and peregrine falcon, are known to inhabit the area within a 50-mile radius of Cannon AFB. The New Mexico Department of Game and Fish also indicated that the state endangered Mississippi Kite, Baird's Sparrow, and the Black-Footed Ferret may also occur in the vicinity of the Base. The federal- and state-protected species are listed in Table 2-1.

Within Curry County, the only state-protected bird that is expected to occur is the Mississippi Kite. In New Mexico, since the early 1960s, this kite summers regularly and breeds in the Clovis region. The birds frequent the golf course at Cannon AFB. Two other state-protected birds that may occur within Curry County are the McCown's Longspur and Baird's Sparrow. These two species have not been sighted regularly in recent years, however. No information is available on the McCown's Longspur in New Mexico; however, Baird's Sparrow occurs mainly in autumn during migration in the eastern plains and southern lowlands. Migrants appear as early as the first week of August and move further south by November. The species seems to have declined in abundance throughout its range in the Southwest due to the loss of shrubby shortgrass habitats.

State-protected birds known to occur infrequently are the bald eagle and the peregrine falcon. The bald eagle migrates and winters from the northern border of New Mexico to the Gila, lower Rio Grande, middle Pecos, and Canadian valleys. It is seen occasionally in summer and as a breeding bird, with nests reported in the extreme northern and western parts of the

state. Winter and migrant populations appear to have increased with reservoir construction. The peregrine falcon is widely distributed but population numbers are low. The American subspecies breeds statewide in New Mexico, but mainly west of the eastern plains (Source: Draft Environmental Impact Statement - Cannon AFB 1990).

TABLE 2-1

FEDERAL- AND STATE-PROTECTED ANIMALS POTENTIALLY OCCURRING IN THE VICINITY OF CANNON AFB (CURRY COUNTY)

Common Name	Scientific Name	Federal Status	State Status
Birds			
Mississippi kite	Ictinia mississippiensis		Endangered (Group 2)
Barid's sparrow	Ammodramus baridii		Endangered (Group 2)
Bald eagle	Haliaeetus leucocephalus	Endangered	Endangered (Group 2)
Peregrine falcon	Falco perigrinus	Endangered	Endangered (Group 1)
Mammals			
Black-footed ferret	Mustela nigripes	Endangered	Possibly Extinct

Endangered (Group 1): Species whose prospects of survival or recruitment within the state are in jeopardy.

Endangered (Group 2): Species whose prospects of survival or recruitment within the state are likely to become jeopardized in the foreseeable future.

Possibly Extinct: Potentially no longer in existence in the state.

Source: Lee Wan and Associates 1990

TABLE 2-2

SUMMARY OF BACKGROUND ELEMENTAL CONCENTRATIONS[1] IN SOIL SAMPLES (2) CANNON AFB, NEW MEXICO

Element	Mean ($\bar{x}$)	Standard Deviation (SD)	95% Tolerance Limits of Background Concentrations[4] ($\bar{x}$)±2SD
Aluminum	5,700	2,420	860 - 10,540
Antimony	6.75[3]	-	-
Arsenic	3.5	6.0	0 - 15.5
Barium	166	238	0 - 642
Beryllim	0.41	0.16	0.09 - 0.73
Cadmium	1.1[3]	-	-
Calcium	69,200	58,600	0 - 186,400
Chromium	6.98	2.78	1.42 - 12.5
Cobalt	2.5	1.0	0.5 - 4.5
Copper	5.40[3]	-	-
Iron	4,780	1,970	840 - 8,720
Lead	7.12	9.35	0 - 25.8
Magnesium	4,650	3,570	0 - 11,790
Manganese	72.0	46.0	0 - 164
Mercury	0.11[3]	-	-
Nickel	5.0	2.0	1.0 - 9.0
Potassium	1,360	606	148 - 2,572
Selenium	8.23[3]	-	-
Silver	1.2[3]	-	-
Sodium	514[3]	-	-
Thallium	0.50[3]	-	-
Vanadium	14.9	5.20	4.50 - 25.3
Zinc	11.3	5.29	0.72 - 21.9

[1] All concentrations are in milligrams per kilogram (mg/kg).
[2] Compiled from data collected by W-C for the RFI and RI (W-C 1992 and W-C 1993) and Walk, Haydel & Associates for the IRP (Walk, Haydel & Associates 1990).
[3] These mean values are determined from a set of numbers including some reporting limits for nondetect results. The actual mean background concentrations are likely less than these values.
[4] Values are equivalent to 95% upper and lower tolerance limits of background concentrations.

TABLE 2-3

REGIONAL WATER QUALITY[1] - OGALLALA AQUIFER[2]

	Sherman Co. Nebraska	Laramie Co. Wyoming	Red Willow Co. Nebraska	Kit Carson Co. Colorado	Kiowa Co. Colorado	Stanton Co. Kansas	Meade Co. Kansas	Union Co. New Mexico	Roberts Co. Texas	Gaines Co. Texas	Gaines Co. Texas	Mean ($\bar{x}$)
Silica	63	28	58	36	22	20	23	38	27	58	64	40
Calcium	94	45	56	30	228	51	63	56	46	72	231	88
Magnesium	14	5.5	15	10	114	20	19	34	18	20	225	45
Sodium and Potassium	21	6.4	19	27	226	35	245	17	37	44	845	138
Bicarbonate	336	157	200	181	184	180	210	215	243	221	282	219
Sulfate	18	6.5	13	10	1,170[5]	8.1	94	49	32	104	1,351[5]	260
Chloride	18	2.8	3.9	3.0	143	30	350[5]	46	28	43	1,109[5]	162
Fluoride	---	0.4	0.8	1.8	4.0[5]	1.4	1.0	1.6	0.8	1.5	4.0[5]	1.6
Nitrate	7.6	7.0	---	7.6	3.9	12[5]	1.7	24[5]	3.9	5.6	4.2	7.0
Dissolved Solids	403	191	273	214	2,140[5]	339	900[5]	372	312	507[5]	3,970[5]	875
pH[3]	7.7	7.4	7.7	8.0	7.7	7.6	7.7	7.4	8.0	7.3	7.4	7.6
Specific Conductance[4]	605	281	420	325	2,630	555	1,650	628	507	675	5,350	1,240

1) Concentrations are in milligrams per liter (mg/L) unless otherwise indicated
2) Source: Krothe, et al. 1982
3) pH units
4) Micro mhos (μmhos)
5) Exceed U.S. Environmental Protection Agency Regulations (1976, 1977)

TABLE 2-4

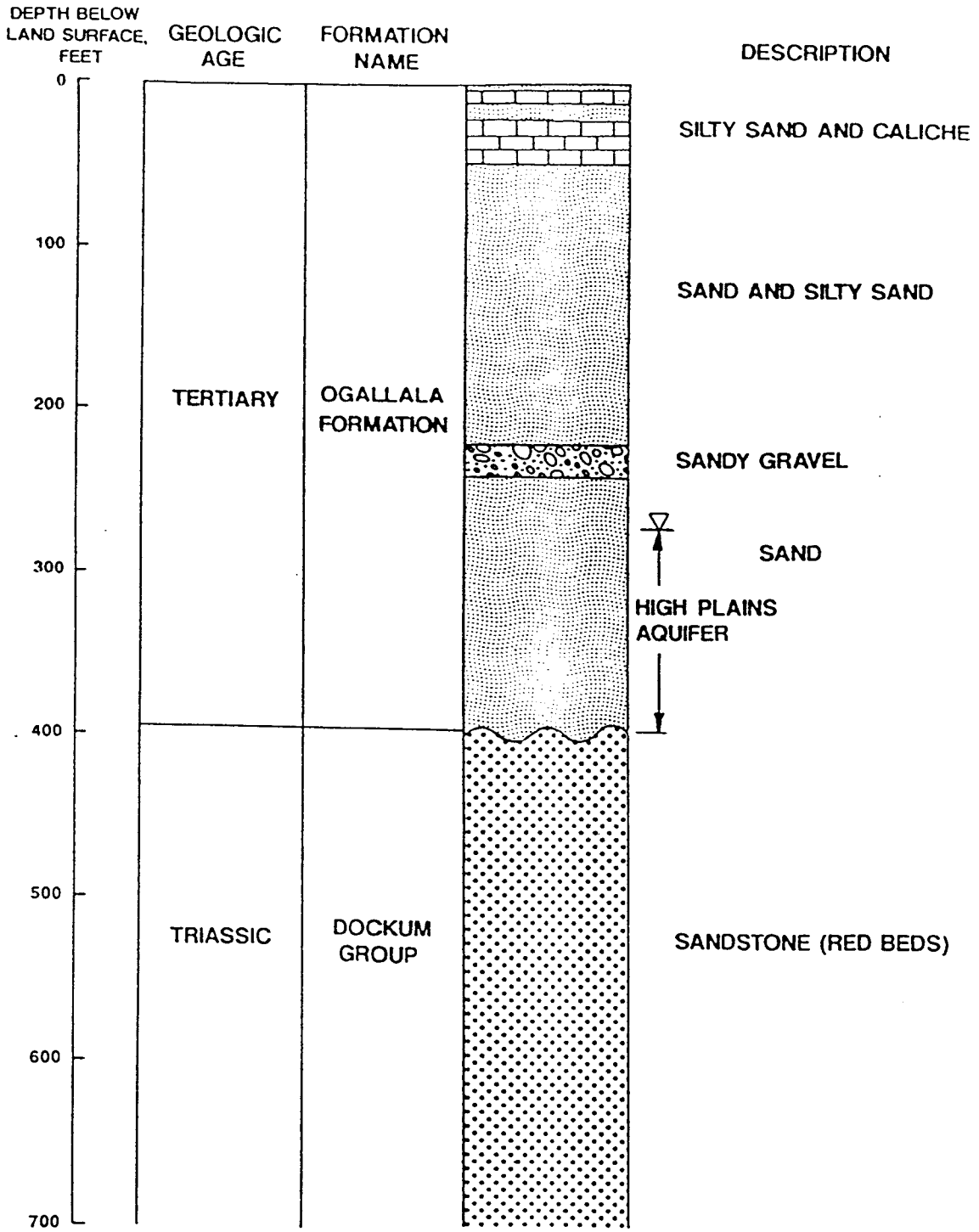
WATER QUALITY SUMMARY[1] FOR CANNON AFB PRODUCTION WELLS AND MONITORING WELLS

	Minimum	Maximum	Mean	MCL[2]
Antimony	0.06U	0.06U	0.06[5]	0.01/0.005[3]
Arsenic	0.005U	0.05U	0.02[5]	0.051
Barium	0.022	0.2	0.50[5]	1.0
Beryllium	0.002U	0.002U	0.002[5]	0.01[3]
Cadmium	0.005U	0.01U	0.0008[5]	0.005[3]
Chloride	42	63.5	52.2	250
Chromium	0.01U	0.001	0.04[5]	0.01
Cobalt	0.01U	0.01U	0.01[5]	*
Copper	0.01U	0.02U	0.012[5]	1.0[4]
Cyanide	0.005U	0.005U	0.005[5]	0.2
Fluoride	1.8	2.6	2.3	2
Lead	0.005U	0.05U	0.015[5]	0.05
Manganese	0.00	0.01U	0.0075[5]	0.05
Mercury	0.0002U	0.003	0.001[5]	0.002
Nickel	0.04U	0.032	0.04[5]	1.0[3]
Nitrate	0.9	6.6	1.8	10.0
Selenium	0.01UJ	0.0049J	0.01[5]	0.05
Silver	0.01U	0.05U	0.02[5]	1.0[4]
Sulfate	115	132	125	250
Thallium	0.01U	0.01U	0.01[5]	0.022/0.001[3]
Tin	0.1U	0.1U	0.1[5]	*
Uranium	0.0036	0.0062	0.0046	5.0
Vanadium	0.02	0.031	0.026	*
Zinc	0.0041J	0.09	0.05	5.0
TDS	385	479	451	500
pH (units)	7.5	7.95	7.78	6.5 - 8.5

MCL = Maximum contaminant level
UJ = Estimated as non-detect at the CRQL
J = Estimated value
U = Not detected
CRQL = Contract Required Quantitation Limit

* No primary or secondary MCL or proposed MCL as of March 1992

[1] All concentrations are in milligrams per liter (mg/L). Values calculated from historical data for Cannon AFB wells 1, 2, 3, 4, 7, 8, 113A, and 101E for period from 1966 through 1991.
[2] Primary MCL in effect as of July 30, 1992
[3] Proposed primary MCL
[4] Secondary MCL in effect as of July 30, 1992
[5] Detection limits (using one times the value) were also used to calculate means.



LEGEND

LITHOLOGIC CONTACT

UNCONFORMITY

WATER LEVEL

SOURCE: MODIFIED FROM GUTENTAG ET.AL., 1984

DRN BY SCR	DATE 08/18/93	GENERALIZED GEOLOGIC STRATA AT CANNON AIR FORCE BASE. NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	2-1

REPORT PHASE: PHASE II – APPX. II R & I
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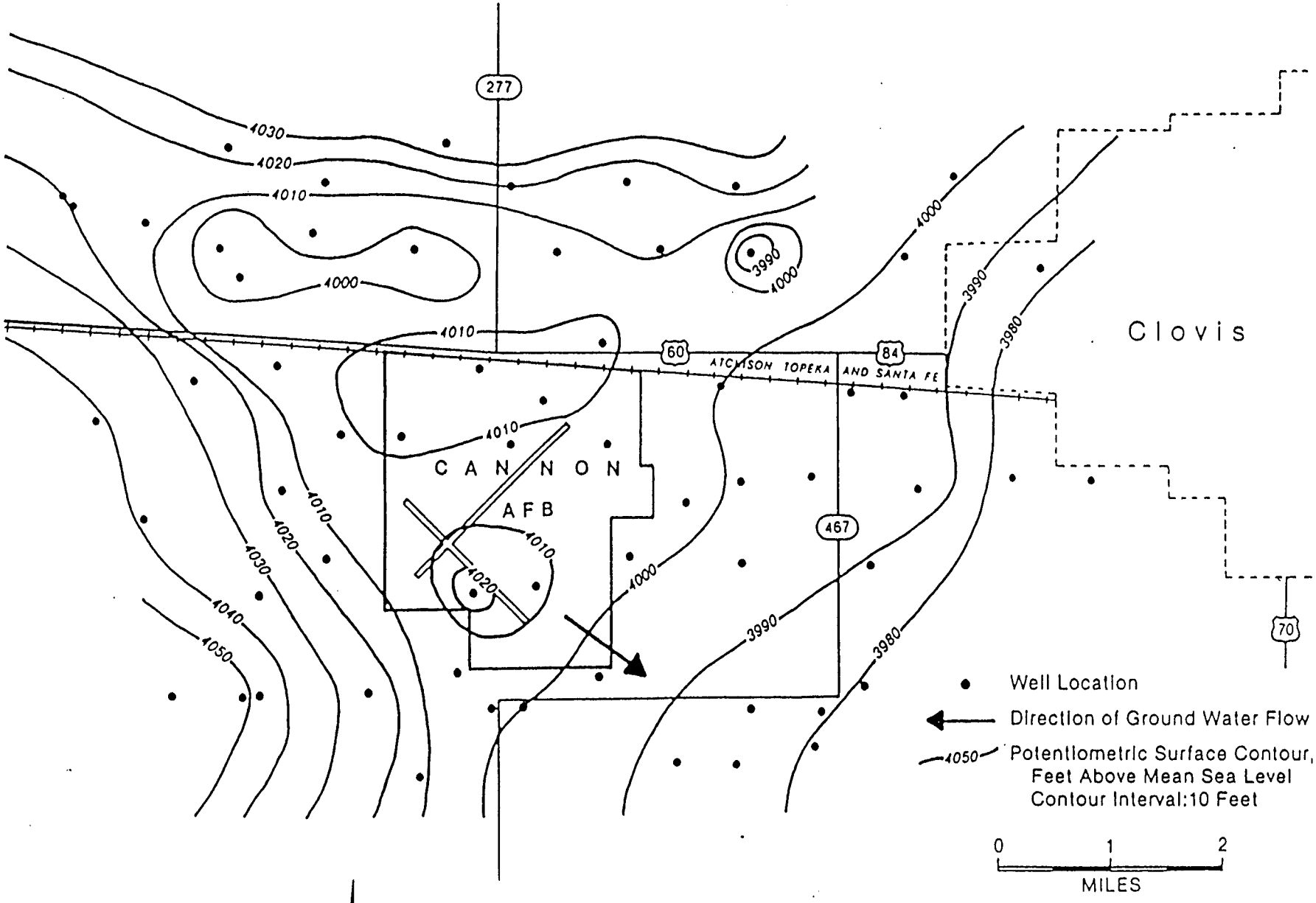
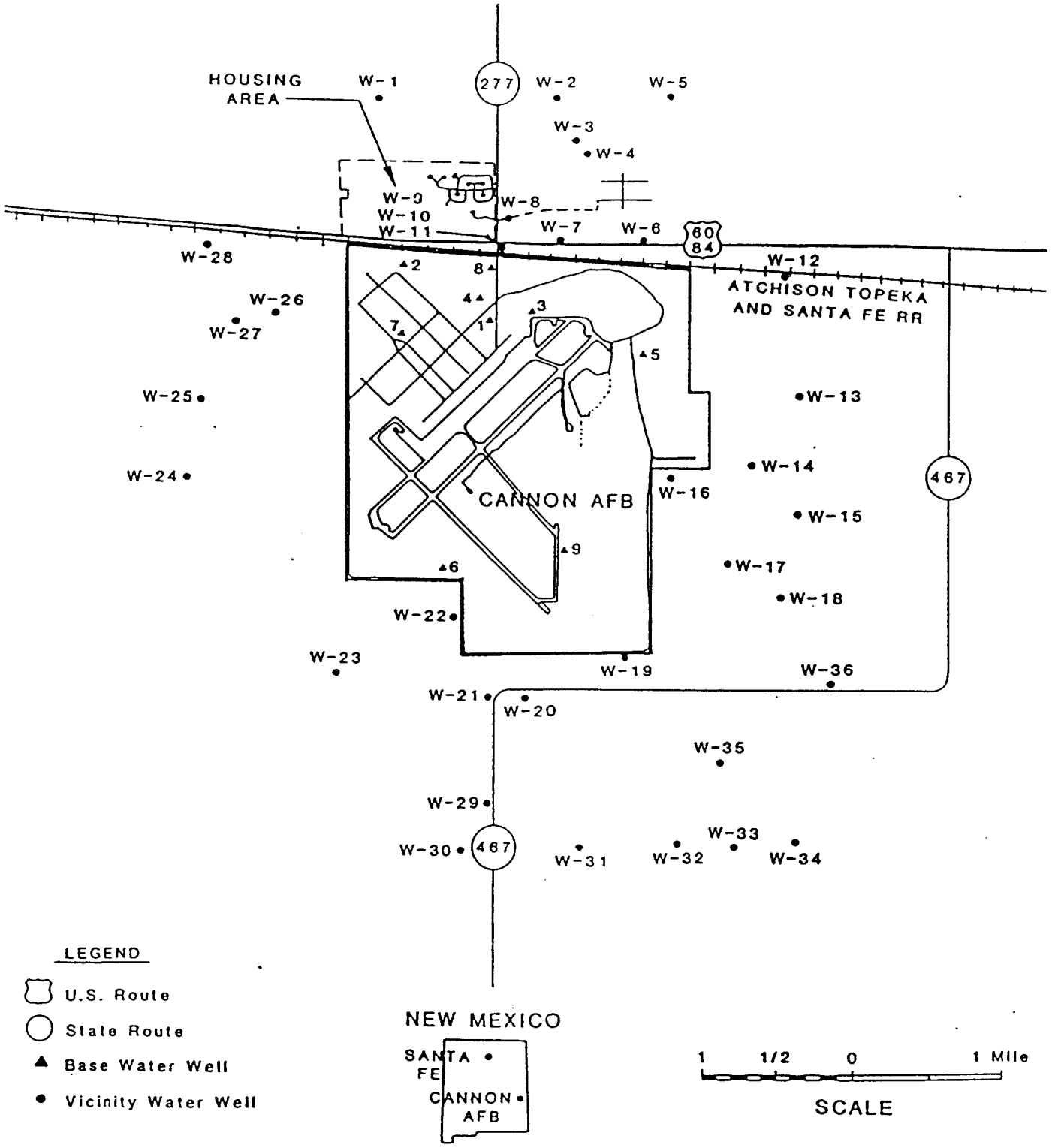


SOURCE: FINAL REPORT, IRP PHASE II

DRN BY SCR	DATE 08/18/93	POTENTIOMETRIC SURFACE CONTOUR MAP, VICINITY OF CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	2-2



BASE MAP ADAPTED FROM: FINAL REPORT, IRP PHASE II

DRN BY SCR	DATE 08/18/93	WATER WELL LOCATIONS ON AND NEAR CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	2-3

REPORT PHASE: PHASE II - APPX. II R & I

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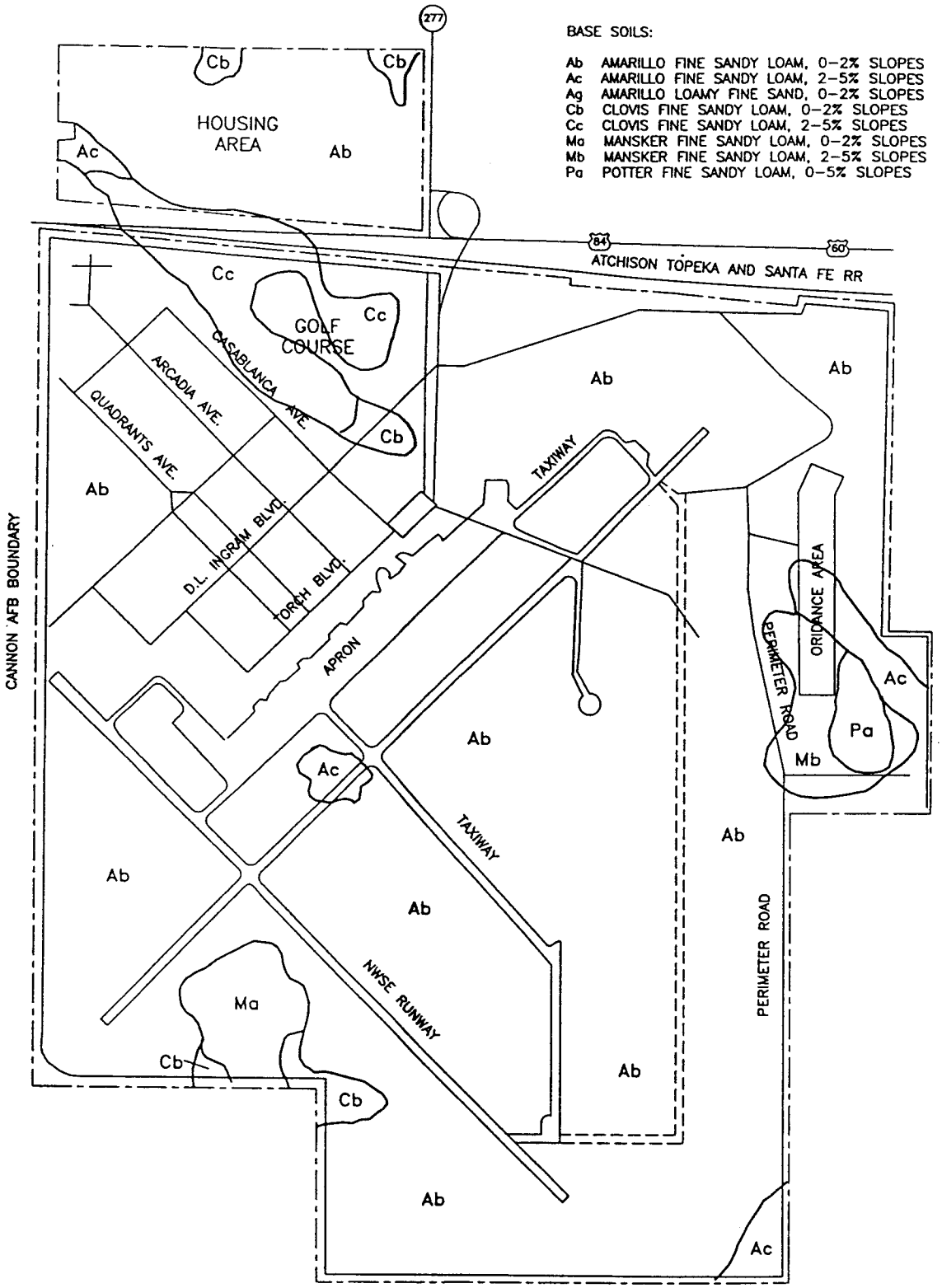


SOURCE: USDA–S.C.S., SOIL SURVEY OF CURRY COUNTY N.M., 1958

N

2000 1000 0 2000

SCALE IN FEET

DRN BY: SCR	DATE: 08/18/93	DISTRIBUTION OF SOILS, BY TYPE CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 2–4
CHK'D BY:	REVISION: 0			

3.0
RCRA FACILITY INVESTIGATION APPROACH

3.1 RFI OBJECTIVES AND APPROACH

The specific objectives of the Phase I RFI at Cannon AFB were to:

- Characterize the physical setting and nature and extent of potential hazardous wastes associated with each SWMU

- Evaluate the data collected to identify potential migration pathways and feasible potential corrective measures

- Perform a Screening-Level Risk Assessment to evaluate human health risks associated with chemicals found at each SWMU (Note: A Baseline Risk Assessment was required to support final recommendations on sites not eliminated by the screening-level assessment)

- Develop recommendations for each SWMU regarding further investigation thru corrective measures studies or, where supported by the findings of the RFI, no further action.

The overall intent of the Phase II RFI is to obtain the additional data necessary to sufficiently characterize the presence or absence of contamination to either support recommendations from Phase I RFI studies, support recommendations for further studies, or recommend "no further action" if warranted. The data collected during the Phase II RFI was used to evaluate human health risks. The specific objectives of the Phase II RFI completed at Cannon AFB are:

- Characterize the physical setting and vertical extent of potential contamination associated with each SWMU

- Compare new data to previously collected data at each Phase II, Appendix III SWMU to evaluate the conclusions from the original screening-level or

baseline risk evaluation. (If the new data did not support the original conclusions, then further evaluations, including additional health risk evaluation, are required.)

- Develop recommendations for each SWMU regarding further evaluations or no further action

The RFI has been completed in accordance with EPA Guidance outlined in "RCRA Facility Investigation (RFI) Guidance, Volumes 1-4, EPA 530/SW-89-031, May 1989". The investigation incorporated the use of the Data Quality Objectives (DQO) Process to establish data quality requirements appropriate for the intended use of the data (EPA 1987).
The program approach for the RFI for the 7 Phase II, Appendix III SWMUs at Cannon AFB is to review known information including results of past investigations, become familiar with past and present operations and the physical setting at each SWMU, identify data needs and formulate a sampling plan to collect the necessary data for each SWMU. The rationale for sampling locations, number of samples and analytical parameters are presented in the Work Plan and in the Field Sampling Plan. Samples taken are listed in tables in sections 6.0 thru 12.0.

3.2 BEHAVIOR OF CONTAMINANT PLUMES

The "pendant plume" model of contaminant migration in a semi-arid region with a deep unconfined water table forms the conceptual basis for soil and groundwater sampling at Cannon AFB (Kearney, 1987). Site-specific sampling plans are designed to account for the presence of clays, caliche, and release quantities. The pendant plume model for subsurface contaminant mitigation is discussed below in more detail.

The behavior of contaminants in unsaturated clay-rich sediments and soils is a complex physicochemical process. Due to the depth to the water table (>200 ft) and lack of precipitation and water infiltration as a contaminant carrier, only large or continuous releases of liquid contaminants may be expected to reach the water table. The presence of low permeability (but not impermeable) caliche layers, as well as chemically active (i.e., high Cation Exchange Capacity [CEC]) clays, will also act to impede contaminant migration. Capillarity will also have a role in attenuating contaminant migration. As illustrated in

Figure 3-1, a relatively small contaminant release will tend to form a "pendant plume". A pendant plume extends downward from the release site with little lateral spread. Downward migration will continue until capillarity and clay adsorption eliminates free liquids (i.e., liquids which can be drained rapidly by gravity. Pendant plumes may spread laterally if low permeability layers are encountered during downward movement (Figure 3-1) . However, in the absence of a carrier fluid such as water, lateral spread will be severely limited.

Relatively large plumes may not be fully attenuated by caliche or clays and may reach the water table. Figure 3-1 illustrates this situation. In this instance, a water table with a low gradient could limit the rate of migration.

Caliche, as a low-permeability barrier, will act to retard downward movement of the contaminant plume. However, lateral spreading immediately above the caliche layer may occur. As a rule of thumb, a difference of permeability of two orders of magnitude or more will provide an effective barrier in the absence of significant head differences. While the vertical migration pathway provides a significant change in head, if generally small quantities of liquids are involved it is unlikely that the liquids would migrate to a great depth through competent caliche given the complex nature of flow in the unsaturated zone. However, migration along fractures in the caliche, where present, may allow deeper migration in some locations.

Clays, zeolites (e.g., heulandite), metal oxides, and humus are chemically active soil/sediment constituents which can impede or trap migrating contaminants. These particulates have large surface areas and slight to moderate electronegative surface and interlayer charges. Cationic contaminants in water may partition and adsorb to clay or humus. The degree of partitioning depends on clay CEC; amount of humus; types and concentrations of natural and contaminant ions; ionic valency; and the presence of dissolved organic co-contaminants (Matthess 1984). Multivalent cationic metals will tend to strongly sorb to clays. Semivolatile organics may also be sorbed to clays and humus. However, volatile organics such as xylene will not sorb and may actually increase permeability relative to organics. Areas in which fuel releases have occurred will, therefore, typically be sampled to greater depths than areas in which only metals or heavy petroleum are of concern.

3.3 DESCRIPTION OF THE DECISION PROCESS

The following decision process has been used to assess the SWMU data needs and investigative approach for the SWMUs. The DQO evaluation process is designed to provide data of sufficient quality and quantity to evaluate whether a release has occurred from a SWMU that could pose a risk to human health or the environment and to evaluate the need for further evaluation such as collection of additional data, completion of a Baseline Risk Assessment (BRA), or possibly completion of a Corrective Measure Study (CMS). The procedures to assess the data needs and investigative approach at each SWMU include:

- Collect soil data to characterize the nature and extent of contamination that has been released from the SWMU, including an evaluation of the potential for chemicals of concern to be transported to the groundwater at concentrations that may pose a human health threat.

- Evaluate analytical results and determine chemicals of concern

- Evaluate potential impact to groundwater by determining if the vertical distribution of contamination decreases with depth. If it does not significantly decrease, it may not be possible to evaluate the impact to groundwater; so further investigation may be required.

- For Appendix III SWMUs, evaluate conclusions of previous investigations by qualitatively comparing concentrations of chemicals of concern reported in this investigation with the previously reported concentrations. If the new data do not exceed Phase I results, no further investigation is required. If the new concentrations exceed those from Phase I, the COCs will be compared to RBCs.

A decision diagram (Figure 3-2) was developed for the Cannon AFB RFI Appendix III SWMUs to present a logical decision process that was used to evaluate the data resulting from the investigation at each SWMU to assure that project objectives are met.

3.3.1 SWMU Decision Process

The RFI soils investigation decision process is designed to identify appropriate actions for disposition of each SWMU investigated based on three alternative actions for any given SWMU: no further action, interim action, and further investigation or evaluation. The recommendation for the selection of alternative action for each SWMU depended upon whether chemicals of concern were detected in soils at levels that may pose an unacceptable risk to human health or the environment. This section provides a summary of the decision-making process that were used to evaluate each SWMU.

The decision process was implemented by first evaluating and summarizing existing historical information and analytical data collected for each of the SWMUs. Historical information was used to identify potential chemicals of concern and to identify potential sites of chemical release at a SWMU.

Environmental media was sampled and analyzed for potential chemicals of concern. The analyte lists from which chemicals of concern were selected are discussed in the QAPP (W-C 1994). SWMU-related chemicals of concern will be selected based on the results of the sampling program. Metals that did not exceed background levels, and chemicals which are attributable to field or laboratory contamination, were not included as chemicals of concern. Organic chemicals that do not have EPA-established toxicity factors were not evaluated quantitatively, but their potential contribution to site risks was evaluated qualitatively.

The potential for site-related contaminants to impact groundwater was assessed by evaluating the vertical distribution of contaminants in the soil column. If the concentrations of chemicals of concern decrease significantly with depth, and the concentrations are below levels that are likely to migrate to groundwater (based on fate and transport properties of the contaminant and the vadose zone), the potential for transport to groundwater was considered to be insignificant. If the concentrations do not decrease with depth, further investigation of the groundwater pathway is recommended. If the concentrations are at levels that could potentially migrate to groundwater at concentrations of concern, fate and transport modeling was done to evaluate the potential for contaminant transport to groundwater.

For Appendix III SWMUs, concentrations of COCs detected during this investigation were compared to concentrations detected during the Phase I RFI. If the new concentrations are not higher than the Phase I RFI concentrations, it was concluded that the results and conclusions of the Phase I RFI are confirmed, and no further investigation is recommended. However, if the concentrations detected during this investigation are higher, by an amount deemed significant, than those from the Phase I RFI, then the new results were compared to RBCs.

Concentrations of chemicals of concern detected at Appendix III SWMUs whose Phase II results exceed Phase I results were evaluated for potential human health and environmental risks by comparing maximum detected concentrations (which are higher than concentrations to which people or ecological receptors would routinely be exposed) to highly conservative (protective) health risk-based concentrations. This conservative approach permits identifying SWMUs that pose no unacceptable risk under highly conservative exposure assumptions and that, therefore, warrant no further evaluation or action. The approach also permits identification of SWMUs that may warrant further evaluation based on exceedance of stringent risk-based concentrations. The methods used in the screening-level human health risk evaluations are presented in section 3.5.

The results of this evaluation were used to make recommendations regarding the three alternatives stated above. The recommendations were made on the following basis:

- If the vertical extent of contamination has been defined, no threat to human health exists based on comparison of maximum concentrations to RBCs, and no potential threat to the environment is apparent, then no further action is recommended.

- If an unacceptable threat to human health or the environment is imminent, a source is well defined, and a source control is readily identified, an interim action to control the source is recommended.

- If there is a potential significant threat to human health or the environment, further investigation is recommended for the SWMU. Further investigation may include additional field investigation and/or a risk assessment.

Figure 3-2 presents the decision diagram that was followed for the SWMU investigations. The steps of the decision process are described below.

3.4 SITE CONCEPTUAL EXPOSURE MODELS

Information concerning waste sources, waste constituent release and transport mechanisms, and locations of potentially exposed individuals (receptors) was used to develop a conceptual understanding of the SWMUs in terms of potential human exposure pathways. The site conceptual exposure model (SCEM) is a schematic representation of the contaminant source areas, chemical release mechanisms, environmental transport media, potential human intake routes, and potential human receptors. The SCEM provides a framework for problem definition, identifying exposure pathways that may result in human health risks, identifying potential data needed to evaluate those pathways, and identifying potential measures that could be used to reduce exposure and risk.

An exposure pathway includes four necessary elements:

- A source of chemicals and a mechanism of chemical release
- An environmental transport medium (air, soil, groundwater)
- A exposure point for a receptor or receptor population
- An intake route (inhalation, ingestion, etc.) for a receptor or receptor population

Each of these elements must be present for an exposure pathway to be complete. Exposure pathways are considered to be potentially complete and significant if there are potential chemical release and transport mechanisms and identified receptors for that exposure pathway. An incomplete pathway means that no human exposure can occur. An exposure pathway is considered to be insignificant if potential receptors can be identified, but potential transport and exposure are clearly inconsequential (i.e., relative to other pathways). In the SCEM, potentially complete and significant exposure pathways are indicated with solid lines; incomplete and insignificant pathways are indicated with broken lines. The SCEMs for each SWMU addressed in this RFI are provided in the SWMU-specific sections.

The primary potential sources of contaminant release at each SWMU are waste materials that could have potentially leaked, been spilled, or discharged from the SWMU to soil. Once mixed with surface or subsurface soil, the chemicals may then be released to other media (e.g., air or groundwater).

Potential receptors at these sites include Base workers (e.g., military and Base personnel, Base contractors), hypothetical future construction workers, hypothetical future trespassers (i.e., if the Base is closed and the sites are used by industries) and residential receptors at the Base boundary who may use the groundwater downgradient of the SWMUs and Base residents who may use groundwater from Base wells located downgradient of the SWMUs.

Site workers, construction workers, and hypothetical future trespassers could be exposed at the sites via soil ingestion, dermal contact with soil, and inhalation of air emissions from soil. In addition, groundwater users could be exposed via ingestion, dermal contact, and inhalation if contaminants are transported to groundwater.

Surface water runoff is considered to be an insignificant pathway at most SWMUs because the SWMUs cover only small areas, most of the SWMUs are no longer active and have been covered by pavement, and the areas are flat with no developed drainageways. Therefore, transport of significant quantities of contaminants in surface soil by surface water runoff from these SWMUs is not likely. In addition, concentrations in surface soil at the site (source area) are expected to be higher than those in transported soils; therefore, evaluation of surface soil at the sites is expected to be protective of the runoff pathway.

3.5 RISK EVALUATION OBJECTIVES AND METHODOLOGY

Maximum concentrations detected during the Phase II investigation were compared to the maximum detected concentrations from Phase I. The purpose of the comparison was to evaluate whether Phase I adequately defined the levels of contamination at these SWMUs and whether the recommendation for no further action is appropriate. If Phase II concentrations exceeded Phase I concentrations, Phase II concentrations were then compared to EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether the higher concentrations could pose a significant health risk. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs that are derived using accepted risk

assessment methodology. Since the SWMUs are located in the industrial portions of the Base, using RBCs for residential soil (rather than industrial soil) was a conservative approach which should prevent underestimation of potential risks at a SWMU. If detected concentrations and resulting risks reported in Phase II are not significantly higher than those reported in Phase I, the conclusions and recommendations of Phase I will be assumed to be appropriate. Otherwise, further investigation will be recommended.

Derivation and Use of RBCs

For a noncarcinogen, an RBC is the concentration of the chemical in environmental media (e.g., soil or drinking water) that is estimated to result in a hazard quotient (HQ) of 1.0 based on the assumed exposure conditions (e.g., residential exposures). An HQ is the ratio of the estimated average lifetime daily dose, based on the assumed exposure conditions, to a reference dose (RfD). The RfD, established by EPA, is the upper limit of the average lifetime daily exposure for a chemical that is considered safe. An HQ of 1.0 (or less) means that the expected dose is below the safe dose and that no toxic effects are likely to occur, even to sensitive individuals. An HQ above 1.0 does not mean that toxic effects will necessarily occur, but that further evaluation of exposures and chemical toxicity may be warranted.

For a carcinogen, an RBC is the concentration of a chemical in environmental media that is estimated to result in an excess cancer risk of 1×10^{-6} (1 in 1,000,000) based on the assumed exposure conditions (e.g., residential exposures). A range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) is EPA's target excess cancer risk range for cleanup under CERCLA (EPA 1990; 1991). Therefore, RBCs based on a target risk of 1×10^{-6} are conservative values, and slight exceedances of these RBCs do not necessarily mean that a significant health risk is present. Exceedance of the RBCs may mean, however, that further evaluation of the SWMU is warranted.

RBCs were calculated using conservative long-term exposure assumptions, conservative EPA-established estimates of chemical toxicity or carcinogenicity, and health-protective target risk levels for carcinogenic and noncarcinogenic effects. The assumptions used in developing the RBCs do not necessarily reflect, and they likely significantly overestimate, current or potential future exposures at the SWMUs. EPA Region III RBCs for residential soils were calculated

based on residential exposure assumptions for combined childhood and adult exposure for carcinogens and on childhood exposure only for noncarcinogens. The EPA Region III RBCs and the methodology used for their calculation are presented in Appendix D.

It is important to note that RBCs are not cleanup goals. Cleanup goals are determined on a SWMU-specific basis. Rather, comparing SWMU concentrations to RBCs is a means of evaluating whether there has been a significant chemical release at a SWMU and whether the chemicals could pose a threat to human health. If the RBCs are not exceeded, it can be concluded that no chemical release has occurred at the SWMU that poses a significant health risk.

If Phase II concentrations exceed Phase I concentrations and also exceed RBCs, further evaluation of the data will be done to assess whether the Phase II concentrations could pose an unacceptable human health risk at the SWMU.

The results of the SWMU-specific health risk evaluations are presented in the SWMU-specific sections (6.0 through 12.0) of this report.

3.6 IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE STANDARDS (ARASs)

Both RCRA and CERCLA requirements for evaluating the nature and extent of hazardous wastes potentially occurring at Appendix II Solid Waste Management Units (SWMUs) will be addressed in the investigations at Cannon AFB.

Cannon AFB must evaluate the SWMUs identified by the USEPA during the RCRA Facility Assessment (RFA) as a condition of their RCRA Part B permit. The investigations conducted by W-C are designed to satisfy RCRA Facility Investigation (RFI) guidance for characterizing the SWMUs and developing and implementing corrective action measures, if necessary.

Cannon AFB is conducting this investigation under the conditions of their RCRA Part B permit and the Air Force's Installation Restoration Program (IRP). Cannon AFB's RCRA Part B permit requires that Cannon AFB identify all applicable or relevant and appropriate standards for the protection of human health and the environment. The IRP requires that the

investigation follow the regulatory requirements of CERCLA and is the basis for assessment and response actions on USAF installations under the provisions of CERCLA. SARA augmented the scope and requirements of CERCLA and gave specific directives to federal facilities regarding investigation of waste disposal sites. Under SARA, determination of ARARs is required, and potential remediation alternatives should be considered at the initiation of a RI/FS (EPA 1988, 1989b).

As part of future Corrective Measure Studies (CMSs) (Feasibility Studies (FSs) under CERCLA), alternative remedial or corrective action measures will be evaluated to assess the degree to which they attain or exceed applicable or relevant and appropriate standards federal and state public health and environmental standards. A preliminary identification and discussion of ARASs for the planned RFI at Cannon AFB is presented below. Review of these will highlight any site-specific regulatory conditions that might either limit the choice of alternatives or place limits on contaminant concentrations at the site.

The ARASs presented herein are chemical specific and location specific. Identification of action-specific ARASs can only be addressed once detailed remedial alternatives are developed.

3.6.1 Definition of ARASs

Cleanup standards for remedial actions must attain a general standard of cleanup that assures protection of human health and the environment, is cost-effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, SARA requires that any hazardous substance or pollutant remaining on site meet the level or standard of control established by standards, requirements, criteria, or limitations that have been established under any federal environmental law, or any more stringent standards, requirements, criteria, or limitations promulgated in accordance with a state environmental statute.

A requirement may be applicable or relevant and appropriate to remedial activities at a site, but not necessarily both. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations

promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a site.

If a regulation is not applicable, it may still be relevant and appropriate. The basic considerations are whether the requirement (1) regulates or addresses problems or situations sufficiently similar to those encountered at the subject site (i.e., relevance), and (2) is appropriate to the circumstances of the release or threatened release, such that its use is well suited to the particular site. Determining whether a requirement is relevant and appropriate is site specific and must be based on best professional judgment. This judgment is based on a number of factors, including the characteristics of the remedial action, the hazardous substances present at the site, and the physical circumstances of the site and of the release, as compared to the statutory or regulatory requirement. Compliance with all requirements found to be applicable or relevant and appropriate is mandatory under SARA unless a waiver is obtained from EPA.

"To be considered" materials (TBCs) are nonpromulgated advisories, proposed rules, criteria, or guidance documents issued by federal or state governments that do not have the status of potential ARASs. However, these advisories and guidance are to be considered when determining protective cleanup levels where no ARASs exists, or where ARASs are not sufficiently protective of human health and the environment. In these circumstances, TBC values are used to establish cleanup targets.

3.6.2 Chemical-Specific ARASs

The chemical-specific ARASs and other criteria or guidelines to be considered are presented in Tables 3-1 and 3-2. This information is based on standards, guidelines, and criteria found in relevant literature, discussions with appropriate state regulatory agency personnel, and past project experience.

Chemical-specific requirements are based on health or risk-based concentration limits of discharge limitations in environmental media (i.e., water, soil) for specific hazardous chemicals. These requirements may be used to set cleanup levels for the chemicals of concern in the designated media, or to set a safe level of discharge (e.g., water, air, etc.) that may occur as part of the remedial activity.

Sources for potential target cleanup levels included selected standards, criteria, and guidelines that are typically considered as ARASs for remedial actions conducted under CERCLA, as well as some recently published guidance and proposed action levels developed under RCRA that should be regarded as TBCs. In addition, New Mexico has developed cleanup levels for special wastes and underground storage tank-related remediation, as well as standards for groundwater. New Mexico has also defined toxic pollutants in its Water Quality Standards. Any contaminant or combination of contaminants from the list in WQCCR, Part 1, section 101.UU found at detectable levels may have to be evaluated for risk to human health and the environment. A summary of these federal and state regulations, standards, and guidance is presented in Table 3-1.

For groundwater, MCLs established under the Safe Drinking Water Act (SDWA) are often accepted by regulatory agencies as cleanup levels for groundwater remedial activities, especially if the groundwater is or could be a drinking water source. Nonzero maximum Contaminant Level Goals (MCLGs) are also established under the SDWA. However, MCLGs are not federally enforceable and should only be used if site-specific health risk conditions warrant their use.

Since groundwater in the vicinity of Cannon AFB is classified as a current source of drinking water (Class IIA Groundwaters), the identification of potential target cleanup levels for groundwater samples from Cannon AFB focused on standards, criteria, and guidelines primarily for drinking water. These standards include MCLs and MCLGs, as well as the New Mexico drinking water standards, and are presented in Table 3-2. Also included are hazardous constituent concentration limits under RCRA Subpart F, which are applicable to releases from RCRA-regulated units. Secondary maximum contamination levels (SMCLs) established under SDWA are also presented in Table 3-2 although they are not federally enforceable and should be regarded as TBCs. In addition, the MCLs for several chemicals (footnoted by [d] in Table 3-2) are not yet in effect and should be considered TBCs. If no value is shown for a possible contaminant in Table 3-2, there are currently no standards for that contaminant. Repeated nondetect analytical results for any constituent during routine groundwater monitoring may allow the constituent to be dropped from the list of analytes, subject to the approval of NMED and EPA.

State and federal standards and criteria for surface water quality are not considered applicable or relevant and appropriate as long as there is no possibility of remedial activities impacting surface water bodies. There are two playa lakes located on Cannon AFB. One playa is located in the southwest section of the Base, south of the runway area, and a second playa is located east of the wastewater sewage lagoons. The southwest playa receives storm water runoff from the western sections of the Base, and the playa lake located east of the wastewater sewage lagoons receives treated effluent. No remedial activities at the Appendix II SWMUs will impact either playa on the Base or any off-site surface waters. However, should any activity at these SWMUs impact surface waters, compliance with both state and federal surface water quality standards and criteria would be required.

3.6.3 TBCs

In general, very few cleanup standards exist for soil contamination. Often cleanup levels are based on guidance developed from Underground Storage Tank (UST) investigations or, if nonpetroleum wastes are involved, levels are based on site-specific risk assessment, hazardous waste definition, or background levels. Recently some human health-based criteria for soil and water contaminant levels have been published as guidance for RFIs (hereinafter referred to as the RFI Guidance), and RCRA-related action levels have been proposed (Tables 3-3 and 3-4). However, these figures were developed specifically for application in RCRA-related activities, although it appears they are being used as proposed ARASs, where no other standards exist. These guidelines are presented, therefore, as TBCs rather than as chemical-specific ARASs and represent "potential" cleanup levels only. Actual cleanup levels that may be applied to a particular area will depend on site-specific requirements based in part on the RCRA Facility Investigation and are subject to final approval by the appropriate regulatory agency or agencies. The RCRA levels are presented and used for the purposes of this ARASs analysis because there are no other sources of standards or guidance for contaminated soils cleanup levels.

The RFI guidance levels presented in Tables 3-3 and 3-4 for cleanup of contaminated soils are based on EPA-derived chronic exposure assumptions and are intended as screening levels at RCRA facilities to determine if a more detailed health-risk evaluation (CMS) is warranted. As previously discussed, they do not necessarily represent a target cleanup level. The proposed RCRA Subpart S action levels, also presented in Tables 3-3 and 3-4, if exceeded,

would also trigger a CMS. However, because these levels are only proposed, at this time they are not enforceable under RCRA (55 FR 30798, July 27, 1990). The equations used to derive the action levels/criteria use essentially identical parameters.

Other regulations or requirements that may need "to be considered" included the New Mexico UST Regulations and the New Mexico Special Waste Requirements Regulations. Those regulations set cleanup standards for soils contaminated with petroleum hydrocarbons associated with underground storage tanks (so called BTEX compounds and total petroleum hydrocarbons).

3.6.4 Location-Specific ARASs

Although the universe of location-specific ARASs is identified in Table 3-5, only those regulations that are deemed ARASs for the Cannon site are discussed below. Location-specific ARASs are restrictions placed on the types of activities that may occur in particular locations. Potential location-specific ARASs for Cannon AFB are presented in Table 3-5 with an explanation as to whether the regulation is applicable or relevant and appropriate and why. The location of a site may be an important characteristic in determining its impact on human health and the environment; thus, individual states may establish location-specific ARASs. These ARASs may restrict or preclude certain remedial actions or may apply only to certain portions of a site. Examples of location-specific ARASs include federal and state requirements for preservation of historic landmarks, endangered species and wetlands protection, and the restrictions on management of hazardous waste in floodplain areas.

Due to the possible presence of both federal- and state-listed threatened/endangered (T/E) species at the site, the federal and state Endangered Species Acts are both considered "potentially" applicable. If T/E species are found at the site, these acts would be applicable. In addition, there are bald eagles, peregrine falcons, other raptors and waterfowl, and their habitat within a 50-mile radius of Cannon AFB (Lee Wan and Associates 1990). Both the Migratory Bird Treaty Act and the Bald Eagle Protection Act are considered applicable if any of the species protected by these two Acts or their habitats are impacted by remedial actions.

Section 106 of the National Historic Preservation Act, the Historic and Archaeological Data Preservation Act, and the Archaeological Resource Protection Act are also considered

"potentially" applicable due to a federal agency having authority over any actions that could impact on historically significant objects, buildings, or structures at the site. Although no buildings, objects, or structures at Cannon AFB have yet been placed on the National Register of Historic Places, the evaluation process is still ongoing at the Base. Due to both architectural and archaeological surveys being conducted on Cannon AFB, the State Cultural Properties Act is also considered "potentially" applicable and negotiations with the State Historic Preservation Office should be renewed prior to any remedial activity.

While there is uncertainty concerning the future definition of wetlands, it is the opinion of the U.S. Fish and Wildlife Service that the playas at the Base fall under the current definition of wetland areas under federal wetland delineation guidance (Hagenbuck 1991). The federal regulations governing wetlands, however, are not considered ARASs as long as the project does not impact the wetland areas. If the playa lakes on Base continue to be considered wetlands and if the remedial activities should impact these wetland areas, then the regulations concerning protection and preservation of wetlands would be considered applicable or relevant and appropriate and coordination with the U.S. Fish and Wildlife Service would need to be initiated prior to any remedial activity. The State of New Mexico does not have its own wetlands regulations at this time.

TABLE 3-1

SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARASs/TBCs CANNON AFB - APPENDIX III SWMUs

Standard, Requirement, or Criteria	Description	Comment
FEDERAL		
Safe Drinking Water Act (40 USC Sect. 300)		
National Primary Drinking Water Standards [40 CFR Parts 141, 142, (1990, 1991)	Establishes maximum contaminant levels (MCLs) for specific contaminants which are health-based standards for public drinking water systems.	MCLs are applicable for drinking water at the tap. MCLs are relevant and appropriate for organic and inorganic contamination of groundwater that is or may be used for drinking.
National Secondary Drinking Water Standards (40 CFR Part 143)	Establishes secondary maximum contaminant levels (SMCLs) which are nonenforceable guidelines for public drinking water systems to protect the aesthetic quality of the water.	SMCLs may be "to be considered" if groundwater is used as a drinking water source.
Maximum Contaminants Level Goals (MCLGs) [PL No. 99-339, 100 Stat. 642 (1986), (1990, 1991); 40 CFR 141,142]	Establishes drinking water quality goals at a level at which no adverse health effects may occur with an adequate margin of safety.	MCLGs set above zero levels are relevant and appropriate for existing or potential sources of drinking water. MCLGs may be relevant and appropriate if the risk posed by multiple contaminants or pathways is in excess of 10^{-4}.
Resource, Conservation, and Recovery Act (RCRA)		
Releases from Solid Waste Management Units (40 CFR Part 264)	Subpart F (264.94) gives concentration limits in groundwater for hazardous constituents from a regulated unit.	Applicable if organic and inorganic contamination of groundwater is found at a RCRA regulated unit.
RCRA Facility Investigation Guidance (EPA, 1989)	Guidance levels for cleanup of contaminated soils based on EPA-derived chronic exposure assumptions; intended as screening levels at RCRA facilities to determine if a more detailed health-risk evaluation is warranted.	To be considered if contaminated soils are found.
Proposed RCRA Action Levels (55 FR 30798, 27 July 1990)	Risk-based action levels for contaminants in soil which, if exceeded, would trigger the need for a Corrective Measures Study.	To be considered if contaminated soils are found.

TABLE 3-1

SUMMARY OF
POTENTIAL CHEMICAL-SPECIFIC ARASs/TBCs
CANNON AFB - Appendix II SWMUs

Standard, Requirement, or Criteria	Description	Comment
STATE		
New Mexico Water Quality Act, 1978		
New Mexico Drinking Water Regulations (4/16/91)(New Mexico Water Supply Regulations, Sections 202 to 203)	Establishes MCLs and standards for sources of drinking water.	State MCLs are applicable or relevant and appropriate to contaminated water if the state MCL is more stringent than federal requirements.
New Mexico Water Quality Regulations, amended through August 17, 1991 (WQCCR Part 3, Sections 100 through 103)	Establishes human health, domestic water supply, and irrigation use standards for ground water protection.	Applicable if remedial activities include discharges onto or below the surface of the ground.
New Mexico Water Quality Regulations, amended through August, 1991 (WQCCR Part1, Section 101.UU)	Establishes definition of toxic pollutant based on effects to human health and the environment. Requires a determination of health and environmental risk due to the presence of the contaminant.	Applicable if groundwater related to the source area contains any of the contaminants listed in the definition of toxic pollutants.
New Mexico Hazardous Waste Act 1978		
New Mexico Underground Storage Tank Regulations, amended through July 18, 1991, Section 1209	Sets cleanup levels for soils contaminated with benzene, aromatic hydrocarbons, or petroleum products.	May be "to be considered" if soils are contaminated with benzene, aromatic hydrocarbons, or petroleum products.
New Mexico Solid Waste Regulations		
New Mexico Special Waste Requirements Regulations, adopted effective January 30, 1992, Part VII	Sets disposal levels for soils contaminated with BTEX compounds and total petroleum hydrocarbons.	May be "to be considered" if soils are contaminated with petroleum hydrocarbons.

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX III SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
pH	Field Parameter	6.5-8.5*					6.0-9.0	6.0-9.0
Total Dissolved Solids	Indicator	500,000 µg/l*					1,000,000 µg/l	1,000,000 µg/l
Carbonate	Anion							
Chloride	Anion	250,000 µg/l*					250,000 µg/l	250,000 µg/l
Fluoride	Anion	4,000 µg/l, 2,000 µg/l*	4,000 µg/l		4,000 µg/l	1,600 µg/l		1,600 µg/l
N as Nitrate	Anion	10,000 µg/l	10,000 µg/l(c)		10,000 µg/l	10,000 µg/l		10,000 µg/l
N as Nitrate+Nitrite	Anion	10,000 µg/l(c)	10,000 µg/l(c)					
N as Nitrite	Anion	1,000 µg/l(c)	1,000 µg/l(c)					
Potassium	Anion							
Sulfate	Anion	250,000 µg/l*					600,000 µg/l	600,000 µg/l
Aluminum	Metal	0.5 to 200 µg/l*(c)						5,000 µg/l
Antimony	Metal	6 µg/l(d)	6 µg/l(d)					
Arsenic	Metal	50 µg/l		50 µg/l	50 µg/l	100 µg/l		100 µg/l
Barium	Metal	2,000 µg/l(e)	2,000 µg/l(e)	1,000 µg/l	1,000 µg/l	1,000 µg/l		1,000 µg/l
Beryllium	Metal	4.0 µg/l(d)	4 µg/l(d)					
Boron	Metal							750 µg/l
Cadmium	Metal	5 µg/l(c)	5 µg/l(c)	10 µg/l	10 µg/l	10 µg/l		10 µg/l
Calcium	Metal							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Chromium	Metal	100 µg/l(c)	100 µg/l(c)	50 µg/l	50 µg/l	50 µg/l		50 µg/l
Cobalt	Metal							50 µg/l
Copper	Metal	1,000 µg/l*	1,300 µg/l(f)				1,000 µg/l	1,000 µg/l
		1,300 µg/l***						
Cyanide	Metal	200 µg/l(d)	200 µg/l(d)			200 µg/l		200 µg/l
Iron	Metal	300 µg/l*					1,000 µg/l	1,000 µg/l
Lead	Metal	50 µg/l	0(f)	50 µg/l	50 µg/l	50 µg/l		50 µg/l
		15 µg/l***						
Magnesium	Metal							
Manganese	Metal	50 µg/l*					200 µg/l	200 µg/l
Mercury	Metal	2 µg/l	2 µg/l(c)	2 µg/l	2 µg/l	2 µg/l		2 µg/l
Molybdenum	Metal							1,000 µg/l
Nickel	Metal	100 µg/l(d)	100 µg/l(d)					200 µg/l
Selenium	Metal	50 µg/l(c)	50 µg/l(c)	10 µg/l	10 µg/l	50 µg/l		50 µg/l
Silver	Metal	100 µg/l*(c)		50 µg/l	50 µg/l	50 µg/l		50 µg/l
Sodium	Metal							
Thallium	Metal	2 µg/l(d)	0.5 µg/l(d)					
Tin	Metal							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Titanium	Metal							
Tungsten	Metal							
Vanadium	Metal							
Zinc	Metal	5,000 µg/l*					10,000 µg/l	10,000 µg/l
Gross Alpha	Radionuclide	15 pCi/l			15 pCi/l			
Gross Beta	Radionuclide	4 mrem/yr						
Radium 226+228	Radionuclide	5 pCi/l			5 pCi/l	30 pCi/l		30 pCi/l
Strontium 90	Radionuclide	8 pCi/l			8 pCi/l			
Tritium	Radionuclide	20,000 pCi/l			20,000 pCi/l			
Uranium (total)	Radionuclide					5,000 µg/l		5,000 µg/l
1,1-Dichloroethane	Volatile					25 µg/l		25 µg/l
1,1-Dichloroethene	Volatile	7 µg/l	7 µg/l		7 µg/l	5 µg/l		5 µg/l
1,1,1-Trichloroethane	Volatile	200 µg/l	200 µg/l		200 µg/l	60 µg/l		60 µg/l
1,1,2,2-Tetrachloroethane	Volatile					10 µg/l		10 µg/l
1,1,2,2-Tetrachloroethene	Volatile					20 µg/l		20 µg/l
1,1,2-Trichloroethane	Volatile	5 µg/l(d)	3 µg/l(d)			10 µg/l		10 µg/l
1,1,2-Trichloroethene	Volatile					100 µg/l		100 µg/l
1,2-Dichloroethane	Volatile	5 µg/l	0 µg/l		5 µg/l	10 µg/l		10 µg/l

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Other Standards for Domestic Water Supply: Human Health	Other Standards for Domestic Water Supply: Supply	Irrigation Use
1,2-Dichloroethene	Volatile							
1,2-Dichloropropane	Volatile	5 µg/l(c)	0 µg/l(c)					
4-Methyl-2-pentanone	Volatile							
Acetone	Volatile							
Benzene	Volatile	5 µg/l	0 µg/l		5 µg/l	10 µg/l		10 µg/l
Bromodichloromethane	Volatile							
Bromoform	Volatile	Tot THM* <100 µg/l						
Bromomethane	Volatile							
Carbon Tetrachloride	Volatile	5 µg/l	0 µg/l		5 µg/l	10 µg/l		10 µg/l
Chlorobenzene (mono)	Volatile	100 µg/l(c)	100 µg/l(c)					
Chlorobenzilate	Volatile							
Chloroethane	Volatile							
Chloroform	Volatile	Tot THM** <100 µg/l			Tot THM** 100 µg/l	100 µg/l		100 µg/l
Chloroprene	Volatile							
Chloromethane	Volatile							
Cis-1,2-Dichloroethene	Volatile	70 µg/l(c)	70 µg/l(c)					
Cis-1,3-Dichloropropene	Volatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Dibromochloromethane	Volatile	Tot THM** <100 µg/l						
Ethyl Benzene	Volatile	700 µg/l(c)	700 µg/l(c)			750 µg/l		750 µg/l
Methylene Chloride	Volatile	5 µg/l(d)	0 µg/l(d)			100 µg/l		100 µg/l
Styrene	Volatile	100 µg/l(c)	100 µg/l(c)					
Tetrachloroethanes	Volatile							
Tetrachloroethene	Volatile	5 µg/l(c)	0 µg/l(c)					
Toluene	Volatile	1,000 µg/l(c)	1,000 µg/l(c)			750 µg/l		
Total Trihalomethanes	Volatile	100 µg/l						
Total Xylenes	Volatile	10,000 µg/l(c)	10,000 µg/l(c)			620 µg/l		620 µg/l
Trans-1,2-Dichloroethene	Volatile	100 µg/l(c)	100 µg/l(c)					
Trans-1,3-Dichloropropene	Volatile							
Trichloroethanes	Volatile							
Trichloroethene	Volatile	5 µg/l	0 µg/l		5 µg/l			
Vinyl Acetate	Volatile							
Vinyl Chloride	Volatile	2 µg/l	0 µg/l		2 µg/l	1µg/l		1 µg/l
1,2-Dichlorobenzene (ortho)	Semi-Volatile	600 µg/l(c)	600 µg/l(c)					
1,3-Dichlorobenzene (meta)	Semi-Volatile	600 µg/l	600 µg/l					
1,4-Dichlorobenzene (para)	Semi-Volatile	75 µg/l	75 µg/l		75 µg/l			

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Other Standards for Domestic Water Supply: Human Health	Other Standards for Domestic Water Supply: Domestic Water Supply	Other Standards for Domestic Water Supply: Irrigation Use
1,2,4-Trichlorobenzene	Semi-Volatile	70 µg/l(d)	70 µg/l(d)					
2-Chloronaphthalene	Semi-Volatile							
2-Chlorophenol	Semi-Volatile							
2-Methylnaphthalene	Semi-Volatile							
2-Nitroaniline	Semi-Volatile							
2-Nitrophenol	Semi-Volatile							
2,3,7,8-Tetrachlorodibenzo-p-dioxin	Semi-Volatile	$3x10^{-8}$(d)	0 µg/l(d)					
2,4-Dichlorophenol	Semi-Volatile							
2,4-Dichlorophenoxyacetic Acid (2,4-D)	Semi-Volatile (H)	70 µg/l(c)	70 µg/l(c)	100 µg/l	100 µg/l			
2,4-Dimethylphenol	Semi-Volatile							
2,4-Dinitrophenol	Semi-Volatile							
2,4-Dinitrotoluene	Semi-Volatile							
2,4,5-TP Silvex	Semi-Volatile (H)	50 µg/l(c)	50 µg/l(c)	10 µg/l	10 µg/l			
2,4,6-Trichlorophenol	Semi-Volatile							
3-Nitroaniline	Semi-Volatile							
4-Bromophenyl Phenylether	Semi-Volatile							
4-Chloroaniline	Semi-Volatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Other Standards for Domestic Water Supply: Human Health	Other Standards for Domestic Water Supply: Supply	Other Standards for Domestic Water Supply: Irrigation Use
4-Chlorophenyl Phenyl Ether	Semi-Volatile							
4-Chloro-3-methylphenol	Semi-Volatile							
4-Nitroaniline	Semi-Volatile							
4,6-Dinitro-2-methylphenol	Semi-Volatile							
Acenaphthalene	Semi-Volatile							
Acrylonitrile	Semi-Volatile							
Alachlor	Semi-Volatile	2 µg/l	0 µg/l					
Aldicarb	Semi-Volatile (P)	3 µg/l(e)	1 µg/l(e)					
Aldicarb Sulfone	Semi-Volatile (P)	2 µg/l	1 µg/l					
Aldicarb Sulfoxide	Semi-Volatile (P)	4 µg/l	1 µg/l					
Aldrin	Semi-Volatile (P)							
Aniline	Semi-Volatile							
Anthracene	Semi-Volatile							
Atrazine	Semi-Volatile	3 µg/l(c)	3 µg/l(c)					
Benzo(a)anthracene	Semi-Volatile							
Benzo(a)pyrene	Semi-Volatile	0.2 µg/l(d)	0 µg/l(d)			0.7 µg/l		0.7 µg/l
Benzo(b)fluoranthene	Semi-Volatile							
Benzo(g,h,i)perylene	Semi-Volatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Benzo(k)fluoranthene	Semi-Volatile							
Benzyl Alcohol	Semi-Volatile							
Bis(2-Chloroethoxy)methane	Semi-Volatile							
Bis(2-Chloroethyl)ether	Semi-Volatile							
Bis(2-Chloroisopropyl)ether	Semi-Volatile							
Bis(2-Ethylhexyl)phthalate	Semi-Volatile							
Butyl Benzylphthalate	Semi-Volatile							
Carbofuran	Semi-Volatile (P)	40 µg/l(c)	40 µg/l(c)					
Carbon Disulfide	Semi-Volatile							
Chlordane	Semi-Volatile (P)	2 µg/l(c)	0 µg/l(c)					
Chlorophenol	Semi-Volatile							
DDT	Semi-Volatile (P)							
DDT metabolite (DDE)	Semi-Volatile (P)							
DDT metabolite (DDD)	Semi-Volatile (P)							
Dalapon	Semi-Volatile (P)	200 µg/l(d)	200 µg/l(d)					
Diallite	Semi-Volatile							
Dibenzofuran	Semi-Volatile							
Dibenz(a,h)anthracene	Semi-Volatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Dibromochloropropane	Semi-Volatile (P)	0.2 µg/l	0 µg/l					
Dichlorobenzene	Semi-Volatile							
Dichlorobenzidine	Semi-Volatile							
Dieldrin	Semi-Volatile (P)							
Di(2-ethylhexyl)adipate	Semi-Volatile (P)	400 µg/l(d)	400 µg/l(d)					
Diethylphthalate	Semi-Volatile							
Di(2-ethylhexyl)phthalate	Semi-Volatile	6.0 µg/l(d)	0 µg/l(d)					
Dimethoate	Semi-Volatile							
Dimethylphthalate	Semi-Volatile							
Dinitrotoluene	Semi-Volatile							
Dinoseb	Semi-Volatile(H)	7 µg/l(d)	7 µg/l(d)					
Di-n-octylphthalate	Semi-Volatile							
Diquat	Semi-Volatile(P)	20 µg/l(d)	20 µg/l(d)					
Endosulfan I	Semi-Volatile (P)							
Endosulfan II	Semi-Volatile (P)							
Endosulfan Sulfate	Semi-Volatile (P)							
Endothall	Semi-Volatile (P)	100 µg/l	100 µg/l					
Endrin	Semi-Volatile (P)	2.0 µg/l(d)	2.0 µg/l(d)	0.2 µg/l	0.2 µg/l			

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Other Standards for Domestic Water Supply: Human Health	Other Standards for Domestic Water Supply: Supply	Irrigation Use
Ethylene Dibromide	Semi-Volatile	0.05 µg/l(c)	0 µg/l(c)			0.1 µg/l		0.1 µg/l
Fluoranthene	Semi-Volatile							
Fluorene	Semi-Volatile							
Glyphosate	Semi-Volatile(P)	700 µg/l(d)	700 µg/l(d)					
Heptachlor	Semi-Volatile (P)	0.4 µg/l(c)	0 µg/l(c)					
Heptachlor Epoxide	Semi-Volatile (P)	0.2 µg/l(c)	0 µg/l(c)					
Hexachlorobenzene	Semi-Volatile	1.0 µg/l(d)	0 µg/l(d)					
Hexachlorobutadiene	Semi-Volatile							
Hexachlorocyclohexane, Alpha	Semi-Volatile (P)							
Hexachlorocyclohexane, Beta	Semi-Volatile (P)							
Hexachlorocyclohexane, (Lindane)	Semi-Volatile (P)	0.2 µg/l(c)	0.2 µg/l(c)	4 µg/l	4 µg/l			
Hexachlorocyclohexane, Technical	Semi-Volatile (P)							
Hexachlorocyclopentadiene	Semi-Volatile	50 µg/l(d)	50 µg/l(d)					
Hexachloroethane	Semi-Volatile							
Indeno(1,2,3-cd)pyrene	Semi-Volatile							
Methoxychlor	Semi-Volatile (P)	40 µg/l	40 µg/l(c)	100 µg/l	100 µg/l			
Naphthalene	Semi-Volatile							
Nitrobenzene	Semi-Volatile							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Nitrophenols	Semi-Volatile							
Nitrosodibutylamine	Semi-Volatile							
Nitrosodiethylamine	Semi-Volatile							
Nitrosodimethylamine	Semi-Volatile							
Nitrosopyrrolidine	Semi-Volatile							
N-Nitrosodiphenylamine	Semi-Volatile							
N-Nitroso-di-n-dipropylamine	Semi-Volatile							
Oxamyl	Semi-Volatile(P)	200 µg/l(d)	200 µg/l(d)					
PCBs	PCBs	0.5 µg/l(c)	0 µg/l(c)			1 µg/l		1 µg/l
Pentachlorinated Ethanes	Semi-Volatile							
Pentachlorophenol	Semi-Volatile	1 µg/l(c)	0 µg/l(e)					
Phenanthrene	Semi-Volatile							
Phenol	Semi-Volatile				5 µg/l		5 µg/l	5 µg/l
Picloram	Semi-Volatile (H)	500 µg/l	500 µg/l					
Polynuclear Aromatic Hydrocarbons (total PAH)	Semi-Volatile				30 µg/l	30 µg/l		30 µg/l
Pyrene	Semi-Volatile							
Simazine	Semi-Volatile(P)	4 µg/l(d)	4 µg/l(d)					

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASs/TBCs
GROUNDWATER QUALITY STANDARDS
CANNON AFB - APPENDIX II SWMUS

		FEDERAL STANDARDS			STATE STANDARDS NMWQCC Groundwater Quality Standards (g)			
Parameter	Type	SDWA Maximum Contaminant Level (a)	SDWA Maximum Contaminant Level Goal (a) ARARs/TBCs	RCRA Subpart F Concentration Limit (40 CFR 264.94) (b)	Community Water Supply System (h)	Human Health	Other Standards for Domestic Water Supply	Irrigation Use
Trans-1,2-Dichloroethene	Semi-Volatile	100 µg/l	100 µg/l					
Toxaphene	Semi-Volatile (P)	3 µg/l(c)	0 µg/l(c)	5 µg/l	5 µg/l			

EXPLANATION OF TABLE

(P) Pesticide (H) Herbicide

* = secondary maximum contaminant level (TBCs)
** = total trihalomethanes: chloroform, bromoform, bromodichloromethane, dibromochloromethane
*** = action levels in no more than 10% of tap samples, 56 FR 26460, 6/7/91, effective 12/7/92

NMWQCC = New Mexico Water Quality Control Commission
RCRA = Resource Conservation and Recovery Act
SDWA = Safe Drinking Water Act

(a) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR 141 and 40 CFR 143 (as of 5/1990)
(b) NCP, 40 CFR 300; NCP Preamble 55 FR 8764; CERCLA Compliance with Other Laws Manual EPA/540/G-89/006, August 1988
(c) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, 143, Final Rule, Effective July 30, 1992 (56 Federal Register 3526; 1/30/91)
(d) EPA National Primary Drinking Water Regulations, 40 CFR 141 and 40 CFR 142, Final Rule (57FR 31776, 7/17/92); Effective date is January 17, 1994, (therefore TBCs) except for endrin, which is effective 8/17/92.
(e) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, 143, Final Rule, Effective January 1, 1993 (56 FR 30266, 7/01/91)
(f) EPA Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, 40 CFR 141 and 142; effective December 7, 1992 (56 FR 26460, 6/7/91)
(g) NM Water Quality Control Commission, NM Water Quality Regulations, Part 3, Section 3-103, 11/16/1967 amended through August 17, 1991
(h) New Mexico Drinking Water/Water Supply Regulations, adopted April 16, 1991

If no values are shown for a possible contaminant, there are no standards at this time.

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Herbicides				
2,4,5-T	200	800	800 (d)	-
2,4,5-TP (Silvex)	600	-	640 (d)	-
2,4-D	800	800	800 (d)	-
2,4-DB	-	-	640(d)	-
Dalaphon	-	-	2,400 (d)	-
Dicamba	-	-	2,400 (d)	-
Dichlorprop	-	-	-	-
Dinoseb	80	-	80 (d)	-
MCPA	-	-	40 (d)	-
MCPP	-	-	80 (d)	-
Pesticides/PCBs				
4,4'-DDD*	2.9	3	2.9 (d)	
4,4'-DDT*	2.1	2	2.1(d)	-
4,4'-DDE*	2.1	2	2.1(d)	-
Aldrin*	0.04	0.04	0.04(d)	-
alpha-BHC*	-	0.10	0.11(d)	-
alpha-Chlordane*	0.54	0.50	0.54(d)	-
Aroclor-1016*	0.09	0.09	(e)	(f)
Aroclor-1221*	0.09	0.09	(e)	(f)
Aroclor-1232*	0.09	0.09	(e)	(f)
Aroclor-1242*	0.09	0.09	(e)	(f)
Aroclor-1248*	0.09	0.09	(e)	(f)
Aroclor-1254*	0.09	0.09	(e)	(f)
Aroclor-1260*	0.09	0.09	(e)	(f)

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Pesticides/PCBs (cont'd)				
beta-BHC*	-	4	0.39(d)	-
Chlordane*	0.54	0.50	0.54(1)	
delta-BHC	-	-	-	-
Diallate*	-	-	11.5(g)	
Dieldrin*	0.04	0.04	0.044(d)	-
Dimethoate	2,000	0.01	16(d)	
Disulfoton	3	3	3.2(d)	
Endosulfan I**	4	4	480(g,h)	-
Endosulfan II**	-	-	480(h)	-
Endosulfan sulfate	-	-	480(h)	
Endrin	20	20	24(d)	-
Endrin ketone	-	-	-	-
Famphur	-	-	-	
gamma-BHC	20	0.50	0.54(g)	-
gamma-Chlordane*	0.54	0.50	0.54(d)	-
Heptachlor	0.16	0.20	0.16(d)	-
Heptachlor epoxide*	0.077	0.08	0.077(d)	-
Isodrin	-	-	-	
Kepone	-	-	-	
Methoxychlor	-	-	400(d)	-
Methyl parathion	20	20	20(d)	
Parathion	20	500	480(g)	
Phorate	-	-	16(g)	
Toxaphene*	0.64	0.60	0.64(d)	-

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles				
1,2,4,5-tetrachlorobenzene	20	20	24(d)	
1,2,4-trichlorobenzene	2,000	2,000	800(d)	-
1,2-dichlorobenzene	-	-	7,200(d)	-
1,3,5-trinitrobenzene	-	-	4(d)	
1,3-dichlorobenzene	-	-	8(d)	-
1,3-dinitrobenzene	-	8	8(d)	
1,4-dichlorobenzene*	-	-	29(g)	
1,4-naphthoquinone	-	-	-	
1-naphthylamine	-	-	-	
2,3,4,6-tetrachlorophenol	2,000	2,000	2,400(d)	
2,4,5-trichlorophenol	8,000	8,000	8,000(d)	-
2,4,6-trichlorophenol*	35	40	6.4(d)	-
2,2'-oxybis(1-chloropropane)	-	-	-	-
2,4-dichlorophenol	200	-	240(d)	-
2,4-dimethylphenol	-	-	1,600(d)	-
2,4-dinitrophenol	200	200	160(d)	-
2,4-dinitrotoluene	2.27	-	160(d)	-
2,6-dichlorophenol	-	-	-	
2,6-dinitrotoluene*	-	1 (i)	80(g)	-
2-acetylaminefluorone	-	-	-	
2-chloronaphthalene	-	-	6,400(d)	-
2-chlorophenol	-	-	400(d)	-
2-methylnaphthalene	-	-	-	0.3-220(j)
2-methylphenol	4,000	4,000	4,000(d)	-
2-naphthylamine	-	-	-	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
2-nitroaniline	-	-	-	-
2-nitrophenol	-	-	-	-
2-picoline	-	-	-	
3-3'-dichlorobenzidine*	-	2	1.6(d)	-
3,3'-dimethylbenzidine	-	-	-	
3-methyl cholanthrene	0.074	-	-	
3-methylphenol	4,000	4,000	4,000(d)	
3-nitroaniline	-	-	-	-
4,6-dinitro-2-methylphenol	-	-	-	-
4-aminobiphenyl	-	-	-	
4-bromophenylphenyl ether	-	-	-	-
4-chloro-3-methylphenol	-	-	-	-
4-chloroaniline	-	-	320(d)	-
4-chlorophenylphenyl ether	-	-	-	-
4-methylphenol	4,000	4,000	400(g)	-
4-nitroaniline	-	-	-	-
4-nitro-1-oxide-quinoline	-	-	-	
4-nitrophenol	-	-	-	-
5-nitro-o-toluidine	-	-	-	
acenaphthene	-	-	4,800(d)	-
acenaphthylene	-	-	-	-
acetophenone	8,000	8,000	8,000(d)	
aniline	270	100	-	
anthracene	-	-	24,000(d)	-
aramite*	-	-	28(d)	

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
benzo(a)anthracene*	0.22	-	0.96(k)	0.3-220(j)
benzo(a)pyrene*	0.06	-	0.096(d)	0.3-220(j)
benzo(b)fluoranthene*	-	-	0.96(k)	0.3-220(j)
benzo(g,h,i)perylene	-	-	-	0.3-220(j)
benzo(k)fluoranthene*	-	-	9.6(k)	0.3-220(j)
benzoic acid	-	-	320,000(d)	-
benzyl alcohol	-	-	24,000(g)	-
bis(2-chloroethoxy)methane	-	-	-	
bis(2-chloroethyl)ether*	0.64	0.60	0.64(d)	-
bis(2-ethylhexyl)phthalate*	83	50	50(d)	0.3-220(j)
butyl benzyl phthalate	-	20,000	16,000(d)	0.3-220(j)
carbazole*	-	-	35(g)	-
chlorobenzilate*	-	-	2.6(g)	
p-chloro-m-cresol	-	-	-	
chrysene*	-	-	96(k)	0.3-220(j)
dibenzo(a,h)anthracene	0.0143	-	0.096(k)	0.3-220(j)
dibenzofuran	-	-	-	0.3-220(j)
dichlorodifluoromethane	20,000	20,000	16,000(d)	
dichlorodiisopropyl ether	-	-	-	
diethylphthalate	60,000	60,000	64,000(d)	-
o,o-diethyl o-pyrazinyl phosphoro-thioate	-	-	-	
p-dimethylaminoazobenzene	-	-	-	
7,12-dimethylbenz(a)anthracene	-	-	-	
alpha,alpha-dimethylphenethylamine	-	-	-	
dimethylphthalate	-	-	800,000(g)	-

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
di-n-butylphthalate	8,000	8,000	8,000(d)	-
di-n-octylphthalate	-	-	1,600(g)	-
diphenylamine	2,000	2,000	2,000(d)	
ethyl methanesulfonate	-	-	-	
fluoranthene	-	-	3,200(d)	0.3-220(j)
fluorene	-	-	3,200(d)	0.3-220(j)
hexachlorobenzene*	0.41	-	0.44(d)	-
hexachlorobutadiene	90	90	9(d)	-
hexachlorocyclopentadiene	600	-	560(d)	-
hexachloroethane*	80	80	50(d)	-
hexachlorophene	-	20	24(d)	
hexachloropropene	-	-	-	
indeno(1,2,3-cd)pyrene*	-	-	0.96(k)	0.3-220(j)
isosafrole	-	-	-	
isophorone*	2,000	2,000	736(d)	-
methacrylonitrile	8	8	8(d)	
methapyrilene	-	-	-	
methyl methane sulfonate	-	-	-	
n-nitrosodiethylamine*	-	0.005	0.0047(d)	
n-nitrosodimethylamine*	0.014	0.01	0.014(d)	
n-nitrosomethylethylamine*	0.032	0.03	0.032(d)	
n-nitrosomorpholine	-	-	-	
n-nitroso-di-n-butylamine*	-	0.10	0.13(d)	
n-nitroso-di-n-propylamine*	0.10	0.10	0.1(d)	-
n-nitrosodiphenylamine*	-	100	143(d)	-

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Semivolatiles (cont'd)				
n-nitrosopiperidine	-	-	-	
n-nitrosopyrrolidine*	0.33	0.30	0.33(d)	
naphthalene	-	-	-	0.3-220(j)
nitrobenzene	40	40	40(d)	-
pentachlorobenzene	60	60	64(d)	
pentachloroethane	-	-	-	
pentachloronitrobenzene*	27.3	200	2.7(g)	
pentachlorophenol*	2,000	2,000	6(d)	-
phenacetin	-	1	-	
phenanthrene	-	-	-	-
phenol	3,000	50,000	48,000(d)	-
p-phenylenediamine	-	-	15,200(g)	
pronamide	6,000	6,000	6,000(d)	
pyrene	-	-	2,400(d)	0.3-220(j)
pyridine	80	80	80(d)	
safrole	-	-	-	
tetraethyldithiopyrophosphate	-	40	40(d)	
trans-1,4-dichloro-2-butene	-	-	-	
o-toluidine	-	-	-	
o,o,o-triethyl phosphorothioate	-	-	-	
Volatiles				
1,1,1-trichloroethane	7,000	7,000	-	-
1,1,1,2-tetrachloroethane*	-	300	27(d)	
1,1,2,2-tetrachloroethane*	35	40	3.5(d)	-

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Volatiles (cont'd)				
1,1,2-trichloroethane	120	100	1.2(d)	-
1,1-dichlorethane*	-	-	8,000(g)	-
1,1-dichloroethene	12	10	1.2(d)	-
1,2-dibromo-3-chloropropane*	0.032	-	0.5(g)	
1,2-dibromoethane*	-	0.008	0.0082(d)	
1,2-dichloroethane*	7.7	8	7.7(d)	
1,2-dichloroethene (total)	-	-	720(g)	-
1,2-dichloropropane	-	-	-	
1,2,3-trichloropropane	80	500	480(d)	
1,4-dioxane*	143	60	64(d)	
2-butanone (MEK)	4,000	4,000	48,000(d)	-
2-hexanone (MnBK)	-	-	-	-
4-methyl-2-pentanone (MIBK)	4,000	4,000	6,400(g)	-
acetone	8,000	8,000	8,000(d)	-
acetonitrile	500	500	480(d)	
acrolein	-	-	1,600(g)	
acrylonitrile*	1.30	1.0	1.3(d)	
allyl chloride	-	-	-	
benzene*	24	-	24(d)	<10(1)
bromodichloromethane*	2,000	0.50	11(d)	-
bromoform*	2,000	2,000	89(d)	-
bromomethane	30	100	112(d)	-
carbon disulfide	8,000	8,000	8,000(d)	-
carbon tetrachloride*	5.4	5	5.4(d)	-
chlorobenzene	2,000	2,000	1,600(d)	-

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Volatiles (cont'd)				
chloroethane	-	-	-	-
chloroform*	110	100	115(d)	-
chloromethane	-	-	54(g)	-
chloroprene	-	-	-	
cis-1,3-dichloropropene	3.9	20	3.9(g)	-
dibromochloromethane*	-	-	8.3(d)	-
ethylbenzene	8,000	8,000	8,000(d)	<500 (l)
ethyl cyanide	-	-	-	
ethyl methacrylate	-	-	7,200(g)	
isobutyl alcohol	20,000	20,000	24,000(d)	
methyl bromide	-	-	112(d)	
methylene bromide	-	-	-	
methylene chloride*	93	90	93(d)	-
methyl iodide	-	-	-	
methyl methacrylate	-	-	6,400(g)	
styrene	20,000	20,000	16,000(d)	-
tetrachloroethene*	140	10	800(d)	-
toluene	20,000	20,000	16,000(d)	<500 (l)
trans-1,2-dichloroethene	-	-	1,600(d)	
trans-1,3-dichloropropene	20	20	3.9(g)	-
trichloroethene*	64	60	-	-
trichlorofluoromethane	20,000	20,000	24,000(d)	
vinyl acetate	-	-	-	
vinyl chloride*	-	-	0.37(g)	-
xylenes (total)	200,000	200,000	160,000(d)	<500 (l)

TABLE 3-3

POTENTIAL SCREENING CONCENTRATIONS FOR ORGANIC COMPOUNDS IN SOIL
(To Be Considered)
CANNON AFB

	RFI Guidance(a) TBCs (mg/kg)	Proposed RCRA Action Level(b) TBCs (mg/kg)	Proposed RCRA Action Level(c) TBCs (mg/kg)	Other TBCs (mg/kg)
Hydrocarbons				
Polycyclic Aromatic Hydrocarbons (PAHs)	-	-	-	<50 ppm(m)
Total Petroleum Hydrocarbons (TPH)	-	-	-	<100 ppm(n)

(a) RCRA Facility Investigation Guidance (EPA 1989a); human health-based criteria for systemic toxicants representing an estimate of the daily exposure an individual can experience without appreciable risk of health effects during a lifetime.
(b) Source: Corrective Action for SWMUs at Hazardous Waste Management Facilities (55 FR 30798, 27 July 1990): these risk based levels trigger the need for a corrective measure study.
(c) Human health proposed action levels calculated using guidance in 55 FR 30798
(d) Calculated from toxicity values provided in IRIS April, 1994.
(e) 55 FR 30798. EPA has already established standards for cleanup of PCBs under TSCA. The agency has determined that the TSCA cleanup standards are relevant to RCRA corrective action.
(f) Cleanup levels for PCB spills occuring before May 4, 1987 are at the discretion of the EPA regional administrator. 40 CFR 761 (Subpart G).
(g) Calculated from toxicity values provided in HEAST 1994.
(h) Toxicity values for Endosulfan adopted for Endosulfan I, Endosulfan II, and Endosulfan sulfate
(i) Value for mixture of dinitrotoluene isomers
(j) Range of anthropogenic and naturally occurring PAH concentrations (Blumer 1977, Mallet 1961)
(k) EPA 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/625/3-89/016. March 1989.
(l) The sum of benzene, toluene, ethylbenzene, and xylene isomer concentrations is less than 500 mg/kg, with benzene individually less than 10 mg/kg.
New Mexico Environmental Improvement Board, New Mexico Special Waste Requirement Regulations. Adopted effective January 30, 1992.
(m) New Mexico Department of Environmental Improvement New Mexico UST Regulations, amended through July 18, 1991.
(n) New Mexico Environmental Improvement Board, New Mexico UST Regulations, TPH Action Level. Under New Mexico Special Waste Requirement Regulations, the TPH Action Level is 1,000 mg/kg.
(o) EPA 1989. Interim Procedures for Estimating risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and -Dibenzofurans (CDDs and CDFs). EPA/625/3-89/016. March 1989.
* Carcinogens

TABLE 3-4

POTENTIAL SCREENING CONCENTRATIONS FOR INORGANIC COMPOUNDS IN SOIL (TO BE CONSIDERED) CANNON AFB - APPENDIX III SWMUs

Compound	RFI Guidance TBCs[a] (mg/kg)	Proposed RCRA Action Level Level TBCs[b] (mg/kg)	Proposed RCRA Action Level TBCs[c] (mg/kg)	Other TBCs[d] (mg/kg)	Average Background Concentration[e] (mg/kg)	Range of Background Concentrations[e,f] (mg/kg)
Aluminum	-	-	-	-	5700	860 - 10,540
Antimony	30	30	32[g]	-	6.75	1.33 - 12.2
Arsenic*	-	80	0.4[g]	-	3.5	0 - 15.5
Barium	4,000	4,000	5600[g]	-	166	0 - 642
Beryllium*	0.14	0.2	0.16[g]	-	0.41	0.09 - 0.73
Cadmium	-	40	40[g]	-	1.1	0 - 2.9
Calcium	-	-	-	-	69,200	0 - 186,400
Chromium III	80,000	-	80,000[g]	-	6.98	1.42 - 12.5
Chromium VI	400	400	400[g]	-		
Cobalt	-	-	-	-	2.5	0.5 - 4.5
Copper	-	-	-	-	5.4	0 - 13.0
Cyanide	2,000	2,000	1,600[g]	-		
Iron	-	-	-	-	4,780	840 - 8,720
Lead	-	-	-	500 - 1000	7.12	0 - 25.8
Magnesium	-	-	-	-	4,650	0 - 11,790
Manganese	-	-	8,000[g]	-	72	0 - 164
Mercury	-	20	24[h]	-	0.11	0.9 - 0.13
Nickel	2,000	2,000	-	-	5.0	1.0 - 9.0
Potassium	-	-	-	-	1360	148 - 2,572
Selenium	-	-	400[g]	-	8.23	0 - 56.6
Silver	200	200	400[g]	-	1.2	0.2 - 2.2
Sodium	-	-	-	-	514	0 - 1,042

TABLE 3-4

POTENTIAL SCREENING CONCENTRATIONS FOR INORGANIC COMPOUNDS IN SOIL (TO BE CONSIDERED) CANNON AFB - APPENDIX II SWMUs

Compound	RFI Guidance TBCs[a] (mg/kg)	Proposed RCRA Action Level Level TBCs[b] (mg/kg)	Proposed RCRA Action Level TBCs[c] (mg/kg)	Other TBCs[d] (mg/kg)	Average Background Concentration[e] (mg/kg)	Range of Background Concentrations[e,f] (mg/kg)
Thallium	-	-	-	-	0.50	0 - 1.2
Vanadium	-	-	-	-	14.9	4.50 - 25.3
Zinc	-	-	24,000[g]	-	11.3	0.72 - 21.9

[a] RCRA Facility Investigation Guidance (EPA 1989a); human health-based criteria for systemic toxicants representing an estimate of the daily exposure an individual can experience without appreciable risk of health effects during a lifetime.
[b] Source: Corrective Action for SWMUs at Hazardous Waste Management Facilities (55 FR 30798, 27 July 1990). These risk-based levels trigger the need for a corrective action measure study.
[c] Human Health proposed action levels using calculations in 55 FR 30798. Sources of toxicity factors used in calculations include: (1) Integrated Risk Information System (IRIS) and (2) Health Effects Assessment Summary Tables (HEAST) FY1992.
[d] Source: OSWER Directive 9355.4-02.
[e] Source: Woodward-Clyde Consultants, 1993.
[f] Average ± 2 standard deviations
[g] IRIS April, 1994
[h] HEAST 1994
* Carcinogen

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Resource Conservation and Recovery Act (RCRA)			
1. New facilities where treatment, storage or disposal of hazardous waste will be conducted is prohibited within 61 meters (200 feet) of a fault displaced in Holocene time [40 CFR 264.18(a)]*	No	No	Treatment, storage and disposal of waste will not be conducted within 61 meters of a fault displaced in Holocene time.
2. New facilities where treatment, storage or disposal of hazardous waste will be conducted is prohibited within the 100-year floodplain. [40 CFR 264.18(b)]*	No	No	Treatment, storage and disposal of waste will not be conducted within the 100-year floodplain of adjacent rivers.
3. Prohibits noncontainerized or bulk liquid hazardous waste placement in salt domes, salt bed formations, and underground mines or caves. [40 CFR 264.18(c)]*	No	No	No action which would place waste in a salt dome or salt bed formation, underground mine or cave is anticipated at this site.
E.O. 11988 Protection of Floodplains			
4. Limits activities in floodplain. Floodplain is defined as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of off-shore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." [40 CFR 6, Appendix A and 40 CRF 6.302]	No	No	Remedial activities will not be conducted within any floodplains.

*Adopted by the State of New Mexico and incorporated within Part V of the New Mexico Hazardous Waste Management Regulations.

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
E.O. 11990 Protection of Wetlands			
5. Minimizes impacts on areas designated as wetlands. [40 CRF 6, Appendix A]	No	No	Although playas are considered wetlands by the U.S. Fish and Wildlife Service, regulations are applicable only if the remedial activities impact the wetland areas. No impacts to the wetland areas are anticipated at this time.
Clean Water Act Section 404			
6. Action to prohibit discharge of dredged or fill material into waters of U.S. without permit. [33 USC 1251; 40 CFR 230; 33 CFR 320-330]	No	No	Dredge and fill permit requirements will not apply as no waters of the U.S. will be impacted by remedial activities on the site.
7. Requires Federal agencies to avoid, to the extent possible, adverse impacts associated with destruction or loss of wetlands	No	No	As described above, although wetlands are considered by the U.S. Fish and Wildlife Service to occur on the base in the form of playas, regulations are applicable only if the remedial activities impact the wetland area.

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Endangered Species Act			
8. Protects endangered species and threatened species and preserves their habitat. [16 USC 1531 et sequence; 50 CFR 200, 50 CFR 402]	Yes	---	Although Walk, Haydel & Associates report in their Remedial Investigation that there are no critical habitats in the immediate vicinity of the site (according to the Wildlife Management Plan for the base), two federally listed endangered species are known to inhabit the area within a 50-mile radius of the site (Lee Wan & Associates, Inc., 6/90).
Bald Eagle Protection Act			
9. Protects all eagle species and restricts activities that may threaten or adversely affect their habitat (16 USC Section 688 et. seq)	Yes	---	If eagle species are found to occur on the base, special protection provisions will need to be coordinated with US Fish and Wildlife Service. Bald eagles are known to inhabit the area within a 50-mile radius of the site (Lee Wan & Associates, Inc., 6/90).
Migratory Bird Treaty Act			
10. Protects migratory, resident, or range habitat of migratory birds including raptors and waterfowl. (16 USC Section 703 et. seq).	Yes	--	Remedial actions cannot threaten or adversely affect the habitats of migratory waterfowl or raptors.

TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Wilderness Act			
11. Limits activities within an area designed as a wilderness area. [16 USC 1311 et seq.; 50CFR 53.1 et seq.]	No	No	The site is not within a federally-owned area designated as a wilderness area.
12. Limits the type of activities permitted in an area designated as a National Wildlife Refuge system [16 USC 668 et seq.; 50 CFR Part 27]	No	No	The site is not in an area designated as part of the National Wildlife Refuge System (the closest NWRS are over 25 miles from the site).
Fish and Wildlife Coordination Act			
13. Prohibits activities affecting/modifying streams or bodies of water if the activity has a negative impact on fish or wildlife. [16 USC 661 et seq.; 33 CFR Parts 320-330; 40 CFR 6.302]	No	No	As described above, no streams, rivers, or playas will be impacted by remedial activities.
Wild and Scenic Rivers Act			
14. Protects rivers that are designated as wild, scenic or recreational. [16 USC 1271; 40 CFR 6.302(e)]	No	No	No rivers designated as wild, scenic or recreational will be affected by remedial activities.

TABLE 3-5

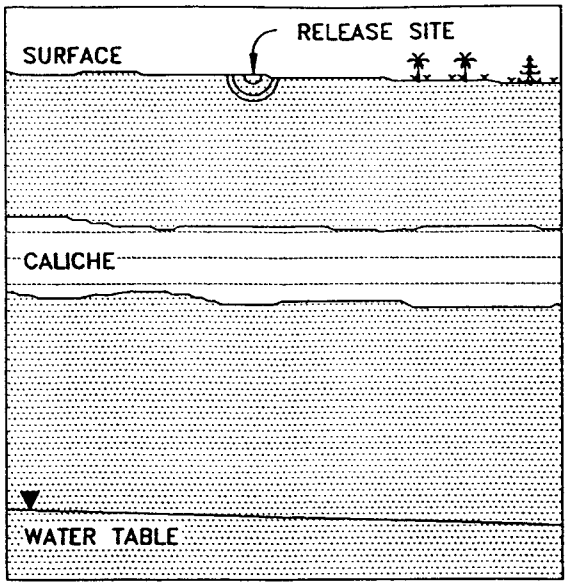
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
National Historic Preservation Act (NHPA)			
15. Requires the preservation of historic properties included in or eligible for the National Register of Historic Places and to minimize harm to National Historic Landmarks. [16 USC 470 et seq.; 7 CFR 650; 36 CFR Part 65, Part 800]	Yes	---	Pursuant to Section 106 of NHPA, proposed federal undertaking in any state shall take into consideration the effect of the undertaking on any site, building, structure, or object that is included or eligible for inclusion in the National Register; nothing has been placed on the register to date, but surveys are ongoing. Also applicable if historical sites are discovered during a remedial action or if known historical sites exist near a remedial action site.
The Historic and Archaeological Data Preservation Act of 1974			
16. Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity program (16 USC 469, 40 CFR 6.301(c))	Yes	---	May be available if remedial activities affect historical and/or undiscovered archaeological data of the site.
The Archaeological Resource Protection Act of 1979			
17. Requires a permit for any excavation or removal of archaeological resources form public or Indian lands (16 USC 470aa-47011)	Yes	---	May be applicable if any remedial activity involves removal of archaeological resources; substantive requirements need to be met.

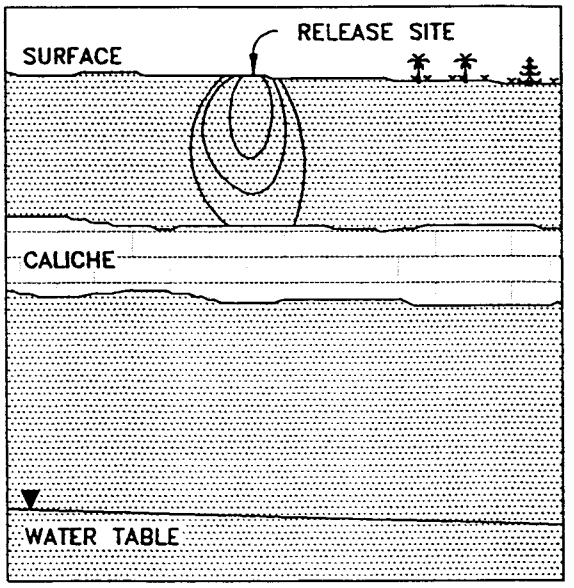
TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX II SWMUs

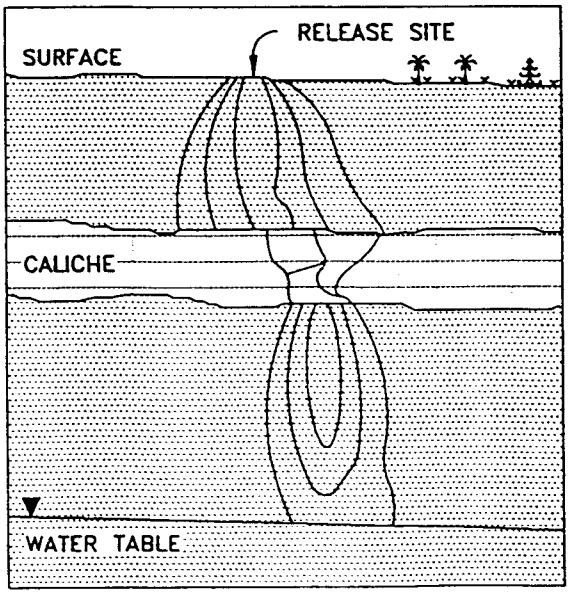
Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
Coastal Zone Management Act			
18. Limits activities affecting the coastal zone, including lands thereunder and adjacent shorelands. [16 USC Section 1451 et sequence]	No	No	The site is not located in the coastal zone management area.
State Regulations			
Endangered Species Act (New Mexico Regulation 682)			
19. Requires coordination with the Department of Game and Fish if activities impact on endangered/ threatened species or their habitat.	Yes	---	As stated above, although Walk, Haydel & Associates report in their Remedial Investigation that there are no significant habitats in the immediate vicinity of the site, state listed threatened/ endangered species have been identified at or near the base.
1978 New Mexico State Cultural Properties Act (Sections 18-6-1 through 18-6-17 NMSA 1978)			
20. Provides for the preservation, protection, and enhancement of structures, sites, and objects of historical significance within the State.	Yes	--	Although the Cannon AFB site, including its properties/buildings are not listed on the State Register of Historic Places, coordination with the State Historic Preservation Office is ongoing with respect to the historical and archaeological surveys that have been conducted at the base; State laws closely follow the federal laws.



A. SINGLE EVENT RELEASE OF A SMALL QUANTITY.



A. SINGLE EVENT RELEASE OF A LARGE QUANTITY.



A. CONTINUOUS RELEASE OF CONTAMINANTS. NOTE MIGRATION OF LIQUIDS THROUGH FRACTURES IN THE CALICHE.

NO SCALE

DRN BY JWB	DATE 08/19/92	PENDANT PLUMES CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	3-1

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CANNON AFB DECISION DIAGRAM FOR PHASE II INVESTIGATION OF APPENDIX III SWMUs

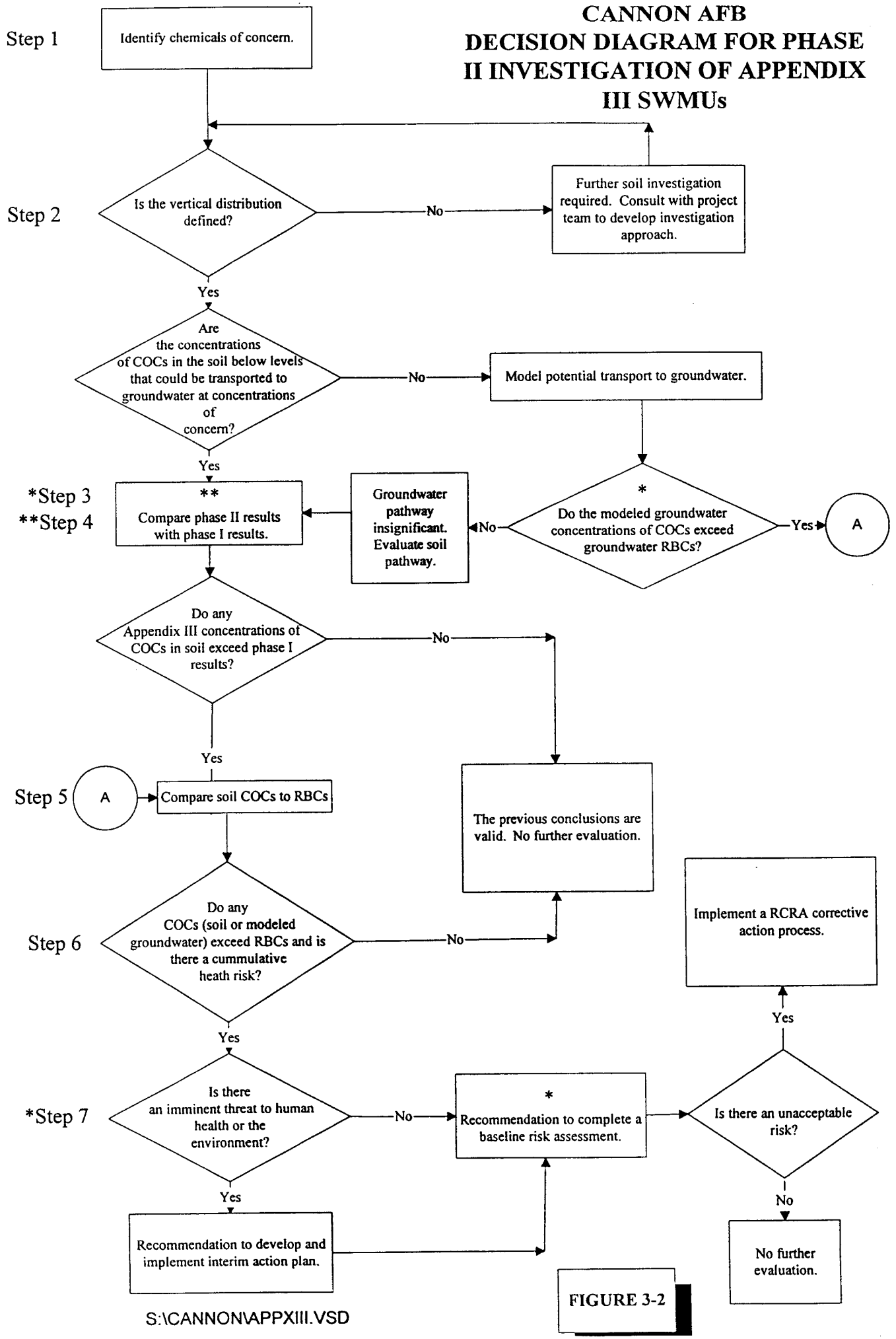

FIGURE 3-2

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4.0
FIELD INVESTIGATION

4.1 FACILITY INSPECTION AND REVIEW

A pre-field investigation site visit to Cannon AFB took place prior to the start-up of work plan document preparation and fieldwork for the Phase I RFI. The on-site visit provided a means to become familiar with the Base personnel, policies, and individual SWMUs targeted under this RFI. Attendees at these discussions included all critical project personnel, including the Cannon AFB CES/CEV project manager, the USACE project manager and technical specialist, and the W-C project manager, risk assessment specialist and field manager. Topics covered during these conversations included: Base security requirements, policies, and access permits; utility clearances and activity permits for proposed drill sites; sources and acquisition of engineering plans and as-built drawings for targeted facilities to provide for accurate location of proposed soil borings; and the logistical requirements for field operations and the staging of supplies.

The facility review included field visits to all 16 SWMUs investigated under the Phase I RFI, seven of which were investigated under this Phase II RFI. Facility managers were contacted during these visits wherever possible to provide them notification of the upcoming fieldwork, to determine optimal times of performing fieldwork so as to minimize its impact to ongoing unit operations, and to generate first person information concerning the targeted facility's history and current use. Field visits also provided an opportunity to observe and evaluate potential health and safety concerns at investigation sites, thus allowing a proactive approach to mitigate identified hazards which could potentially impact the successful and timely completion of the project.

4.2 SURFACE SOIL SAMPLING

Surface soil samples were collected at soil boring sites to help evaluate the potential risk to human health and the environment and to assess whether any releases of SWMU-related compounds had occurred. The surface samples were typically collected from the depth interval of 0 to 2 feet. Where pavement was present, holes were cut into this surface, and

the drill rig and stainless steel split-spoon were used to collect the soil sample beginning at the asphalt/soil contact. Other surface soil samples were collected from the surface to a depth of about 0.5 feet by using decontaminated stainless steel hand implements. The sample material was dug up completely by hand with the tools provided. For both types of sample collection, sample containers for volatile organic compound (VOC) analysis were filled immediately with soil from the sampler or the hand utensils. The remaining soil was then homogenized and used to fill any additional sample containers required for that site. Collected samples were labeled and placed in an ice-filled cooler for preservation. All tools and bowls used for sample collection were decontaminated after use by washing in a liquinox/water solution, rinsing in potable water, and rinsing again with a double rinse of deionized water. Surface soil sampling activities followed the applicable Standard Operating Procedures (SOPs) included in the QAPP (W-C 1994).

4.3 SOIL BORING DRILLING AND SAMPLING

Soil borings were drilled and sampled using either a CME-55 or CME-85 hollow-stem auger (HSA) drill rig. The CME-55 drill rig was equipped with 3.5-inch inside diameter HSAs, while the CME-85 was equipped with 4.25-inch inside diameter HSAs. Each drill rig was also equipped with two 2-foot by 3-inch-diameter stainless steel split spoons, and hydraulically operated automatic sampling hammers.

The soil samples were collected by driving a decontaminated, 3-inch ID by 2-foot-long stainless steel split-spoon sampler through the targeted depth interval. Blow counts were recorded to provide standard penetration test data for each interval sampled. The sampler was retrieved from the boring and opened for sample recovery. Sample containers for VOC samples were filled first directly from the split spoon. Once these samples were secured, the remaining material was homogenized in a stainless-steel bowl and placed in the remaining sample containers. If recovered sample volume was inadequate for the targeted interval, a decontaminated split-spoon sampler was reinserted into the boring and driven deeper to assure that sufficient material was collected for analysis. On the successful completion of sampling at each target interval, the HSAs advanced the boring to the top of the next sample interval, where the process was repeated.

All sampling equipment was decontaminated between sample intervals with a liquinox/water solution wash, potable water rinse and a final rinse of deionized water sprayed liberally over the equipment. Soil boring, drilling, and sampling activities generally followed the applicable SOPs included in the QAPP (W-C 1994).

4.4 LAKE SEDIMENT SAMPLING

Sediment (lake bed) samples were collected at five locations in the Playa Lake (SWMU No. 103). The sediment samples were collected from depths of 2 to 3 feet and 4 to 5 feet below the surface of the lake bottom. Sediment samples were collected by first driving a decontaminated steel pipe into the lake bottom at the sampling location. The water inside the steel pipe was then bailed out of the pipe with a decontaminated Teflon bailer. Once the water had been bailed from the pipe, a decontaminated stainless steel hand auger was used to drill to the desired sample interval. Once the top of the desired sample interval had been reached, the samples were collected by driving a decontaminated 3-inch OD by 2-foot stainless steel split spoon through the sampling interval. The split spoon was removed from the pipe, opened, and the respective sample jars were filled beginning with VOCs, SVOCs, the remaining organic analytes, and then metals.

4.5 GROUNDWATER SAMPLING

One groundwater sample was collected from MW-0K at Landfill No. 25 to assess whether SWMU-related contaminants have impacted the groundwater. Several difficulties were encountered while purging the well. The well was initially purged on January 17, 1995 using a decontaminated Teflon bailer. The well was bailed, and a large quantity of what appeared to be drilling mud was observed in the bailer. After this mud was removed, a submersible pump was installed in the well for further development. The well was quickly pumped dry after a volume of about 5 gallons. The well subsequently recharged only slightly during the rest of this day. The following day the decision was made to bail the well dry and begin collecting samples. The following morning the well had only recovered about 2 feet. The well was bailed dry, and some muddy conditions were again observed in the bailer. No well recharge was observed during the rest of this day. On the morning of January 19, 1995, the well had recovered about 1.2 feet. By the end of the next day, January 20, 1995, the well had recovered about 4 feet. The decision was made to return to the well as soon as it was

fully recovered for sampling. Upon returning to the well on January 23, 1995, the water column in the well was about 9 feet. Sampling was begun with a decontaminated Teflon bailer. The water in the bailer was observed to be very clear and free of sediment. Sample containers were filled until the well was bailed dry again. Although sufficient water was present to obtain a complete suite of analyses for the sample, only VOCs could be collected for the duplicate sample. Field measurements for pH, temperature, conductivity, and turbidity were collected only at 5 gallons of purging before the well went dry. The groundwater sample, and any QA/QC samples, were collected with the bailer after the well had recovered sufficiently. Sample containers were filled for the various analytes in the following order:

- VOCs and TPH (GRO)
- SVOCs, pesticides and PCBs, TPH (TCO), and herbicides
- TRPH
- Metals

A sample collection field sheet showing the sampling information can be found in Appendix B of this report. Chain-of-custodies can also be found in Appendix B.

4.6 SURVEY OF SAMPLING LOCATIONS

On the completion of field activities, the locations of all soil boring sites were accurately surveyed in terms of northing, easting, and elevation relative to the Cannon AFB coordinate system. Boring sites were also located relative to significant nearby physical features such as building corners and street intersections. All survey work was performed by a surveyor licensed by the state of New Mexico. The data generated during this site survey were used to accurately depict the locations of soil borings in figures found elsewhere within this document. A table containing the actual coordinates and elevations of all soil borings drilled under this investigation is also available in the appendixes to the RFI Report.

5.0
DATA REVIEW, QUALITY ASSURANCE AND ASSESSMENT

5.1 GENERAL

The data review process, which involved a review of the laboratory summary data, was implemented to assess the quality of data resulting from the field sampling program with respect to the quality assurance objectives established for the project. Additionally, 10 percent of the data was validated, which involved a review of the laboratory summary and raw data, following the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluation Inorganic Analyses (EPA 1988). Data assessment for each SWMU involved a consideration of the major data uses, the decision types, the identification of data which were qualified or otherwise did not meet Cannon AFB RFI Quality Assurance Project Plan (QAPP) Addendum (W-C 1994) requirements, and limitations on data in order to evaluate the appropriate usage of the data in supporting decisions to be made at each SWMU.

5.2 DATA REVIEW PROCESS

Analytical laboratory results were reviewed following the procedures described below utilizing the quality control (QC) data specified in the Cannon AFB RFI QAPP Addendum (W-C 1994) for the respective EPA analytical methodologies. The QC elements reviewed in laboratory analytical data packages included the following: completeness of the data package; compliance with required holding times; presence or absence of analytes in method blanks and field blanks; results of duplicate control samples (DCS); recoveries of surrogate spikes in samples; results of matrix spike samples, matrix duplicates (metals); and field duplicate samples.

The analytical data received from the laboratory have been summarized and are included in the Cannon AFB RFI Quality Control Summary Report (QCSR). The laboratory flagged data **J** when a result was below reporting limits to indicate that the concentration reported is an estimated value. The data review procedures used are described in this section. Qualified data are addressed in the data assessment for each SWMU. The data, including all W-C

qualifiers, are presented in the data summary tables which are presented in the section discussing the chemical investigation results for each SWMU.

Based on results of the data review process, sample data may have been qualified as **J** (estimated), **UJ** (estimated nondetect), **U** (nondetect), or **R** (rejected). The review process was performed in accordance with the Cannon AFB RFI QAPP Addendum (W-C 1994) with guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). Although the data packages provided were not CLP deliverables, the guidance was followed where applicable.

In accordance with these guidelines, professional judgment was invoked in certain areas in determining the need for data qualification. Professional judgment as prescribed by the Functional Guidelines involves a secondary evaluation of data with respect to qualifications, which takes into account additional knowledge based on experience with laboratory practices, analyte-specific factors such as chemical properties, and other current resolution of technical issues addressed in the literature.

The data review results are presented in the respective data assessment section for each SWMU and the QCSR. Each SWMU-specific QC review details quality control issues associated with the analysis of the sample, describes if qualification of data was required, and describes how professional judgment was used.

5.2.1 Completeness of Data Package

Data packages were reviewed to make certain that they contained the data contractually required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with the requested QC documentation for the respective EPA methods.

5.2.2 Holding Times

Sample holding times were calculated from the date of sampling as determined from the Chain-of-Custody (COC) forms to the date of sample extraction/analysis. Holding times were compared to the criteria specified in Tables 5-1a and 5-1b of the Cannon AFB RFI QAPP Addendum (W-C 1994). If the sample analysis was conducted outside of the required holding times, all results for that sample were qualified as estimated **J** (detects) or **UJ** (nondetects) or rejected **R**, depending on the severity of the holding time exceedance in accordance with EPA Functional Guidelines.

5.2.3 Blanks and Rinsates

The same guidelines were applied to the results of method blanks, rinsate blanks, and trip blanks in the evaluation and usage of blank results. If analytes were reported in the blank, but not in samples associated with the method blank, data were not qualified. If analytes were reported in the blank and in associated samples, the following actions were taken:

- No positive sample results were reported unless the concentration of the analyte in the sample exceeded 10 times (10x) the amount in any blank for the common laboratory contaminants (methylene chloride, acetone, 2-butanone, methyl isobutyl ketone, and common phthalate esters) or exceeded 5 times (5x) the amount for other compounds.

- When the sample results were greater than the reporting limit, but less than the required multiple (5x or 10x) of the blank result, sample results were qualified as nondetect **U**, and the reporting limit raised to the sample concentration.

- When the sample results were less than the reporting limits and less than the required multiple of the blank result, sample results were qualified as nondetect **U** at the reporting limit.

- When the sample results were greater than the required multiple (5x or 10x) of the blank result, sample results were reported without qualification.

5.2.4 Surrogates and Duplicate Control Samples

Surrogates were used to access accuracy for organic analyses on a case-by-case basis. Criteria for recovery of surrogates spiked into samples are listed in Table 4-3 of the Cannon AFB RFI QAPP (W-C 1994). If any one surrogate for volatile organic (VOC) analyses or any two surrogates for semivolatile organic (SVOC) analyses were out of specification due to recoveries greater than the upper evaluation limit, positive results for that fraction were qualified as estimated **J**; nondetect data did not require qualification. If recoveries were below the lower evaluation limit, but greater then 10 percent, positive results for that fraction were qualified as estimated **J**, and nondetect results were qualified as estimated **UJ**. If any surrogate in a fraction had a recovery less than 10 percent, positive results were qualified as estimated **J**, and nondetect results for that fraction were rejected **R**. Surrogate recovery review is not applicable to total recoverable petroleum hydrocarbons (TRPH) or metals analyses.

Duplicate control samples (DCS) are well-characterized, laboratory-generated samples used to monitor the laboratory's day-to-day performance for inorganic and organic analyses and to access the accuracy and precision the analytical process independently of matrix effects. Evaluation criteria for DCS are provided in Table 4-2a through Table 4-2e of the Cannon AFB RFI QAPP Addendum (W-C 1994). Sample results associated with the DCS which were below the evaluation limits were qualified as estimated **J** (detects) or **UJ** (nondetects) based on a potential low bias. Detected sample results associated with the DCS which were above the evaluation limits were qualified as estimated **J** based on a potential high bias.

5.2.5 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed for organics and matrix spike/duplicate (MS/D) samples were analyzed for inorganics. Evaluation criteria for accuracy (percent recovery) and precision (relative percent difference [RPD]) of these MS/MSD and MS/D samples are listed in Table 4-4, Table 4-5, and Table 4-6 of the Cannon AFB RFI QAPP Addendum (W-C 1994).

For MS/MSD samples with percent recoveries greater than the upper evaluation limit nondetect sample results were considered to be acceptable, and detected results were qualified

as estimated **J**. For percent recoveries less than the lower evaluation limit both nondetect and reported sample results were qualified as estimated **J**. If MS or MSD recoveries were less than 10 percent for organics and less than 30 percent for metals analyses, nondetect sample results were rejected **R**, and detected results were qualified as estimated **J**. MS and MSD samples where RPDs were greater than 100 percent were qualified as unusable **R**.

In general for soil samples, sample results for the sample on which the MS/MSD was prepared were qualified using the above guidelines. However, using informed professional judgment in conjunction with a review of the other QC criteria, the data reviewer may determine the need for qualification of other sample data for the analytical batch for the SWMU.

5.2.6 Field Duplicate Samples

Precision evaluation criteria of 50 percent relative percent difference (RPD) for soil and 25 percent for aqueous samples were considered if the analyte concentrations were greater then 5x the reporting limit. For analytical results less than or equal to 5x the reporting limit, precision evaluation limits of ± 2x the reporting limit were utilized. Duplicate results were evaluated on a case-by-case basis to determine if qualification of data was necessary. Where it was determined that qualification based on field duplicate samples was required, associated data were qualified **J** (detects) or **UJ** (nondetects).

5.3 MEASUREMENT OF QUALITY ASSURANCE OBJECTIVES

5.3.1 Precision

Precision is the measure of variability between individual sample measurements under prescribed conditions. Precision is assessed by replicate measurements of known standards and analysis of duplicate environmental samples. Precision was assessed by evaluating the RPDs obtained from results of DCS, matrix spike duplicate samples, and field duplicate samples. The precision of the data is discussed in Section 4.0 of the QCSR.

5.3.2 Accuracy

Accuracy is the degree of agreement of a measurement to an accepted reference or true value. Accuracy was assessed by evaluating percent recoveries for DCS, matrix spike samples, and surrogates. The accuracy of the data is discussed in Section 4.0 of the QCSR.

5.3.3 Completeness

Following the QC review of the data packages for each SWMU, the data were assessed with respect to the fulfillment of quality assurance objectives and usability. The completeness for laboratory analytical data for each SWMU was calculated by the ratio of acceptable (including estimated data) analyses requested on the samples submitted for analysis.

$$\%\ Complete = \frac{Valid\ Analytical\ Results\ [including\ estimated\ (J)\ results]}{Total\ Number\ of\ Analytical\ Results\ Requested}$$

The percent completeness with respect to overall project objectives for each SWMU was evaluated for data required to make decisions on a case-by-case basis.

5.3.4 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness of the analytical results with respect to the medium sampled can be assessed by comparing the results for field duplicate samples collected from a SWMU.

As stated in the EPA Functional Guidelines, there are no review criteria for field duplicate analyses. Evaluation criteria for the field duplicate samples are discussed in Section 5.2.6. Each SWMU-specific QC review in the QCSR contains a qualitative assessment of data representativeness as defined by the Cannon AFB QAPP (W-C 1994).

5.3.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data are comparable when collection techniques and measurement procedures, methods, and reporting are equivalent for the samples within the sample set. Each SWMU-specific QC review in the QCSR contains a qualitative assessment of data comparability.

5.4 SAMPLE REPORTING LIMITS

The sample reporting limit (RL) is the lowest concentration of an analyte that can be reported by the laboratory to be present in a sample with a specified level of confidence. The RLs are a function of the sample characteristics, method quantitation, and laboratory performance.

Method quantitation limits are determined by the laboratory and defined as the level at which the laboratory can reliably quantitate the concentration of an analyte on multiple analyses. The RLs can be equal to the method quantitation limits, but often are above since method quantitation limit studies are performed using laboratory-prepared samples (spiked deionized [DI] water); whereas, environmental samples are naturally more variable. For the Cannon project, Quanterra reporting limits for organics were equal to the practical quantitation limit, and for the metals the reporting limits were equal to the instrument detection limit. Reporting Limits were provided in Table 8-2 through Table 8-5 and Table 8-7 of the Cannon AFB RFI QAPP Addendum (W-C 1994). For the Cannon AFB project, Quanterra does report data below the RLs as estimated. For samples analyzed by Method 8240, estimated values (flagged J) were reported down to 1/5th the reporting limit. For semivolatile organic compounds analyzed by Method 8270, estimated values were reported down to 1/10th the reporting limit. For pesticide/PCBs analyzed by Method 8080 and herbicides analyzed by Method 8150, estimated values were reported down to 1/2 the reporting limit. For inorganic data, estimated values were reported down to IDLs. Factors which may result in elevated RLs are discussed below.

1. High concentrations of target or nontarget analytes may require that the sample extract be diluted to avoid saturation of the detector or to quantify the analyte concentration within the calibration range of the instrument. Consequently, RLs are elevated in proportion to the dilution factor.

2. Matrix interferences may require that the sample be diluted to reduce or eliminate the interference. Consequently, the RLs are elevated in proportion to the dilution factor.

3. Analytical results and RLs are corrected for the moisture content of the sample. The RLs listed in the Cannon AFB RFI QAPP (W-C 1993) for soil are based on wet weight. RLs calculated by the laboratory for soil on a dry weight basis will be higher. Because moisture content can vary from sample to sample, RLs will vary accordingly.

4. The physical characteristics of the matrix do not permit concentration to the required final volume during sample preparation resulting in a larger sample extract volume and consequently an elevation in RLs.

5. Matrix interference may require the RLs be elevated because of the inability to quantify data below the elevated RL.

In a given sample, one or more of these effects may be exhibited. When the reporting limits have been elevated as a result of one or more of the above causes, surrogate or target compounds present at low concentrations may not be detected. The possibility exists that the low level analytes may have been diluted below the detection limit; therefore, elevated RLs may cause limitations to the objective of the data. These limitations on data for contaminants of concern are discussed on a case-by-case basis.

5.5 DATA ASSESSMENT

The assessment of data for each SWMU involved a consideration of the major data uses, the potential decisions, the identification of data which were qualified or otherwise deviated from Cannon AFB RFI QAPP Addendum (W-C 1994) requirements, and limitations associated with the evaluation of data use in supporting decisions to be made at each SWMU.

5.5.1 Uses of Data

The major uses for data collected in the RFI were:

- Characterization of the physical setting and nature and extent of contamination at a SWMU
- Human risk assessment screening to determine if a baseline risk assessment is needed
- Recommendations for each SWMU regarding further evaluation or no further action

Characterization of the nature and extent of contamination released from a SWMU included identifying specific compounds and their concentrations present in environmental media (e.g., soil, groundwater). Nature and extent characterization also involved consideration of the lateral and vertical distribution within certain spatial and temporal boundaries in environmental media of contamination released from a SWMU.

The human risk assessment screening involved a comparison of metal concentrations to background. Metals detected above background and detected organics were compared to previously collected data for each Appendix III SWMU and EPA Region IV RBCs for each SWMU.

5.5.2 Summary of Data Quality Requirements

Data collected in the RFI must be of known quality to support the uses for which it is intended. That is, the data must be able to support remedial decisions concerning the respective SWMUs. The data collected must be able to support the primary uses of the data. Data must be able to characterize what chemicals were released from the SWMU and, at an acceptable level of uncertainty, what their concentrations are in environmental media of concern at potential exposure points. RLs must meet the levels necessary to determine whether analytes are present at concentrations of concern (i.e., above RBCs).

Inherent to providing defensible data is the need for a QA/QC program. The QA/QC program must have measurement tools so that data collected will be of known quality. QA/QC objectives for sampling and analysis were developed for this project which use as indicators: precision, accuracy, completeness, comparability, and representativeness.

5.5.3 Sampling Issues

Daily Quality Control Reports (DQCRs) were completed during the field activities. DQCRs summarized the weather conditions, work performed, QC activities, and problems encountered. The DQCRs and field log books were reviewed to determine if there were any sampling issues which would impact the data usability.

5.5.4 Data Usability Assessment

For each SWMU, a determination of data usability was made with respect to project data quality objectives (DQOs). Sampling issues and data review issues were discussed in terms of the appropriateness of using the data as intended as well as making recommendations or limitations on data usage. These discussions addressed items such as elevated reporting limits, analytes suspected as laboratory contaminants, potential bias in results, and professional judgment utilized in the data review.

6.1 SITE BACKGROUND

6.1.1 Site Description

The AGE Maintenance Shop Pad is an open concrete area adjacent to the southeast side of the AGE Maintenance Shop, located in Building No. 186. The pad is approximately 60 to 70 feet wide and 240 to 280 feet long (Figure 6-1). A wash rack occupies an area about 45 feet square beyond the southeast edge of the pad. The AGE Drainage Ditch (SWMU No. 34, investigated in the Appendix I RI) lies to the southeast of the maintenance pad and carries runoff to the northeast.

6.1.2 Site History

The maintenance pad has been active since 1971. Water from washing and surface or storm water, potentially contaminated with JP-4, oils, and diesel fuel, flows off the pad to the southeast. The Appendix I RI investigation of soils lining the AGE Drainage Ditch, southeast of the AGE pad, found negligible to nondetectable levels of target contaminants in the soils sampled.

6.1.3 Current Use

Maintenance on aeronautical ground equipment is performed in Building No. 186 and on the south and east sections of the pad. The wash rack (not a target of this investigation) is frequently used to wash and clean support vehicles and equipment. The wash rack is drained separately to an adjacent OWS which was a part of the Appendix II investigation. A portion of the drainage from the pad reportedly flows into a sand trap at the northwest corner of the wash rack. This sand trap reportedly empties into the OWS.

6.1.4 Potential Contaminants

Potential contaminants include JP-4, mineral and synthetic oils, solvents, metals, and diesel fuel.

6.1.5 Previous Investigations

Four 10-foot soil borings were drilled and soil samples collected during the Phase I RFI (W-C 1994) in areas where wash-down water from the maintenance pad enters the AGE ditch and along expansion joints or cracks in the maintenance pad to determine if a release of SWMU-related chemicals posing a hazard to human health or the environment has occurred at these points. A summary of boring numbers and sample descriptions can be found in Table 6-1 of the Phase I RFI report (W-C 1994). The Phase I boring locations and numbers are shown on Figure 6-2. Boring 03101 was drilled in a slight drainage channel entering the AGE ditch to sample the effect maintenance pad runoff may have on the soil at this location. Surface soils at this site are discolored and vegetation within the channel appears distressed. Since this drainage ditch receives runoff from locations other than the AGE Maintenance Shop, other sources may be contributing contaminants to this sample location. Boring 03102 was drilled in an area of soil cover near the AGE ditch to determine the presence and the lateral extent of potential contaminants in soils at this point. Soils at this site did not appear contaminated and vegetation appeared normal. The high density of buried utilities under the maintenance pad forced the relocation of two borings from the pad itself to nearby sites. Boring 03103 was located just off the slab to the west of the Wash Rack near the expansion joint to ascertain the presence and extent of possible contamination at these points. Small piles of stained soil observed at this location suggest that oily soils have been deposited here. Boring 03104 was located about 10 feet southwest of boring 03103, just off the edge of the AGE pad. No surface staining was evident at this site.

Soil samples were collected from the 0- to 0.5-foot, 1.5- to 3.5-foot, 4- to 6-foot, and 8- to 10-foot depth intervals in borings 03101 and 03102 and from the 0.5- to 2-foot, 2- to 4-foot, and 8- to 10-foot depth intervals in borings 03103 and 03104. Target analytes included VOCs, SVOCs, metals, and TRPH. SVOCs were analyzed only at the surface samples and at selected depth intervals to allow for risk assessment. Surficial samples from the 0 to .5-foot interval were collected in areas of soil cover from the 0.2- to 0.5-foot depth interval to

provide a worst-case situation for risk assessment purposes if SVOC contamination was found in these samples. In areas of pavement or concrete surfaces, soil sampling began immediately below the pavement/soil contact.

Tetrachloroethene (PCE) was detected at low concentrations in boring 03103 at the surface. Anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, carbazole, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, phenanthrene, and pyrene were detected in samples from the surface of boring 03101 and boring 03102 at 3.5 feet. Petroleum hydrocarbons were detected in borings 03101, 03102, and 03103 at the surface and in boring 03102 at 3.5 feet. Antimony, barium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, and zinc were detected above background in surface and subsurface samples to 10 feet in one or more of the borings. Barium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, cadmium, chromium, chrysene, indeno(1,2,3-cd)pyrene, lead, and petroleum hydrocarbons exceeded the risk screening criteria. These results are summarized on Figure 6-3.

BRA Summary

A BRA was done at SWMU 31 based on the recommendations made in the Phase I RFI report. Potential receptors at SWMU 31 for human health risk included occupational workers, hypothetical future construction workers, and hypothetical future trespassers. These receptors were assumed to be exposed to soil via ingestion, dermal contact, and inhalation pathways. Potential human health risks from groundwater were evaluated using fate and transport modeling. The modeling indicated that contaminants would not reach groundwater at concentrations of potential concern. Therefore, this pathway was considered insignificant.

The maximum potential excess human health risk at SWMU 31 was 5×10^{-6} for occupational workers. This is within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} for risk from releases at hazardous waste sites indicating that no unacceptable risk is expected. The primary contributor to the risk was ingestion of PAHs in surface soils.

Results of the ecological risk assessment showed that no unacceptable ecological risks due to chemical releases are expected at the SWMU.

Since no unacceptable human health or ecological risks due to chemical releases are expected from this SWMU, no further action was recommended for this SWMU in the Phase I RFI report.

6.1.6 Phase II Sampling Objectives

The overall objective of sampling at the site of the AGE Maintenance Shop Pad was to evaluate whether or not a release of SWMU-related chemicals has occurred as a result of seepage through cracks or joints in the pavement or adjacent to the pad in areas of runoff which could pose a significant risk to human health or the environment. The analytical data collected from this investigation was used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the AGE Maintenance Shop Pad. Potential release points included cracks and joints in the pavement surface and at the pavement edge in areas of surface runoff.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

6.2 PHASE II FIELD INVESTIGATION AND DATA COLLECTION

6.2.1 Soils Sampling

Three soil borings were drilled and soil samples collected at the AGE Maintenance Shop Pad. One boring was drilled near the location of the wash rack (boring 3107), one boring was drilled in a grassy area northeast of the washrack (boring 3105), and one boring was drilled at the bottom of a shallow drainage swale northeast of the washrack (boring 3106) (Figure 6-2). The borings were drilled to a total depth of 10 feet. The boring locations were chosen to further assess the lateral and vertical presence and extent of site related soil contaminants

at the 10-foot-depth interval. Phase II RFI boring numbers and sample descriptions are shown in Table 6-1 and on Figure 6-2.

Surface soil samples from all borings were collected from 0 to 0.5 feet. All borings were also sampled at intervals of 3 to 5 feet and 8 to 10 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 -Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile Organic Compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL Metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

6.2.2 Geologic Summary of Boring Logs

Phase I RFI

Logs from the four Phase I RFI soil borings drilled in this SWMU indicate a consistent subsurface environment. Fill consisting of sandy clays and silts ranging from 0.5 to 3.5 feet thick underlie the physical facility. This soil is underlain by interbedded light, yellowish white sandy clay and a reddish brown sandy clay, each ranging in thickness from 2 to 7 feet. Soils are dry to moist, and firm to hard with occasional angular, white gravel. Visible indications of contamination were observed in two of the boring locations. Stained surface soils at boring 03101 did not persist below approximately 0.5 feet deep, and OVA readings were low at depths below 3 feet. Soils with a black greasy appearance and a petroleum odor were described in boring 03103 encountered at the 0.5- to 2-foot depth interval, but this indication did not persist below 1.5 feet in depth. Soils from borings 03102 and 03104 had no visual indications of contamination.

Phase II RFI

Logs from the three Phase II RFI borings show a subsurface lithology consisting mostly of uniform fine-grained fill material and Ogallala Formation sediments. Boring 3107 encountered 5-inches of concrete pavement at the surface. Fill material consisting of stiff, dark brown, low plastic silty clay (USCS symbol CL) was found below the concrete to a depth of 2 feet. Fill materials were encountered from the surface to depths of 3.2 feet and 3.6 feet in borings 3105 and 3106, respectively. The fill in boring 3105 consisted of sandy clay (USCS symbol CL) described as brown and moist with some gravel, pieces of plastic, caliche, and roots. The fill in boring 3106 consisted of a clay (USCS symbol CL) described as dark brown, moist, medium plastic, with some gravel and numerous roots. Below the fill in borings 3105 and 3106 a natural silty clay (USCS symbol CL) was encountered to the boring completion depths at 10 feet. This silty clay is red or pinkish-red, dry to moist, medium stiff to hard, medium plastic, with some calcium carbonate deposits and nodules. Below the fill layer in boring 3107 a clayey silt (USCS symbol ML) was encountered to the boring completion depth at 10 feet. The clayey silt is reddish-brown, dry, loose to medium dense and contains some caliche and caliche cemented zones. Boring logs can be found in Appendix B of this Phase II RFI report.

No field screening (headspace) or visual indications of contamination were observed while drilling and sampling Phase II soil borings 3105 and 3106. A field headspace of 16.7 ppm was noted at the 1-foot depth interval in boring 3107. No odors were noted during drilling or sampling activities.

6.2.3 Site Topography

The site is level with a shallow drainage swale located near Phase II RFI boring 3106 (Figure 6-2). The drainage swale is located in a grassy area. The area surrounding boring 3107 is paved with concrete and is near the washrack. Boring 3105 was drilled in a grassy area immediately northeast of the washrack. This area has a gentle slope to the southeast into the drainage swale. The area immediately southeast of the site is paved with concrete. Building 186 is located about 50 feet to the northwest, building 191 is located about 100 feet to the north, and building 190 is located about 75 feet to the southeast.

The maintenance pad has a slight gradient to the southeast, which directs surface runoff from the area north and east of Building 186 toward the AGE ditch. Runoff northwest of the wash rack is directed along an expansion joint southwestward off of the pad.

6.3 CHEMICAL INVESTIGATION RESULTS

6.3.1 General

Soil samples were collected from four Phase I borings (03101, 03102, 03103, and 03104) and three Phase II borings (3105, 3106, and 3107). Sampling and analyses performed are summarized in Table 6-1 for the Phase II RFI borings. A summary of the analytical results for the Phase I RFI and Phase II RFI soil samples are provided on Figure 6-3. Analytical results for the Phase II RFI soil samples are also provided in Table 6-2. For each sample type, the table provides results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results for the Phase II RFI soil samples are provided in Appendix A.

6.3.2 Organic Results for Phase II Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN031-3105-0000, CAN031-3106-000 and CAN031-3107-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 6-1.

Other than acetone, which was qualified nondetected after it was determined to be laboratory contamination, the only VOC reported was total xylenes at a concentration of 130 μg/kg reported for sample CAN031-3107-0000. Several SVOC compounds, mostly PAHs, were reported for all three near-surface samples. Total PAHs were detected at concentrations of 7,903 μg/kg (CAN031-3105-0000), 18,265 μg/kg (CAN031-3106-0000) and 25,450 μg/kg (CAN031-3107-0000). Other SVOCs detected in sample CAN031-3105-0000 were bis(2-Ethylhexyl)phthalate (340 μg/kg, estimated), butyl benzyl phthalate (65 μg/kg, estimated), and carbazole (170 μg/kg, estimated). Other SVOCs detected in sample CAN031-3106-0000 were bis(2-Ethylhexyl)phthalate (1,200 μg/kg), butyl benzyl phthalate (73 μg/kg, estimated), carbazole (370 μg/kg, estimated), and dibenzofuran (49 μg/kg, estimated). Other SVOCs detected in sample CAN031-3107-0000 were

bis(2-Ethylhexyl)phthalate (2,500 μg/kg, estimated) and 4-methylphenol (1,100 μg/kg, estimated). Petroleum hydrocarbons were detected at concentrations of 696 mg/kg, 914 mg/kg, and 2,500 mg/kg in samples CAN031-3105-0000, CAN031-3106-0000 and CAN031-3107-0000, respectively.

6.3.3 Organic Results for Phase II RFI Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN031-3105-0005 and CAN031-3105-0010 for boring 3105, CAN031-3106-0005 and CAN031-3106-0010 for boring 3106, and CAN031-3107-0005 and CAN031-3107-0010 for boring 3107) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 6-1.

Other than acetone, which was qualified nondetected after it was determined to be laboratory contamination, the only VOC reported was toluene at concentrations of 5.5 μg/kg (estimated) and 4.9 μg/kg (estimated) reported for samples CAN031-3107-0005 and CAN031-3107-0010, respectively. Only one SVOC compound (fluoranthene) was reported for any of the subsurface samples (sample CAN031-3107-0005 at a concentration of 120 μg/kg, estimated). Petroleum hydrocarbons were not reported in any of the subsurface samples.

6.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 6-1 for the Phase II RFI soil samples. The range of results, combining Phase I and Phase II data, for metals reported in these soil samples are summarized in Table 6-A.

TABLE 6-A

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Aluminum	25/26	2,160 mg/kg	0314-0008	10,500 mg/kg	3105-0005
Antimony	1/25	1.9 mg/kg	0311-0000	(Only detection)	
Arsenic	25/26	1.0 mg/kg	3170-0010	4.6 mg/kg	0314-0000
Barium	25/26	81.2 mg/kg	0311-0004	1,460 mg/kg	0311-0000
Beryllium	20/25	0.22 mg/kg	0312-0000	0.69 mg/kg	0314-0000
Cadmium	9/25	0.63 mg/kg	0312-0002	8.7 mg/kg	0311-0000
Calcium	25/26	4,200 mg/kg	0314-0000	222,000 mg/kg	0314-0008
Chromium	24/25	2.3 mg/kg	0314-0008	130 mg/kg	0311-0000

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Cobalt	24/25	1.7 mg/kg	0311-0008	22.2 mg/kg	3107-0000
Copper	25/25	1.5 mg/kg	0314-0008	61.4 mg/kg	0311-0000
Iron	25/26	1,680 mg/kg	0314-0008	10,700 mg/kg	0314-0000
Lead	25/26	1.9 mg/kg	0314-0008	930 mg/kg	0311-0000
Magnesium	25/26	1,150 mg/kg	0311-0000	5,230 mg/kg	3107-0000
Manganese	All results rejected during data review				
Mercury	0/25	-	-	-	-
Nickel	25/26	3.6 mg/kg	0314-0008	15.8 mg/kg	3107-0000
Potassium	25/25	639 mg/kg	0311-0002	2,200 mg/kg	3106-0000
Selenium	4/25	0.12 mg/kg	0311-0008	0.24 mg/kg	0313-0000
Silver	0/25	-	-	-	-
Sodium	1/25	193 mg/kg	0313-0000	(Only detection)	
Thallium	2/25	0.12 mg/kg	3105-0010	0.13 mg/kg	3105-0005
Vanadium	25/26	6 mg/kg	0314-0008	23.7 mg/kg	3106-0010
Zinc	25/26	5.6 mg/kg	0314-0008	479 mg/kg	0311-0000

Note: See Table 6-3 for comparison to background ranges.

6.4 DATA ASSESSMENT

An assessment of the AGE Maintenance Pad (SWMU 31) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

6.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

6.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988). A detailed review of SWMU 31 data is provided in the Quality Control Summary Report (QCSR).

For the organic analyses, qualification of data was required based on outlying internal standard areas. For VOC analysis of sample CAN031-3106-0000, internal standard areas were reported below evaluation criteria, and a surrogate recovery was above evaluation criteria. Analytes associated with the outlying internal standards were qualified estimated **J** (detects) or **UJ** (nondetects). No qualifications were required based on the outlying surrogate recovery because associated data was reported as nondetect. Additionally, methyl isobutyl ketone and methylene chloride data were qualified as nondetect **U** for several samples, based on blank contamination.

The MS recoveries for antimony, selenium, and thallium were below evaluation criteria, and the MS recovery for manganese was reported above evaluation criteria. Antimony, selenium, and thallium data for SWMU 31 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected manganese results were qualified as estimated **J** to indicate a potential high bias for samples CAN031-3105-0000, CAN031-3105-0005, CAN031-3105-0010, CAN031-3106-0000, CAN031-3106-0005, and CAN031-3106-0010. For lead, one MS recovery was above criteria, and the second MS recovery was below criteria. Additionally, for one of the matrix duplicates the relative percent difference (RPD) for lead was above the evaluation criteria. Lead data for borings 3105 and 3106 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate the low potential bias, and detected lead data for boring 3107 samples were qualified as estimated **J** to indicate a potential high bias.

Precision parameters for the organic analyses were within evaluation criteria. For one of the matrix duplicate samples, the RPD for lead did not meet the evaluation criteria. Lead data associated with the matrix duplicate were qualified based on the low MS recovery.

6.4.3 Reporting Limits

Reporting limits were raised for several metals and TRPH analyses and one VOC and SVOC analysis by less than 10 times the nominal RL. For selenium and thallium analyses, reporting limits were raised due to either matrix interference or dilutions. Selenium and thallium data which had elevated reporting limits based on the matrix interferences were qualified estimated **J** (detects) or **UJ** (nondetects). Lead analyses required dilutions for several samples due to either analyte concentrations above the calibration range or matrix interferences. The lead

analysis for sample CAN031-3106-0000 required a dilution by a factor of 20 due to lead concentrations above the calibration range. Method 6010 and TRPH analyses required dilutions which elevated the reporting limits due to calcium or TRPH concentrations, respectively, above the calibration range, and one arsenic analysis required a dilution due to matrix interferences. For sample CAN031-3107-0000, the VOC and SVOC analyses required a dilution by a factor less than 10 due to concentrations of nontarget compounds above the calibration range.

6.4.4 Summary of Data Usability and Limitations

Limitations to the use of the data may occur with the dilution of samples because the possibility exists that low level analytes could be diluted to be below the elevated reporting limits. The elevated reporting limits were judged not to limit the use of the data for the human health risk screening, because RLs for selenium and thallium were below the RBCs, and arsenic, TRPH, and lead were detected above the elevated RLs. For Method 6010, analytes would be reported at concentrations below the RBCs. For sample CAN031-3107-0000, dilutions were required for the VOC and SVOC analyses. Xylenes (total) and fourteen PAHs were detected in the sample. The Method 6010, VOC, and SVOC RLs would not be limiting to the data usability because the laboratory would report estimated concentrations below the RBCs if the analyte were present.

Overall, the data generated for SWMU 31 were determined to meet quality criteria. Based on the data quality review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of the contamination and to be used for the human health risk screening.

6.5 NATURE AND EXTENT OF CONTAMINATION

The sampling at this facility was directed at areas just off the edge of the pavement where materials spilled during equipment maintenance would be expected to run off or be carried by wash water or storm water. The only VOCs detected in Phase II soil samples were toluene in the subsurface samples from boring 3107 and total xylenes in the surface sample from the same boring. These compounds were detected in relatively low concentrations. The surface samples at two of the four Phase I RFI borings and one of the Phase II borings were

found to be contaminated with petroleum hydrocarbons in excess of 1,000 mg/kg. The maximum is 4,070 mg/kg at the surface of boring 03103. The remaining two Phase II borings also had TRPH reported at concentrations ranging from 696 mg/kg to 914 mg/kg. These Phase I and Phase II surface samples were also contaminated with elevated levels of various SVOCs at or slightly above reporting limits. The Phase II surface samples contained SVOCs mainly in the form of PAHs in total concentrations ranging from 7,903 μg/kg to 25,450 μg/kg.

In general, there is no significant contamination in the samples below 2 feet of depth, and the surface contamination appears to be closely adjacent to the edge of the pavement. The contaminated surface soils could have resulted from materials involved in the equipment maintenance or possibly from the asphalt pavement or a combination of both sources.

6.6 COMPARISON OF PHASE II METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals in soil were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values from regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 6-3 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, barium, beryllium, thallium, and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. The maximum concentrations of cadmium, chromium, cobalt, copper, lead, manganese, nickel, and zinc exceeded background levels; therefore, these metals were retained for further evaluation as chemicals of concern in soil.

Although the maximum detected concentration of barium (716 mg/kg) slightly exceeded the background UTL of 642 mg/kg, this concentration was within the range of Base-wide detected background concentrations. Additionally, barium has been shown to substitute for calcium; it is believed that the barium is a naturally occurring constituent of the caliche (Klein and Hurlbutt 1985). Therefore, barium was considered to be within background levels and was not retained for further evaluation.

6.7 RISK EVALUATION

6.7.1 Site Conceptual Exposure Model

Figure 6-4 shows the site conceptual exposure model of chemical sources and potential human exposure pathways for the AGE Maintenance Shop Pad. In the SCEM, potentially complete exposure pathways are indicated with solid lines; incomplete or insignificant pathways are indicated with broken lines.

The primary potential contaminant source is waste fluids (e.g., fuels, oils, and solvents) that may have leaked or been spilled on the pad. Mixing and infiltration of the wastes with the soil and storm water runoff are shown as primary chemical release mechanisms. Once released to soil, the chemicals may then be released to groundwater by infiltration/percolation, to the atmosphere by volatilization or wind erosion, or they could be transported by storm water. Chemicals could also be released directly to receptors via contact with soil.

As shown in Figure 6-4, surface soils may provide exposures to Base workers (occupational exposures), hypothetical future construction workers, or hypothetical future trespassers (if the Base is closed in the future) via soil ingestion, dermal contact, or inhalation of air emissions (volatile and particulates). Subsurface soils may provide exposures to construction workers (i.e., during excavation) via ingestion, dermal contact, and inhalation of air emissions from subsurface soil.

Groundwater is used for domestic purposes on- and off-Base. However, groundwater is probably an insignificant pathway at this site because fate and transport modeling in the Phase I investigation showed that chemicals would not be transported to groundwater at concentrations of concern. In addition, only low levels of contamination were found in

subsurface soils, and the SWMU is mainly covered by concrete which limits infiltration and vertical transport of contaminants.

In summary, the potentially complete human exposure pathways at SWMU 31 are:

Occupational Workers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

Hypothetical Construction Workers

- Ingestion of and dermal contact with surface and subsurface soil
- Inhalation of volatile emissions and airborne particulate matter from surface and subsurface soil

Hypothetical Trespassers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

6.7.2 Comparison of Phase II Concentrations to Phase I Concentrations and RBCs

The objective of the Phase II risk evaluation was to verify whether the recommendation for no further action, based on the Phase I baseline risk assessment (W-C 1994), is appropriate for this SWMU. To meet this objective, maximum detected Phase II concentrations were compared to maximum detected Phase I concentrations. This comparison was made to evaluate whether the extent of contamination and potential risks had been adequately defined in Phase I and to assess whether the no further action recommendation was appropriate.

If Phase II concentrations exceeded Phase I concentrations, Phase II maximum concentrations for those chemicals which exceeded Phase I concentrations were compared to highly

conservative EPA Region III (EPA 1994) risk-based concentrations (RBCs) for residential soil. This comparison was made to evaluate if chemicals detected in Phase II were at concentrations that could pose a significant human health risk (i.e., if the potential risk at the SWMU is higher than predicted in Phase I). EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. Note that the RBCs are based on conservative residential exposure assumptions that significantly overestimate exposures that are likely to occur at this SWMU. Therefore, risks predicted from the RBC comparison significantly overestimate actual risks at the SWMU. A discussion of the methodology used to derive the RBCs is given in section 3.4 and Appendix D.

Table 6-4 shows the comparison of the Phase II maximum concentrations with Phase I concentrations and with RBCs. As would be expected, the maximum detected concentrations of several chemicals from Phase II slightly exceeded the Phase I maximum detected concentrations while for many others the Phase II concentrations were lower. Of the chemicals that exceeded Phase I concentrations, only dibenzo(a,h)anthracene was detected at a concentration (0.63 μg/kg) which also exceeded the residential soil RBC (0.088 mg/kg). Residential RBCs are overly conservative for actual exposures at this site. As shown in the table, several other chemicals were detected at concentrations which exceeded RBCs, but the Phase II concentrations were lower than the Phase I concentrations. Since the Phase I Baseline Risk Assessment showed that these chemicals posed no significant human health risk at the higher concentrations, it can be concluded that they do not pose a significant human health risk at the lower Phase II concentrations.

The reporting limits were normal for all samples except for the surface soil sample in boring 3107 (CAN031-3107-0000), which had elevated reporting limits of 3.7 mg/kg for semivolatile chemicals. The contract lab that analyzed the samples reported concentrations (J-qualified) at one-fifth the reporting limit. One-fifth of 3.7 mg/kg is 0.74 mg/kg. This concentration exceeds the residential RBCs for only the PAHs benzo(a)pyrene (0.088 mg/kg) and dibenzo(a,h)anthracene (0.088 mg/kg), but it is below industrial RBCs for all PAHs. All of the PAHs (including benzo(a)pyrene and dibenzo(a,h)anthracene) would have been reported at estimated (J-qualified) concentrations had they been present in the samples at concentrations above 0.74 mg/kg (below industrial RBCs). Since this is below RBCs, the data show that the compounds are not present at concentrations of concern.

As stated earlier, the maximum detected concentration of dibenzo(a,h)anthracene (0.63 μg/kg) exceeded the residential soil RBC of 0.088 mg/kg. The estimated risk based on the assumed residential exposures, from this concentration is 7×10^{-6} which is within the EPA target range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) indicating that no significant risk is present even under residential exposure conditions. The maximum concentration also slightly exceeded the industrial soil RBC of 0.39 mg/kg and results in an estimated risk of 2×10^{-6} which is well within the target risk range. Therefore, no unacceptable human health risks are expected from contaminants detected at SWMU 31.

The potential cumulative risk at the SWMU was estimated by adding the incremental risk posed by Phase II concentrations to the risks calculated in the Phase I risk assessment. This is a very conservative approach that overestimates risk because it accounts for risk from the same chemical twice (i.e., in the Phase I risk assessment and in the Phase II risk evaluation). Chemicals for which the Phase II concentrations did not exceed Phase I concentrations were not included because higher concentrations were already evaluated in the Phase I risk assessment. Table 6-4a presents the incremental risk due to the Phase II concentrations, the Phase I risks, and the potential cumulative risks. Table 6-4a shows that the incremental effects of the Phase II concentrations do not significantly impact the results of the risk assessment. In addition, the potential cumulative cancer risk of 5×10^{-6} and the potential cumulative noncancer hazard of 0 .03 are below or within EPA's target risk range.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, naphthalene, pyrene and toluene) were analyzed for individually in the soil samples at the SWMU.

In the Phase II investigation at SWMU 31, TRPH was detected at a maximum concentration of 2500 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. (In Phase I, TRPH was detected at a maximum concentration of 4070 mg/kg). Except for dibenzo(a,h)anthracene, potentially toxic constituents of the TRPH (e.g., toluene, xylenes, other PAHs) were detected at concentrations which were below the Phase I concentrations or which did not exceed RBCs. In addition, the maximum detected concentration of dibenzo(a,h)anthracene did not result in an estimated potential risk which exceeded the EPA's

target risk range (see above). Since the known toxic constituents of TRPH were not detected at concentrations of concern, it is unlikely that other TRPH constituents would contribute significantly to risks at the SWMU. Furthermore, the SWMU area is mostly covered by concrete which limits potential exposure to TRPH in the soil.

6.7.3 Evaluation of the Groundwater Pathway

Fate and transport modeling done for the Phase I RFI indicated that chemicals detected at SWMU 31 would not be transported to groundwater at concentrations of potential concern.

The vertical distribution of the soil contaminants detected during the Phase II investigation was used to evaluate whether chemical releases pose a threat to groundwater. Most of the contamination found during the Phase II investigation was contained in the surface soil of borings 3106 and 3107. The deeper samples from these borings were nondetect for most of the organic analytes, and only surface soil samples had concentrations exceeding residential RBCs. The lack of detected concentrations of contaminants in the deeper samples indicates that the contaminants are not being transported vertically to the groundwater (approximately 200 to 300 feet bgs). Additionally, most of SWMU 31 is covered by concrete, and the potential for detected contaminants to infiltrate to groundwater is limited by the pavement. Therefore, groundwater is not likely to be impacted by the Phase I or Phase II contaminants detected at SWMU 31.

6.7.4 Conclusions

Since no unacceptable human health risks due to chemicals detected during Phase II are expected from this SWMU, and the vertical distribution of soil contamination indicated that groundwater would not be impacted, the results of the Phase I Baseline Risk Assessment are verified, and no further action is recommended for SWMU 31.

6.8 SUMMARY AND RECOMMENDATIONS

Nine additional soil samples were collected and analyzed from three 10-foot-deep soil borings at SWMU 31 during the Phase II RFI. Results of the analytical testing were compared to the Phase I results to determine whether any analytes exceeded Phase I concentrations. Several

chemicals slightly exceeded the Phase I concentrations; however, only dibenzo(a,h)anthracene exceeded the residential soil RBC. The Phase I BRA showed that this chemical posed no unacceptable health risk at higher concentrations than were detected during the Phase II RFI.

The majority of site contaminants were detected in surface soils during both the Phase I and Phase II investigations. Potential impact to groundwater is considered to be low. Because there is no unacceptable human health risk from any of the chemicals detected at the SWMU, it is recommended that no further investigation is necessary.

TABLE 6-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
AGE MAINTENANCE SHOP PAD (SWMU NO. 31)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 03105	0 - 0.5	CAN031-3105-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN031-3105-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN031-3105-0010		Soil	X	X	X	X	2	1
Boring 03106	0 - 0.5	CAN031-3106-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN031-3106-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN031-3106-3101	MRD	Soil	X	X	X	X	2	1
	8 - 10	CAN031-3106-0010		Soil	X	X	X	X	2	1
Boring 03107	0 - 0.5	CAN031-3107-0000		Soil	X	X	X	X	2	1
	0 - 0.5	CAN031-3107-3101	MRD	Soil	X	X	X	X	2	1
	3 - 5	CAN031-3107-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN031-3107-6005	MS/MSD	Soil	X	X	X	X	2	1
	8 - 10	CAN031-3107-0010		Soil	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 6-2 for locations of the borings.

TABLE 6-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 031
CANNON AFB

LOCATOR	CAN031-3105-0000			CAN031-3105-0005			CAN031-3105-0010			CAN031-3106-0000			CAN031-3106-0005			CAN031-3106-0010		
LAB SAMPLE NUMBER	0397140012SA			0397140013SA			0397140014SA			0397140015SA			0397140016SA			0397140017SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	12	U	<	12	U	<	12	U	<	11	U	2.6	12	J	<	11	U
Toluene	<	6	U	<	5.8	U	<	5.8	U	<	5.5	UJ	<	6	U	<	5.7	U
Xylenes (total)	<	6	U	<	5.8	U	<	5.8	U	<	5.5	UJ	<	6	U	<	5.7	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	400	U	<	380	U	<	380	U	89	360	J	<	400	U	<	380	U
Anthracene	80	400	J	<	380	U	<	380	U	370	360		<	400	U	<	380	U
Benzo(a)anthracene	490	400		<	380	U	<	380	U	1600	360		<	400	U	<	380	U
Benzo(a)pyrene	600	400		<	380	U	<	380	U	1900	360		<	400	U	<	380	U
Benzo(b)fluoranthene	1100	400		<	380	U	<	380	U	<	360	U	<	400	U	<	380	U
Benzo(g,h,i)perylene	310	400	J	<	380	U	<	380	U	870	360		<	400	U	<	380	U
Benzo(k)fluoranthene	1300	400		<	380	U	<	380	U	3800	360		<	400	U	<	380	U
bis(2-Ethylhexyl)phthalate	340	400	J	<	380	U	<	380	U	1200	360		<	400	U	<	380	U
Butyl benzyl phthalate	65	400	J	<	380	U	<	380	U	73	360	J	<	400	U	<	380	U
Carbazole	170	400	J	<	380	U	<	380	U	370	360		<	400	U	<	380	U
Chrysene	790	400		<	380	U	<	380	U	270	360	J	<	400	U	<	380	U
Dibenz(a,h)anthracene	140	400	J	<	380	U	<	380	U	400	360		<	400	U	<	380	U
Dibenzofuran	<	400	U	<	380	U	<	380	U	49	360	J	<	400	U	<	380	U
Fluoranthene	1300	400		<	380	U	<	380	U	3800	360		<	400	U	<	380	U
Fluorene	47	400	J	<	380	U	<	380	U	96	360	J	<	400	U	<	380	U
Indeno(1,2,3-cd)pyrene	330	400	J	<	380	U	<	380	U	920	360		<	400	U	<	380	U
4-Methylphenol	<	400	U	<	380	U	<	380	U	<	360	U	<	400	U	<	380	U
Naphthalene	66	400	J	<	380	U	<	380	U	39	360	J	<	400	U	<	380	U
Phenanthrene	540	400		<	380	U	<	380	U	1500	360		<	400	U	<	380	U
Pyrene	810	400		<	380	U	<	380	U	2700	360		<	400	U	<	380	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented on Table A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) = MS/MSD for preceding sample number.

TABLE 6-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 031
CANNON AFB

LOCATOR	CAN031-3105-0000			CAN031-3105-0005			CAN031-3105-0010			CAN031-3106-0000			CAN031-3106-0005			CAN031-3106-0010		
LAB SAMPLE NUMBER	0397140012SA			0397140013SA			0397140014SA			0397140015SA			0397140016SA			0397140017SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	9230	12		10500	11.5		8700	23.2		10200	11		3970	60.3		10200	11.4	
Arsenic	2.4	1.2		2.3	0.58		2	0.58		3.1	0.55		2.4	0.6		2.5	0.57	
Barium	237	1.2		657	1.2		275	2.3		305	1.1		270	6		101	1.1	
Beryllium	0.38	0.24		0.45	0.23		0.4	0.46	J	0.42	0.22		<	1.2	U	0.47	0.23	
Cadmium	1.2	0.6		<	0.58	U	<	1.2	U	3.3	0.55		<	3	U	<	0.57	U
Calcium	44600	24		105000	23		124000	46.3		46600	21.9		288000	121		96600	22.8	
Chromium	11.3	1.2		8.2	1.2		5.8	2.3		26.5	1.1		<	6	U	7.7	1.1	
Cobalt	2.9	1.2		2.1	1.2		2.2	2.3	J	3.1	1.1		<	6	U	2.5	1.1	
Copper	14.9	2.4		5.6	2.3		4	4.6	J	15.5	2.2		3.9	12.1	J	4.5	2.3	
Iron	8700	12		7590	11.5		6370	23.2		10600	11		3620	60.3		8050	11.4	
Lead	42.7	6	J	7	0.58	J	5.1	1.2	J	138	11		3.1	1.2	J	5.8	1.1	
Magnesium	2310	24		2620	23		2910	46.3		2460	21.9		3270	121		4330	22.8	
Manganese	234	1.2	J	99.4	1.2	J	73.2	2.3	J	187	1.1	J	40.7	6	J	112	1.1	J
Nickel	8.7	4.8		9.3	4.6		8.6	9.3	J	10.1	4.4		8.8	24.1	J	9	4.6	
Potassium	1460	600		1740	576		1430	1160		2200	548		639	3010	J	1830	571	
Thallium	<	1.2	UJ	0.13	1.2	J	0.12	1.2	J	<	1.1	UJ	<	1.2	UJ	<	1.1	UJ
Vanadium	17.3	1.2		15.1	1.2		15.4	2.3		19.9	1.1		12.2	6		23.7	1.1	
Zinc	114	2.4		21.1	2.3		16.4	4.6		139	2.2		8.5	12.1	J	20.6	2.3	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	696	48		<	46.1	U	<	46.3	U	914	132		<	48.2	U	<	45.7	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented on Table A-1.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

(1) = MS/MSD for preceding sample number.

TABLE 6-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 031 CANNON AFB

LOCATOR	CAN031-3107-0000			CAN031-3107-0005			CAN031-3107-6005[1]			CAN031-3107-0010		
LAB SAMPLE NUMBER	0398710006SA			0398710002SA			0398710010SA			0398710004SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)												
Acetone	210	110		6.3	11	J	14	11		12	12	
Toluene	<	56	U	5.5	5.7	J	<	5.7	U	4.9	5.9	J
Xylenes (total)	130	56		<	5.7	U	<	5.7	U	<	5.9	U
Semivolatile Organics (µg/kg)												
Acenaphthene	<	3700	U	<	380	U	<	380	U	<	390	U
Anthracene	820	3700	J	<	380	U	<	380	U	<	390	U
Benzo(a)anthracene	1800	3700	J	<	380	U	<	380	U	<	390	U
Benzo(a)pyrene	1700	3700	J	<	380	U	<	380	U	<	390	U
Benzo(b)fluoranthene	1200	3700	J	<	380	U	<	380	U	<	390	U
Benzo(g,h,i)perylene	1100	3700	J	<	380	U	<	380	U	<	390	U
Benzo(k)fluoranthene	1800	3700	J	<	380	U	<	380	U	<	390	U
bis(2-Ethylhexyl)phthalate	2500	3700	J	<	380	U	<	380	U	<	390	U
Butyl benzyl phthalate	<	3700	U	<	380	U	<	380	U	<	390	U
Carbazole	<	3700	U	<	380	U	<	380	U	<	390	U
Chrysene	2000	3700	J	<	380	U	<	380	U	<	390	U
Dibenz(a,h)anthracene	630	3700	J	<	380	U	<	380	U	<	390	U
Dibenzofuran	<	3700	U	<	380	U	<	380	U	<	390	U
Fluoranthene	4800	3700		120	380	J	170	380	J	<	390	U
Fluorene	<	3700	U	<	380	U	<	380	U	<	390	U
Indeno(1,2,3-cd)pyrene	1100	3700	J	<	380	U	<	380	U	<	390	U
4-Methylphenol	1100	3700	J	<	380	U	<	380	U	<	390	U
Naphthalene	3100	3700	J	<	380	U	<	380	U	<	390	U
Phenanthrene	1900	3700	J	<	380	U	<	380	U	<	390	U
Pyrene	3500	3700	J	<	380	U	<	380	U	<	390	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented on Table A-1.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] = MS/MSD for preceding sample number.

TABLE 6-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 031
CANNON AFB

LOCATOR	CAN031-3107-0000			CAN031-3107-0005			CAN031-3107-6005[1]			CAN031-3107-0010		
LAB SAMPLE NUMBER	0398710006SA			0398710002SA			0398710010SA			0398710004SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)												
Aluminum	7550	22.5		7550	23		7050	23		4160	58.9	
Arsenic	3.7	0.56		3	0.57		2.8	0.57		1	0.59	
Barium	716	2.2		267	2.3	J	208	2.3	J	344	5.9	J
Beryllium	0.46	0.45		0.43	0.46	J	0.45	0.46	J	<	1.2	U
Cadmium	1.9	1.1		1	1.1	J	5.2	1.1		<	2.9	U
Calcium	173000	45		120000	45.9		133000	46		289000	118	
Chromium	25.6	2.2		5.6	2.3		4.9	2.3		<	5.9	U
Cobalt	22.2	2.2		2.8	2.3		2.6	2.3		2.6	5.9	J
Copper	22.5	4.5		4.9	4.6		5.2	4.6		<	11.8	U
Iron	8990	22.5		6410	23		6120	23		2930	58.9	
Lead	20.7	2.8	J	4.7	0.57	J	4.8	0.57	J	3.3	0.59	J
Magnesium	5230	45		3050	45.9		3070	46		4820	118	
Manganese	280	2.2		86.5	2.3		89	2.3		81.6	5.9	
Nickel	15.8	9		7.5	9.2	J	8.8	9.2	J	7.4	23.6	J
Potassium	994	1120	J	1180	1150		1180	1150		706	2940	J
Thallium	<	2.2	UJ	<	1.1	UJ	<	1.1	UJ	<	1.2	UJ
Vanadium	21	2.2		18	2.3		18.8	2.3		10	5.9	
Zinc	44.7	4.5		18.7	4.6		20.8	4.6		8.2	11.8	J
TRPH (mg/kg)												
Total Recoverable Petroleum Hydrocarbons	2500	225		<	45.9	U	<	46	U	<	47.1	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented on Table A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] = MS/MSD for preceding sample number.

TABLE 6-3

COMPARISON PHASE I AND II OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 31, CANNON AFB
AGE Maintenance Shop Pad

Sample ID	Metal	Maximum detected concentration	Range of Background concentrations (2)	Upper tolerance limit (UTL) background concentration(3)	Reported Level in Clovis, NM Region (4)	Does maximum detected exceed background
CAN031-3105-0005	Aluminum	10,500	1,410 - 11,000	10,540	50,000	NO
CAN031-3107-0000	Arsenic	3.7	0.67 - 28	15.5	6.5	NO
CAN031-3107-0000	Barium	716	14.5 - 1200	642	500	NO**
CAN031-3106-0010	Beryllium	0.47	0.17 - 0.77	0.73	1-2	NO
CAN031-3106-0000	Cadmium	3.3	<0.51 - 4.2	*	----	YES
CAN031-3106-0000	Chromium	26.5	4 - 15.4	12.5	30	YES
CAN031-3107-0000	Cobalt	22.2	0.85 - 5.3	4.5	3-7	YES
CAN031-3107-0000	Copper	22.5	<2 - 18.4	*	20	YES
CAN031-3106-0000	Lead	138	1.1 - 46	25.8	15	YES
CAN031-3107-0000	Manganese	280	22.4 - 216	164	500	YES
CAN031-3107-0000	Nickel	15.8	1.3 - 9.8	9	15	YES
CAN031-3105-0005	Thallium	0.13	0.14 - 0.22	*	----	NO
CAN031-3106-0010	Vanadium	23.7	5.2 - 28.3	25.3	30-70	NO
CAN031-3106-0000	Zinc	139	<4.3 - 27.5	21.9	45	YES

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1993) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).

Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1994).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

(4) USGS 1984.

*Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 6-4

COMPARISON OF PHASE II SOIL CONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCs
SWMU 31, CANNON AFB
AGE Maintenance Shop Area

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detecte Concentration (mg/kg)	Phase II Concentration Greater Than Phase I Concentration	Residential Soil Risk-Based Concentration[1] (mg/kg)	Phase II Concentrations Exceeds RBC[1]	Estimated Risk[2]
Acetone	ND	0.21	YES	7,800	NO	
Methylene Chloride	ND	0.0065	YES	85	NO	
Tetrachloroethene	0.0036	ND	NO	12	----	
Toluene	ND	0.0055	YES	16,000	NO	
Xylenes	ND	0.13	YES	160,000	NO	
Acenaphthene	ND	0.089		4,700	NO	
Anthracene	0.6	0.82	YES	23,000	NO	
Benzo(a)anthracene	2.4	1.8	NO	0.88	YES	
Benzo(a)pyrene	2.7	1.9	NO	0.088	YES	
Benzo(b)fluoranthene	5.6	1.2	NO	0.88	YES	
Benzo(k)fluoranthene	ND	3.8	YES	8.80	NO	
Benzo(g,h,i)perylene	2.6	1.1	NO	NA(a)	----	
Bis(2-ethylhexyl)phthalate	ND	2.5	YES	46	NO	
Butylbenzylphthalate	ND	0.073	YES	16,000	NO	
Carbazole	0.5	0.37	NO	32	NO	
Chrysene	3.1	2	NO	88	NO	
Dibenzo(a,h)anthracene	ND	0.63	YES	0.088	YES	7 x 10-6
Dibenzofuran	ND	0.049	YES	310	NO	
Fluoranthene	5.6	4.8	NO	3,100	NO	
Fluorene	ND	0.096	YES	3,100	NO	
Indeno(1,2,3-cd)pyrene	2.3	1.1	NO	0.88	YES	
2-Methylnaphthalene	0.045	ND	NO	NA(a)	----	
4-Methylphenol	ND	1.1		390	NO	
Naphthalene	ND	3.1	YES	3,100	NO	
Phenanthrene	3.2	1.9	NO	NA(a)	----	
Pyrene	4.6	3.5	NO	2,300	NO	
Siloxane	NA	0.019				
TRPH	4070	2500	NO	NA(a)	----	

TABLE 6-4

COMPARISON OF PHASE II SOIL CONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCs
SWMU 31, CANNON AFB

AGE Maintenance Shop Area

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II Concentration Greater Than Phase I Concentration	Residential Soil Risk-Based Concentration[1] (mg/kg)	Phase II Concentrations Exceeds RBC[1]	Estimated Risk[2]
Antimony	1.9	ND	NO	31	----	
Barium	1460	716	NO	5,500	NO	
Cadmium	8.7	3.3	NO	39	NO	
Chromium	130	26.5	NO	390	NO	
Cobalt	5.1	22.2	YES	4700	NO	
Copper	61.4	22.5	NO	2900	NO	
Lead*	930	138	NO	400	----	
Manganese	NAF	280	NA	390	NO	
Nickel	9.7	15.8	YES	1600	NO	
Zinc	479	139	NO	23000		

[1] EPA Region III Risk-Based Concentrations for residential soil (EPA 1994).

[2] Estimated risk based on residential exposures to the maximum Phase II concentrations that exceeded previously evaluated Phase I levels. Estimated risk = 1×10^{-6} * concentration/RBC.

(a) Not Applicable: EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.

*No RBC has been calculated for lead; however, EPA recommends an interim residential soil concentration.

NA = Not Applicable

ND = Not Detected

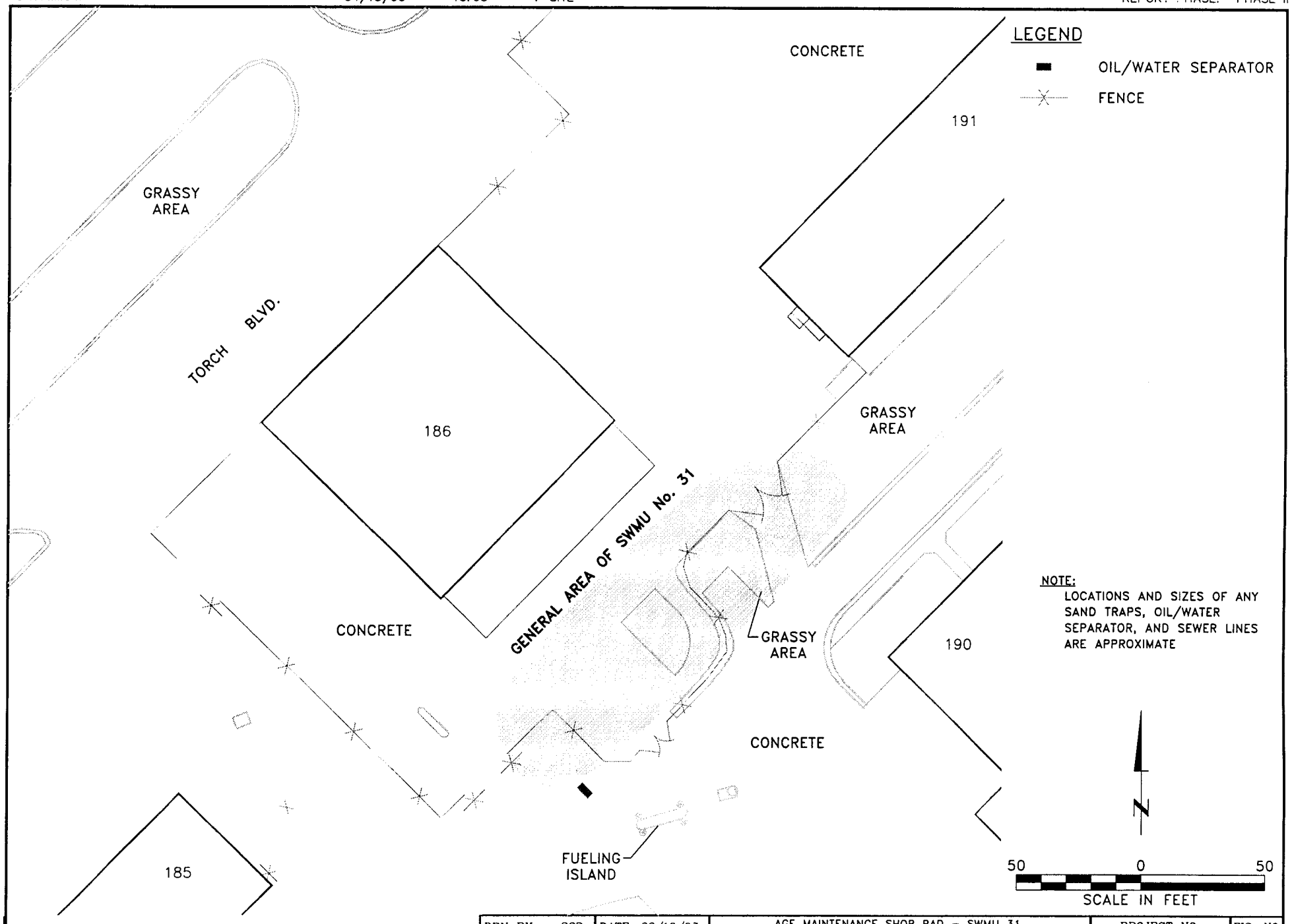
NAF = Not Analyzed For

TABLE 6-4a

POTENTIAL CUMULATIVE RISK AT SWMU 31
CANNON AFB, NEW MEXICO

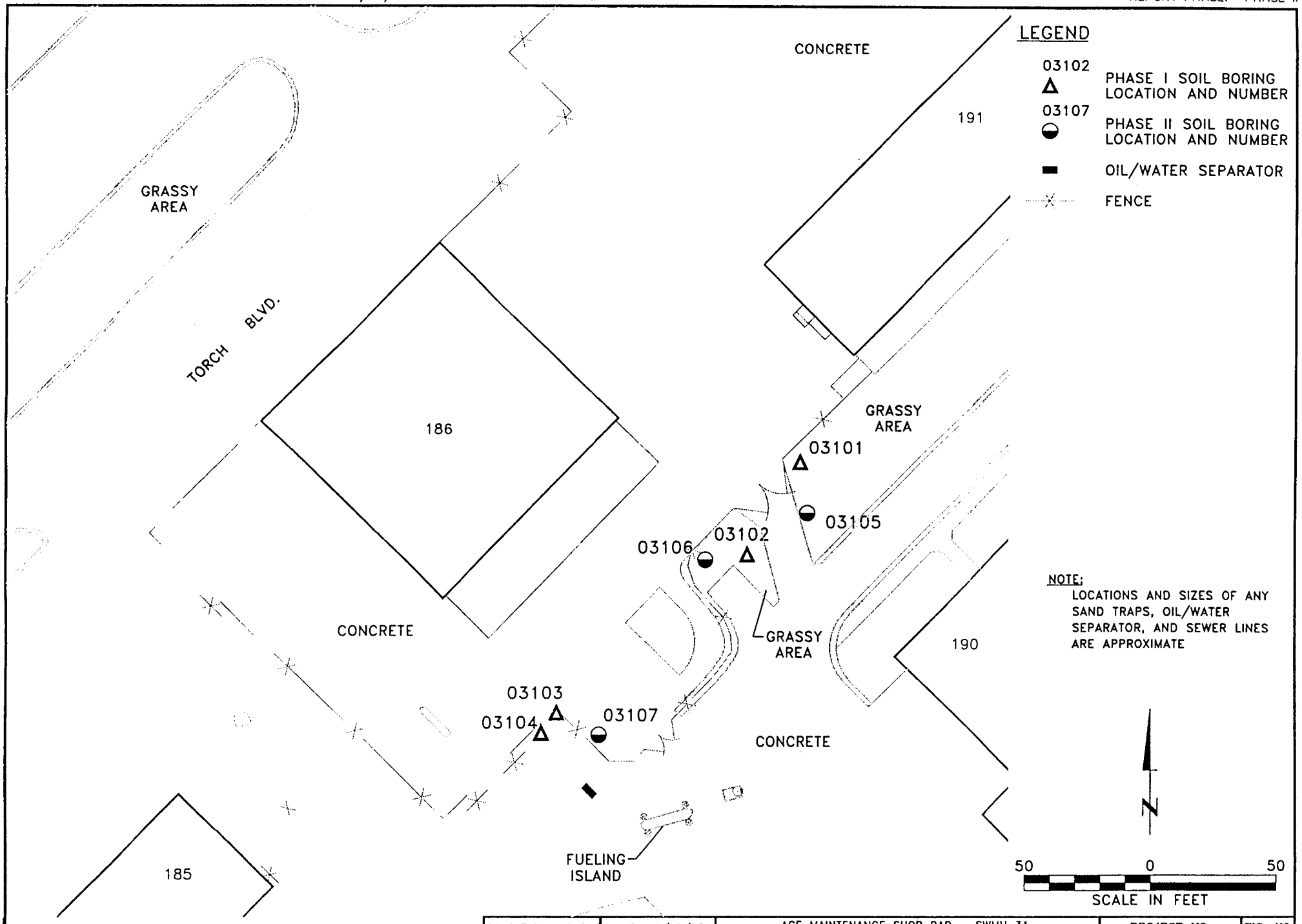
Chemical[1]	Carcinogen?	Phase II Concentration (mg/kg)	Residential RBC (mg/kg)	Industrial RBC (mg/kg)	Risk Residential[2]	Hazard Residential[3]	Risk Industrial[2]	Hazard Industrial[3]
Acetone	No	0.21	7,800	100,000		0.00003		0.000002
Methylene chloride	Yes	0.0065	85	380	7.65E-11		1.71E-11	
Toluene	No	0.0055	16,000	200,000		0.0000003		0.00000003
Xylenes	No	0.13	160,000	1,000,000		0.0000008		0.0000001
Acenaphthene	No	0.089	4,700	61,000		0.00002		0.000001
Anthracene	No	0.82	23,000	310,000		0.00004		0.000003
Benzo(k)fluoranthene	Yes	3.8	8.8	39	4.32E-07		9.74E-08	
Bis(2-ethylhexyl) phthalat	Yes	2.5	46	200	5.43E-08		1.25E-08	
Butyl benzyl phthalate	No	0.073	16,000	200,000		0.000005		0.0000004
Dibenzo(a,h)anthracene	Yes	0.63	0.088	0.39	7.16E-06		1.62E-06	
Dibenzofuran	No	0.049	310	4100		0.0002		0.00001
Fluorene	No	0.096	3,100	41,000		0.00003		0.000002
4-Methylphenol	No	1.1	390	5,100		0.003		0.0002
Naphthalene	No	3.1	3,100	41,000		0.001		0.00008
Siloxane		0.019	NA	NA				
Cobalt	No	22.2	4,700	61,000		0.005		0.0004
Nickel	No	15.8	1,600	20,000		0.010		0.0008
Totals					8E-06	0.02	2E-06	0.001
Phase I Risk[4]					NA	NA	3E-06	0.03
Cumulative Risk[5]					NA	NA	5E-06	3E-02

[1] Chemicals with maximum Phase II concentration exceeding Phase I concentrations
[2] Risk = 1E-06 x concentration/RBC
[3] Hazard = concentration/RBC
[4] Highest calculated risk and hazard for all receptors evaluated in risk assessment (W-C 1994d)
[5] Sum of Phase I risk and incremental risk from Phase II concentrations (i.e., that exceeded Phase I levels)



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: SCR	DATE: 08/16/93	AGE MAINTENANCE SHOP PAD – SWMU 31 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 6-1

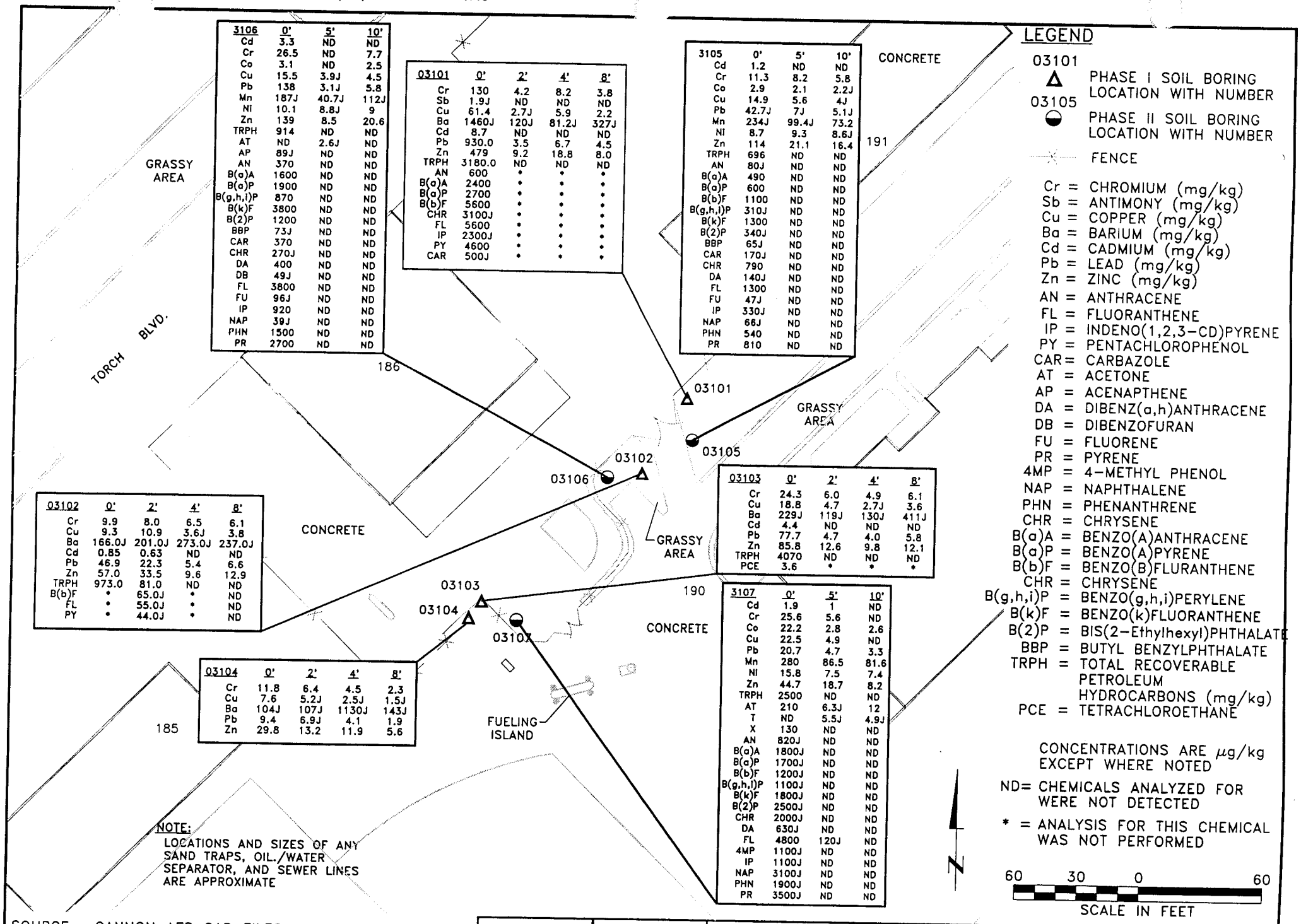


NOTE:
LOCATIONS AND SIZES OF ANY SAND TRAPS, OIL/WATER SEPARATOR, AND SEWER LINES ARE APPROXIMATE

SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: SCR	DATE: 08/16/93	AGE MAINTENANCE SHOP PAD – SWMU 31 SITE PLAN WITH BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 6-2

CAD FILE: 3M1[illegible]13.DWG V=HITS 04/13/1995 13:19



3106	0'	5'	10'
Cd	3.3	ND	ND
Cr	26.5	ND	7.7
Co	3.1	ND	2.5
Cu	15.5	3.9J	4.5
Pb	138	3.1J	5.8
Mn	187J	40.7J	112J
Ni	10.1	8.8J	9
Zn	139	8.5	20.6
TRPH	914	ND	ND
AT	ND	2.6J	ND
AP	89J	ND	ND
AN	370	ND	ND
B(a)A	1600	ND	ND
B(a)P	1900	ND	ND
B(g,h,i)P	870	ND	ND
B(k)F	3800	ND	ND
B(2)P	1200	ND	ND
BBP	73J	ND	ND
CAR	370	ND	ND
CHR	270J	ND	ND
DA	400	ND	ND
DB	49J	ND	ND
FL	3800	ND	ND
FU	96J	ND	ND
IP	920	ND	ND
NAP	39J	ND	ND
PHN	1500	ND	ND
PR	2700	ND	ND

03101	0'	2'	4'	8'
Cr	130	4.2	8.2	3.8
Sb	1.9J	ND	ND	ND
Cu	61.4	2.7J	5.9	2.2
Ba	1460J	120J	81.2J	327J
Cd	8.7	ND	ND	ND
Pb	930.0	3.5	6.7	4.5
Zn	479	9.2	18.8	8.0
TRPH	3180.0	ND	ND	ND
AN	600	*	*	*
B(a)A	2400	*	*	*
B(a)P	2700	*	*	*
B(b)F	5600	*	*	*
CHR	3100J	*	*	*
FL	5600	*	*	*
IP	2300J	*	*	*
PY	4600	*	*	*
CAR	500J	*	*	*

3105	0'	5'	10'
Cd	1.2	ND	ND
Cr	11.3	8.2	5.8
Co	2.9	2.1	2.2J
Cu	14.9	5.6	4J
Pb	42.7J	7J	5.1J
Mn	234J	99.4J	73.2
Ni	8.7	9.3	8.6J
Zn	114	21.1	16.4
TRPH	696	ND	ND
AN	80J	ND	ND
B(a)A	490	ND	ND
B(a)P	600	ND	ND
B(b)F	1100	ND	ND
B(g,h,i)P	310J	ND	ND
B(k)F	1300	ND	ND
B(2)P	340J	ND	ND
BBP	65J	ND	ND
CAR	170J	ND	ND
CHR	790	ND	ND
DA	140J	ND	ND
FL	1300	ND	ND
FU	47J	ND	ND
IP	330J	ND	ND
NAP	66J	ND	ND
PHN	540	ND	ND
PR	810	ND	ND

03102	0'	2'	4'	8'
Cr	9.9	8.0	6.5	6.1
Cu	9.3	10.9	3.6J	3.8
Ba	166.0J	201.0J	273.0J	237.0J
Cd	0.85	0.63	ND	ND
Pb	46.9	22.3	5.4	6.6
Zn	57.0	33.5	9.6	12.9
TRPH	973.0	81.0	ND	ND
B(b)F	*	65.0J	*	ND
FL	*	55.0J	*	ND
PY	*	44.0J	*	ND

03103	0'	2'	4'	8'
Cr	24.3	6.0	4.9	6.1
Cu	18.8	4.7	2.7J	3.6
Ba	229J	119J	130J	411J
Cd	4.4	ND	ND	ND
Pb	77.7	4.7	4.0	5.8
Zn	85.8	12.6	9.8	12.1
TRPH	4070	ND	ND	ND
PCE	3.6	*	*	*

03104	0'	2'	4'	8'
Cr	11.8	6.4	4.5	2.3
Cu	7.6	5.2J	2.5J	1.5J
Ba	104J	107J	1130J	143J
Pb	9.4	6.9J	4.1	1.9
Zn	29.8	13.2	11.9	5.6

3107	0'	5'	10'
Cd	1.9	1	ND
Cr	25.6	5.6	ND
Co	22.2	2.8	2.6
Cu	22.5	4.9	ND
Pb	20.7	4.7	3.3
Mn	280	86.5	81.6
Ni	15.8	7.5	7.4
Zn	44.7	18.7	8.2
TRPH	2500	ND	ND
AT	210	6.3J	12
T	ND	5.5J	4.9J
X	130	ND	ND
AN	820J	ND	ND
B(a)A	1800J	ND	ND
B(a)P	1700J	ND	ND
B(b)F	1200J	ND	ND
B(g,h,i)P	1100J	ND	ND
B(k)F	1800J	ND	ND
B(2)P	2500J	ND	ND
CHR	2000J	ND	ND
DA	630J	ND	ND
FL	4800	120J	ND
4MP	1100J	ND	ND
IP	1100J	ND	ND
NAP	3100J	ND	ND
PHN	1900J	ND	ND
PR	3500J	ND	ND

LEGEND

03101 △ PHASE I SOIL BORING LOCATION WITH NUMBER

03105 ◒ PHASE II SOIL BORING LOCATION WITH NUMBER

FENCE

Cr = CHROMIUM (mg/kg)
Sb = ANTIMONY (mg/kg)
Cu = COPPER (mg/kg)
Ba = BARIUM (mg/kg)
Cd = CADMIUM (mg/kg)
Pb = LEAD (mg/kg)
Zn = ZINC (mg/kg)
AN = ANTHRACENE
FL = FLUORANTHENE
IP = INDENO(1,2,3-CD)PYRENE
PY = PENTACHLOROPHENOL
CAR = CARBAZOLE
AT = ACETONE
AP = ACENAPTHENE
DA = DIBENZ(a,h)ANTHRACENE
DB = DIBENZOFURAN
FU = FLUORENE
PR = PYRENE
4MP = 4-METHYL PHENOL
NAP = NAPHTHALENE
PHN = PHENANTHRENE
CHR = CHRYSENE
B(a)A = BENZO(A)ANTHRACENE
B(a)P = BENZO(A)PYRENE
B(b)F = BENZO(B)FLURANTHENE
CHR = CHRYSENE
B(g,h,i)P = BENZO(g,h,i)PERYLENE
B(k)F = BENZO(k)FLUORANTHENE
B(2)P = BIS(2-Ethylhexyl)PHTHALATE
BBP = BUTYL BENZYLPHTHALATE
TRPH = TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (mg/kg)
PCE = TETRACHLOROETHANE

CONCENTRATIONS ARE μg/kg EXCEPT WHERE NOTED

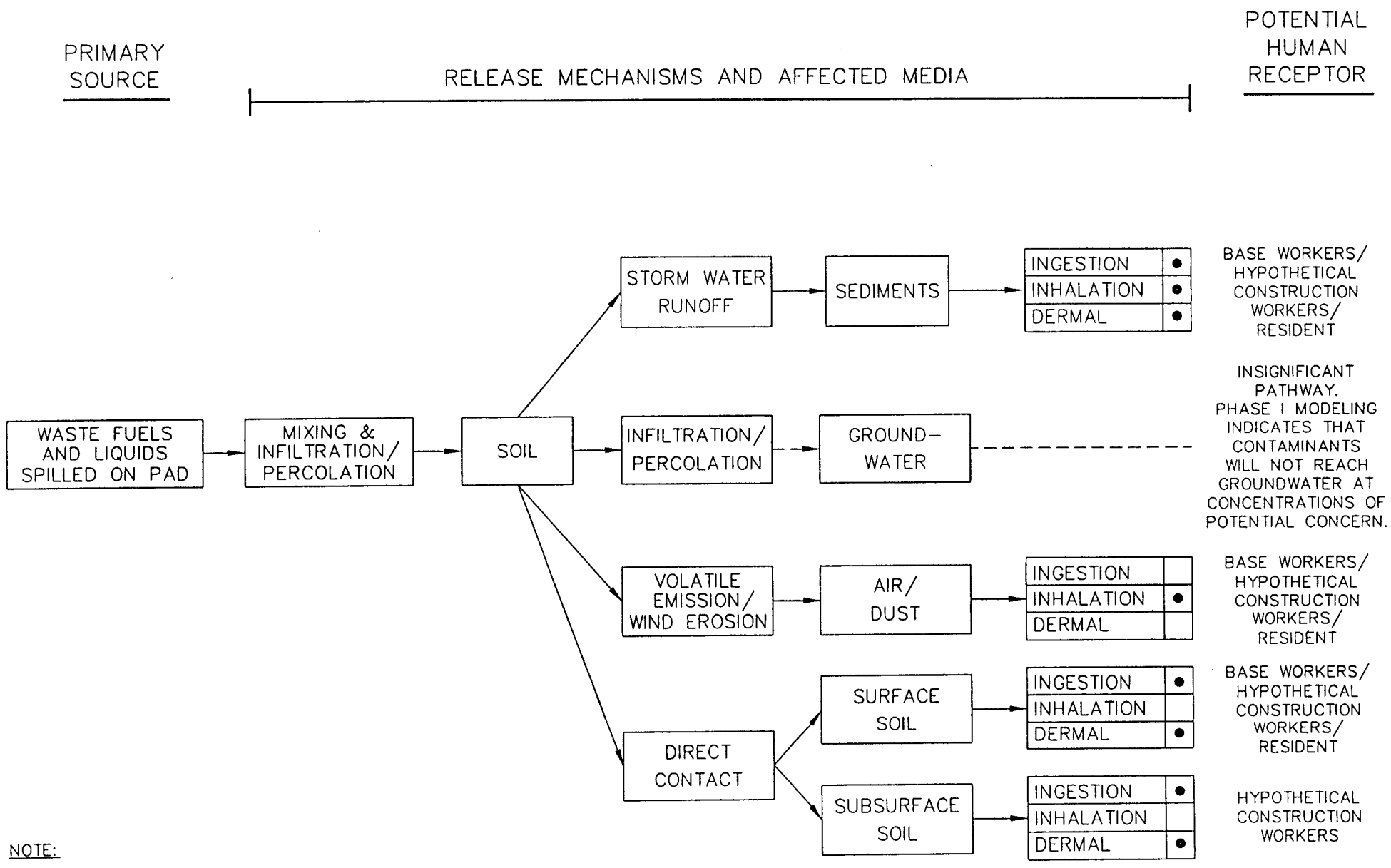
ND= CHEMICALS ANALYZED FOR WERE NOT DETECTED

* = ANALYSIS FOR THIS CHEMICAL WAS NOT PERFORMED

NOTE:
LOCATIONS AND SIZES OF ANY SAND TRAPS, OIL./WATER SEPARATOR, AND SEWER LINES ARE APPROXIMATE

SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: TBS	DATE: 03/31/95	AGE MAINTENANCE SHOP PAD - SWMU 31 CHEMICAL CONCENTRATIONS DETECTED IN SOIL CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY: .	REVISION: 0		C3M11MM	6-3



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 08/19/93	SITE CONCEPTUAL EXPOSURE MODEL AGE MAINTENANCE SHOP PAD SWMU - 31 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY .	REVISIONS: 0		FIG. NO. 6-4

7.1 SITE BACKGROUND

7.1.1 Site Description

The former location of OWS 5121 is under the hush house portion of Building 5123 which houses a jet engine test facility. The ground surface around the hush house is soils and non-native grasses.

7.1.2 Site History

OWS 5121 was located on the east side of Power Check Pad No. 5121 (Figure 7-1). The OWS was a two-compartment underground unit with a detached 100-gallon oil storage tank which received waste wash water generated from aircraft engine testing and maintenance operations. The oils recovered by the OWS were directed to the 100-gallon oil holding tank and the wastewater was discharged to a leach well located approximately 40 feet east of the OWS. This facility was active from approximately 1957 to 1988 when OWS 5121 and the associated leach well were removed during the demolition of Building 5121. This building was replaced with Facility 5123 which was constructed over the location formerly occupied by OWS 5121.

7.1.3 Current Use

OWS 5121 and the associated leach well no longer exist. Building 5123 is currently used for the testing of jet engines from fighter aircraft.

7.1.4 Potential Contaminants

Potential residual contaminants from the operation of OWS 5121 include JP-4 fuel, petroleum and synthetic lubricating oils, greases, solvents, and metals.

7.1.5 Previous Investigations

Three, 60-foot-deep soil borings were drilled during the Phase I RFI (W-C 1994) as close as possible to the former location of the OWS and leach well to sample soils for indications of contaminants which leaked or seeped from these sources. A summary of boring numbers and sample descriptions can be found in Table 14-1 of the Phase I RFI report (W-C 1994). The Phase I boring locations and numbers are shown on Figure 7-2. Placement of these borings in the targeted area was impacted by the presence of the Building 5123 foundation and hush house. Two borings were located on the north side of the hush house structure and one on the south side to encompass the location of the former facility.

Soil samples were collected at the surface and at the 1.5- to 3.5-foot, 4- to 6-foot, 8- to 10-foot, 18- to 20-foot, 28- to 30-foot, 38- to 40-foot, 48- to 50-foot, and 58- to 60-foot depth intervals.

Target analytes for all borings include VOCs, SVOCs, metals and TRPH. SVOCs were analyzed only for a limited set of samples for risk assessment purposes. The samples selected were typically the surface sample and one selected sample at depth in each boring. Surficial samples in areas of soil cover were collected approximately at the 0.2- to 0.5-foot depth interval to provide a worst-case situation for risk assessment purposes in the event that VOC contamination was discovered during this investigation.

Toluene and xylene were detected in low concentrations in the surface samples in boring Nos. 09301 and 09303. Toluene was detected at low concentrations in boring No. 09302 and 09303. Toluene was detected at low concentrations in boring No. 09302 at 3.5 feet. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene were detected in boring Nos. 09302 and 09303 at the surface. Fluoranthene and pyrene were detected in boring No. 09301 at 6 feet. 1,1,1-Trichloroethane, 1,1,2-trichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, 1,2-dichloropropane, 4-methyl-2-pentanone (MIBK), bromodichloromethane, carbon disulfide, chloroform, ethylbenzene, styrene, and xylene were detected in boring No. 09303 at 30 feet. Carbon disulfide was detected in boring No. 09303 at 50 feet. Petroleum hydrocarbons were detected at the surface in all of the borings and in boring Nos. 09302 and 09303 at 3.5 feet. Antimony, barium, cadmium, chromium, cobalt, copper, lead, selenium, silver, and zinc were

detected above background in surface samples and subsurface samples to 60 feet in one or more of the borings. Barium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene exceeded the risk screening criteria. These results are summarized on Figure 7-3.

BRA Summary

A BRA was done at SWMU 93 based on the recommendations made in the Phase I RFI report (W-C 1994). Potential receptors at SWMU 93 for human health risk included occupational workers, hypothetical future construction workers, and hypothetical future trespassers. These receptors were assumed to be exposed to soil via ingestion, dermal contact, and inhalation pathways. Potential human health risks from groundwater were evaluated using fate and transport modeling. The modeling indicated that contaminants would not reach groundwater at concentrations of potential concern. Therefore, this pathway was considered insignificant.

The maximum potential excess human health risk at SWMU 93 was 2×10^{-7} for occupational workers. This is within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} for risk from releases at hazardous waste sites indicating that no unacceptable risk is expected. The primary contributor to the risk was ingestion of PAHs in surface soils.

Results of the ecological risk assessment showed that there is a low potential for risk to predatory birds (i.e., Northern harrier) due to chemical releases from the SWMU. However, this risk is not likely to be significant because the surface area of the SWMU represents only a very small percentage of the hunting range.

Since no unacceptable human health or ecological risks due to chemical releases are expected from this SWMU, no further action was recommended for this SWMU in the Phase I report.

7.1.6 Phase II Sampling Objectives

The overall objective of sampling at the site of former Oil/Water Separator No. 5121 and the associated leach well was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the oil/water separator and/or seepage

from the leach well which could pose a significant risk to human health or the environment. The analytical data collected from this investigation was used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the former oil/water separator and associated leach well. Potential release points included spills at the surface that may have occurred during removal by pumping from the separator and leaks in either the separator or the associated underground piping.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

7.2 FIELD INVESTIGATION AND DATA COLLECTION

7.2.1 Soils Sampling

Three soil borings were drilled and soil samples collected at oil/water separator No. 5121 for the Phase II RFI. One boring was drilled near the northwest and southeast corners of the facility and one boring was drilled immediately south of the facility. The borings were drilled to a total depth of 10 feet. The boring locations were chosen to further assess the lateral presence and extent of site related soil contaminants to the 10-foot depth interval. Phase II RFI boring numbers and sample descriptions are shown in Table 7-1 and on Figure 7-2.

Surface soil samples from all borings were collected from 0 to 2 feet. All borings were also sampled at intervals of 3 to 5 feet and 8 to 10 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 -Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile Organic Compounds (VOCs) by EPA Method 8240

- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL Metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

7.2.2 Geologic Summary of Boring Logs

Phase I RFI

Boring logs for the Phase I borings completed at this SWMU include a layer of probable fill consisting of a reddish brown silt with some gravel and occasional asphalt extending from the surface to a depth of 4 feet. This soil grades to a salmon pink calcareous silt with local zones of increased moisture, sand and caliche content to approximately 48 feet in depth. Silty sand predominates from 48 to 60-feet and ranges in color from pinkish to reddish-orange. It is dry with local zones of hard caliche cementing the grains. The variable thickness of this unit depicted in the drilling logs is probably attributable to the dynamics of its depositional environment. No visual indications of subsurface contamination were encountered in the boreholes completed in this SWMU.

Phase II RFI

Logs from the three Phase II RFI borings show a subsurface lithology consisting mostly of uniform fine-grained fill material and Ogallala Formation sediments. Borings 9304 and 9305 encountered silty clay (USCS symbol CL) fill material starting at the surface to depths of 4.3 feet and 2 feet, respectively. The silty clay is described as reddish-brown, dry, stiff, and low plastic. From the surface to 3.7 feet the fill in boring 9304 contained a trace of caliche and fine sand. From 3.7 to 4.3 feet the fill contained some fine gravel and asphalt fragments. Below the fill in boring 9304, and from the surface in boring 9306, a natural silty clay (USCS symbol CL) was encountered to the boring completion depths. The silty clay is described as reddish-brown, dry, stiff, and low plastic with some caliche. Below the fill in boring 9305 a silty sand (USCS symbol SP) was encountered to the completion depth of the boring. The silty sand is described as reddish-brown, dry, and fine-grained.

No field screening (headspace) or visual indications of contamination were observed while drilling and sampling Phase II soil borings. No odors were noted during drilling or sampling activities.

7.2.3 Site Topography

The site is level and in a grassy area immediately east of building 5123.

7.3 CHEMICAL INVESTIGATION RESULTS

7.3.1 General

Soil samples were collected from 3 Phase I RFI borings (09301, 09302, and 09303) and 3 Phase II RFI borings (09304, 09305, and 09306). Sampling and analyses performed are summarized in Table 7-1 for the Phase II RFI soil borings. A summary of the analytical results for the Phase I and Phase II RFI soil samples is provided on Figure 7-3. Analytical results for the Phase II RFI soil samples are also provided in Table 7-2. For each sample type, the table provides results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results for the Phase II RFI soil samples are provided in Appendix A.

7.3.2 Organic Results For Near-surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN093-9304-0000, CAN093-9304-000 and CAN093-9306-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 7-1.

The only VOC reported was toluene at an estimated concentration of 3.1 μg/kg reported for sample CAN093-9306-0000. Several SVOC compounds, all in the form of PAHs, were reported for two of the near-surface samples. Total PAHs were detected at concentrations of 471 μg/kg (CAN093-9304-0000) and 614 μg/kg (CAN093-9305-0000). No other SVOCs were detected in the near-surface samples. Petroleum hydrocarbons were detected at concentrations of 11.9 mg/kg (estimated), 11.7 mg/kg (estimated), and 1,760 mg/kg in samples CAN093-9304-0000, CAN093-9305-0000 and CAN093-9306-0000, respectively.

7.3.3 Organic Results For Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN093-9304-0005 and CAN093-9304-0010 for boring 09304, CAN093-9305-0005 and CAN093-9305-0010 for boring 09305, and CAN093-9306-0005 and CAN093-9306-0010 for boring 09306) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 7-1.

The only VOC reported was toluene at an estimated concentration of 4.9 μg/kg reported for sample CAN093-9304-0010. Only one SVOC compound, bis(2-ethylhexyl)phthalate, was reported for any of the subsurface samples (sample CAN093-9305-0005 at an estimated concentration of 120 μg/kg. While not detected in associated method blanks for the sample, bis(2-ethylhexyl)phthalate is considered a common laboratory contaminant and is not expected to be present in this SWMU. Petroleum hydrocarbons were not reported in any of the subsurface samples.

7.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 7-1. The range of results, combining Phase I and Phase II data, for metals reported in these soil samples are summarized in Table 7-A.

TABLE 7-A

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Aluminum	36/36	2040 mg/kg	0931-0048	15400 mg/kg	9306-0000
Antimony	1/36	2.3 mg/kg	0931-0018	--	--
Arsenic	36/36	0.37 mg/kg	0931-0058	2.8 mg/kg	9304-0000
Barium	36/36	17.2 mg/kg	0932-0058	1890 mg/kg	9306-0010
Beryllium	28/36	0.11 mg/kg	0931-0058	0.73 mg/kg	9306-0010
Cadmium	22/36	0.48J mg/kg	9306-0000	3 mg/kg	0933-0008
Calcium	36/36	3710 mg/kg	0931-0002	241000 mg/kg	0932-0018
Chromium	33/36	1.85 mg/kg	0931-0038	12.9 mg/kg	0933-0000
Cobalt	35/36	0.58 mg/kg	0931-0048	5 mg/kg	0933-0008
Copper	36/36	0.97 mg/kg	0931-0058	158 mg/kg	0932-0000
Iron	36/36	1230 mg/kg	0931-0048	12000 mg/kg	9306-0000
Lead	36/36	0.92 mg/kg	0931-0002	32.4 mg/kg	0932-0000

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Magnesium	36/36	830 mg/kg	0931-0002	33700 mg/kg	0931-0028
Manganese	36/36	20.4 mg/kg	0931-0048	209 mg/kg	9305-0010
Mercury	0/36	--	--	--	--
Nickel	33/36	2 mg/kg	0931-0048	11.5 mg/kg	9306-0000
Potassium	35/36	384 mg/kg	0931-0048	2,460 mg/kg	9306-0000
Silver	25/36	0.5 mg/kg	0933-0058	4.8 mg/kg	0932-0018
Selenium	2/36	0.25 mg/kg	0932-0000	0.31 mg/kg	0931-0058
Sodium	14/36	170 mg/kg	0931-0002	472 mg/kg	0931-0028
Thallium	3/36	0.12J mg/kg	9306-0000	0.15J mg/kg	9305-0010
Vanadium	36/36	6.4 mg/kg	0933-0038	22.3 mg/kg	9306-0000
Zinc	36/36	3.8 mg/kg	0931-0048	77.2 mg/kg	0932-0000

Note: See Table 14-3 for comparison to background.

7.4 DATA ASSESSMENT

An assessment of the Oil/Water Separator (SWMU 93) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

7.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

7.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C, 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA, 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988). A detailed review of SWMU 93 data is provided in the QCSR.

For the organic analyses, qualification of data was required based on outlying internal standard areas. For VOC and SVOC analyses of sample CAN093-3106-0000, internal

standard areas were reported below evaluation criteria. Analytes associated with the outlying internal standards were qualified estimated **J** (detects) or **UJ** (nondetects). Additionally, acetone, methyl isobutyl ketone, and methylene chloride data were qualified as nondetect **U** for several samples based on blank contamination (as listed in the QCSR).

The MS recoveries for antimony, lead, selenium, and thallium were below evaluation criteria, and the MS recovery for manganese was reported above evaluation criteria. Antimony, lead, selenium, and thallium for all SWMU 93 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected manganese results were qualified as estimated **J** to indicate a potential high bias for all SWMU 93 samples.

Precision parameters for the organic analyses and for the field duplicate samples were within evaluation criteria. For the matrix duplicate samples, the RPD for lead was above the evaluation criteria, and detected lead data were qualified as estimated **J** (detects) or **UJ** (nondetects) based on the outlying precision parameter for all SWMU 93 samples.

7.4.3 Reporting Limits

Reporting limits were raised for several metal analyses and one TRPH analysis by factors less than 10. For selenium and thallium analyses, reporting limits were raised due to matrix interference for several samples, and the selenium and thallium data were qualified estimated **J** (detects) or **UJ** (nondetects). Three lead analyses, one Method 6010 analysis, and one TRPH analysis required dilutions due to lead, calcium, and TRPH concentrations, respectively, above the calibration range. Two arsenic analyses required dilutions due to matrix interferences. No dilutions which greater than a factor of 10 were required.

7.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 93 were determined to meet quality criteria, and the elevated reporting limits were judged not to impact the data usability because either the elevated RLs were below the RBC or the target analyte was detected. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of contamination and to be used for the human health risk screening.

7.5 NATURE AND EXTENT OF CONTAMINATION

SWMU 93 was an OWS with a leach well formerly serving Building 5121 in the engine test area. The OWS and leach well were removed from service and demolished in about 1988 at the time Building 5121 was removed. A new building (5123) has been constructed over the same area. The area adjacent to the former location of the leach well is currently accessible near the new Building 5123. Three borings were advanced to a depth of 10 feet at this location. In general the samples appeared relatively free of organic contamination. There was no visible evidence of spills or leaks in the vicinity, and the entire area around the building was unpaved. The Phase I and Phase II RFI chemical test results show low levels of organic contamination, including PAHs, that are present mainly in the near-surface soils at the SWMU. However, the PAHs may be present due to asphalt fragments observed in site fill soils down to a depth of 4 to 5 feet.

7.6 COMPARISON OF PHASE II METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals in soil were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels were not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 7-3 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, chromium, cobalt, copper, lead, manganese, and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. The maximum concentrations of barium, cadmium, nickel, thallium, and zinc exceeded background levels; therefore, theses metals were retained for further evaluation as chemicals

of concern in soil. A brief discussion of the interpretations of the background comparison is presented here.

The maximum detected concentration of aluminum (15,400 mg/kg) exceeded the background UTL of 10,540 mg/kg. The maximum concentration also exceeded the range of detected Base-wide background concentrations. However, this concentration is well below the aluminum literature value for the region (50,000 mg/kg). Therefore, aluminum was considered to be within background levels and was not evaluated further.

The maximum detected concentration of barium (1,890 mg/kg) exceeded the background UTL of 642 mg/kg. The maximum concentration also exceeded the range of detected Base-wide background concentrations and was more than three times higher than the regional barium literature value of 500 mg/kg. While barium has been shown to substitute for calcium in caliche and may be naturally occurring (Klein and Hurlbutt 1985), to be conservative barium was considered to exceed background levels at this SWMU. This conservative approach was used because of the magnitude by which the regional and background values were exceeded.

Although the maximum detected concentration of manganese (209 mg/kg) slightly exceeded the background UTL of 164 mg/kg, this concentration was within the range of detected Base-wide background concentrations and was below the regional literature value for manganese (500 mg/kg). Therefore, manganese was considered to be within background levels and was not evaluated further.

7.7 RISK EVALUATION

7.7.1 Site Conceptual Exposure Model

Figure 7-4 shows the site conceptual exposure model (SCEM) of chemical sources and potential human exposure pathways for O/WS 5121 (SWMU 93). In the SCEM, potentially complete exposure pathways are indicated with solid lines; incomplete or insignificant pathways are indicated with broken lines.

The primary potential contaminant source is waste fuels and liquids (e.g., fuels, oils, and solvents) that may have been spilled during servicing or that may have leaked from the O/WS. Mixing and infiltration of the wastes with the soil is the primary chemical release mechanisms. Once released to the soil the chemicals may then be released to groundwater by infiltration/percolation and to the atmosphere by volatilization or wind erosion. Chemicals could also be released to receptors via contact with soil. Storm water runoff is considered to be an insignificant pathway because the O/WS is primarily below ground and potential surface spills would be minor and affect only a small area.

As shown in Figure 7-4, surface soils may provide exposures to Base workers (occupational exposures), hypothetical future construction workers, or hypothetical future trespassers (if the Base is closed in the future) via soil ingestion, dermal contact, or inhalation of air emissions (volatile and particulates). Subsurface soils may provide exposures to construction workers (i.e., during excavation) via ingestion, dermal contact and inhalation of air emissions from subsurface soil.

Groundwater is used for domestic purposes on- and off-Base. However, groundwater is probably an insignificant pathway because fate and transport modeling in the Phase I investigation showed that chemicals would not be transported to groundwater at concentrations of concern. In addition, only low levels of contamination were found in subsurface soils, and the O/WS was removed and a building now covers the SWMU. Therefore, the source of contamination and the infiltration driving force (precipitation) are no longer present.

In summary, the potentially complete human exposure pathways at SWMU 93 are:

Occupational Workers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

Hypothetical Construction Workers

- Ingestion of and dermal contact with surface and subsurface soil
- Inhalation of volatile emissions and airborne particulate matter from surface and subsurface soil

Hypothetical Trespassers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

7.7.2 Screening of Contaminants Against RBCs (and other criteria)

The objective of the Phase II risk evaluation was to verify whether the recommendation for no further action based on the Phase I Baseline Risk Assessment (W-C 1994) is appropriate at this SWMU. To meet this objective, maximum detected Phase II concentrations were compared to maximum detected Phase I concentrations. This comparison was made to evaluate whether the extent of contamination and potential risk had been adequately defined in Phase I and to assess whether the no further action recommendation was appropriate.

Phase II concentrations that exceeded Phase I concentrations were compared to highly conservative EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994). This comparison was made to evaluate if chemicals detected in Phase II were at concentrations that could pose a significant human health risk (i.e., if the potential risk at the SWMU is higher than predicted in Phase I). EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. Note that the RBCs are based on conservative residential exposures that are not likely to occur at this SWMU because the SWMU is in an industrial area. Therefore, risks predicted from the RBC comparison significantly overestimate actual risks at the SWMU. A discussion of the methodology used to derive the RBCs is given in section 3.4 and Appendix D.

Table 7-4 shows the comparison of the Phase II maximum concentrations with Phase I concentrations and with RBCs. As would be expected, the maximum detected concentrations of some chemicals from Phase II slightly exceeded the Phase I maximum concentrations while for many others the Phase II concentrations were lower. None of the Phase II concentrations that exceeded Phase I concentrations exceeded RBCs. Therefore, no unacceptable human health risks are expected from SWMU 93.

TRPH is a complex mixture hundreds of branched, straight-chain, cyclic and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, naphthalene, pyrene, and toluene) were analyzed for individually in the soil samples collected at the SWMU.

In the Phase II investigation at SWMU 93, TRPH was detected at a maximum concentration of 1,760 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Potentially toxic constituents of the TRPH (e.g., toluene and PAHs) were detected at low concentrations (see Table 7-B) which were well below the RBCs for residential soil and may be related to the presence of asphalt in the fill soils near the surface. Therefore, it is not likely that other TRPH constituents would contribute significantly to risks at the SWMU. In addition, the area of contamination is small and partially covered by a building which limits potential exposure to TRPH in the soil.

7.7.3 Evaluation of the Groundwater Pathway

Fate and transport modeling done for the Phase I RFI indicated that chemicals detected at SWMU 93 would not be transported to groundwater at concentrations of concern.

The vertical distribution of the soil contaminants detected during the Phase II investigation was used to evaluate whether chemical releases pose a threat to groundwater. Most of the chemicals of potential concern were detected only in the surface soil indicating that they are not infiltrating and being transported to the groundwater (approximately 200 to 300 feet bgs). The O/WS was removed and a building has been constructed over the area. Therefore, future infiltration and vertical transport will be limited and groundwater is not likely to be impacted by Phase I or Phase II contaminants detected at SWMU 93.

7.7.4 Conclusions

Since none of the chemicals detected during the Phase II investigation exceeded the RBCs, and the vertical distribution of soil contamination indicates that groundwater will not be impacted, the results of the Phase I Baseline Risk Assessment are verified, and no further action is recommended for SWMU 93.

7.8 SUMMARY AND RECOMMENDATIONS

Nine soil samples were collected and analyzed from three 10-foot-deep soil borings at SWMU 93 during the Phase I RFI. Maximum detected concentrations were compared to Phase I results. If any Phase II results exceeded Phase I results, maximum concentrations were compared to background levels and RBCs. Two metals and three organic compounds exceeded Phase I concentrations. However, none of the metals or organic compounds exceeded RBCs.

The Phase II sampling results confirmed that contamination was present mainly in the surface and near-surface samples at the SWMU. The vertical distribution of site contaminants appears to be well defined, and the potential impact to groundwater is considered to be low. Because there are no unacceptable health risks associated with the site, it is recommended that no further investigation is necessary for this SWMU.

TABLE 7-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
OIL/WATER SEPARATOR NO. 5121 (SWMU NO. 93)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 09304	0 - 2	CAN093 -9304-0000		Soil	X	X	X	X	1	1
	3 - 5	CAN093 -9304-0005		Soil	X	X	X	X	1	1
	3 - 5	CAN093 -9304-9561	FD	Soil	X	X	X	X	1	1
	8 - 10	CAN093 -9304-0010		Soil	X	X	X	X	1	1
Boring 09305	0 - 2	CAN093 -9305-0000		Soil	X	X	X	X	1	1
	3 - 5	CAN093 -9305-0005		Soil	X	X	X	X	1	1
	3 - 5	CAN093 -9305-9301	MRD	Soil	X	X	X	X	1	1
	8 - 10	CAN093 -9305-0010		Soil	X	X	X	X	1	1
Boring 09306	0 - 2	CAN093 -9306-0000		Soil	X	X	X	X	1	1
	3 - 5	CAN093 -9306-0005		Soil	X	X	X	X	1	1
	3 - 5	CAN093 -9306-6005	MS/MSD	Soil	X	X	X	X	1	1
	8 - 10	CAN093 -9306-0010		Soil	X	X	X	X	1	1

FD = Field Duplicate
MRD = Missouri River Division
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 7-2 for locations of the borings.

TABLE 7-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 093 CANNON AFB

LOCATOR	CAN093-9304-0000			CAN093-9304-0005			CAN093-9304-9361[1]			CAN093-9304-0010			CAN093-9305-0000			CAN093-9305-0005		
LAB SAMPLE NUMBER	0397140002SA			0397140003SA			0397140001SA			0397140004SA			0397140005SA			0397140006SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg//kg)																		
Toluene	<	5.5	U	<	5.7	U	<	5.7	U	4.9	5.8	J	<	5.5	U	<	5.5	U
Semivolatile Organics (µg//kg)																		
Benzo(a)anthracene	45	360	J	<	380	U	<	380	U	<	380	U	49	360	J	<	360	U
Benzo(a)pyrene	52	360	J	<	380	U	<	380	U	<	380	U	69	360	J	<	360	U
Benzo(b)fluoranthene	50	360	J	<	380	U	<	380	U	<	380	U	<	360	U	<	360	U
Benzo(k)fluoranthene	71	360	J	<	380	U	<	380	U	<	380	U	160	360	J	<	360	U
bis(2-Ethylhexyl)phthalate	<	360	U	<	380	U	<	380	U	<	380	U	<	360	U	120	360	J
Chrysene	70	360	J	<	380	U	<	380	U	<	380	U	78	360	J	<	360	U
Fluoranthene	110	360	J	<	380	U	<	380	U	<	380	U	130	360	J	<	360	U
Phenanthrene	<	360	U	<	380	U	<	380	U	<	380	U	38	360	J	<	360	U
Pyrene	73	360	J	<	380	U	<	380	U	<	380	U	90	360	J	<	360	U
Metals (mg/kg)																		
Aluminum	14800	10.9		13300	11.4		10700	11.4		8620	23		12400	11.1		13300	11.1	
Arsenic	2.8	0.55		2.6	0.57		2.9	0.57		2.3	0.58		2.5	1.1		2	0.55	
Barium	153	1.1		94.1	1.1		80.8	1.1		647	2.3		326	1.1		126	1.1	
Beryllium	0.61	0.22		0.55	0.23		0.58	0.23		0.41	0.46	J	0.51	0.22		0.52	0.22	
Cadmium	0.68	0.55		<	0.57	U	<	0.57	U	<	1.2	U	<	0.55	U	<	0.55	U
Calcium	48600	21.9		20800	22.7		15400	22.8		158000	46.1		65300	22.1		15300	22.1	
Chromium	12.1	1.1		11.8	1.1		9.3	1.1		5.4	2.3		11	1.1		11.9	1.1	
Cobalt	3.4	1.1		4.5	1.1		3.9	1.1		1.8	2.3	J	3.2	1.1		4	1.1	
Copper	13.6	2.2		8.1	2.3		7.2	2.3		3.8	4.6	J	7.9	2.2		7.9	2.2	
Iron	11200	10.9		11200	11.4		9560	11.4		5890	23		10100	11.1		10700	11.1	
Lead	11.9	2.7	J	8.6	0.57	J	8.3	0.57	J	5.1	0.58	J	11.7	1.1	J	7.5	0.55	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-6.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceding sample number.
[2] MS/MSD for preceding sample number.

TABLE 7-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 093 CANNON AFB

LOCATOR	CAN093-9304-0000			CAN093-9304-0005			CAN093-9304-9361[1]			CAN093-9304-0010			CAN093-9305-0000			CAN093-9305-0005		
LAB SAMPLE NUMBER	0397140002SA			0397140003SA			0397140001SA			0397140004SA			0397140005SA			0397140006SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Magnesium	2790	21.9		2570	22.7		2190	22.8		3610	46.1		2590	22.1		2340	22.1	
Manganese	168	1.1	J	206	1.1	J	205	1.1	J	73	2.3	J	193	1.1	J	181	1.1	J
Nickel	10.3	4.4		10.1	4.5		10.2	4.6		9.1	9.2	J	9.6	4.4		10.6	4.4	
Potassium	2370	547		2270	568		1830	571		1330	1150		2050	553		2350	553	
Thallium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.2	UJ	<	1.1	U	0.14	0.55	J
Vanadium	22.1	1.1		19.3	1.1		12.8	1.1		17.9	2.3		21	1.1		18.7	1.1	
Zinc	46.7	2.2		28.4	2.3		24.6	2.3		15.2	4.6		45.8	2.2		28.4	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	213	43.8		<	45.5	U	51.2	45.6		<	46.1	U	547	44.2		<	44.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Table A-6.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceding sample number.

[2] MS/MSD for preceding sample number.

TABLE 7-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 093
CANNON AFB

LOCATOR	CAN093-9305-0010			CAN093-9306-0000			CAN093-9306-0005			CAN093-9306-6005[2]			CAN093-9306-0010		
LAB SAMPLE NUMBER	0397140007SA			0397140008SA			0397140009SA			0397140010SA			0397140011SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg//kg)															
Toluene	<	5.5	U	3.1	5.4	J	<	5.6	U	<	5.6	U	<	5.7	U
Semivolatile Organics (µg//kg)															
Benzo(a)anthracene	<	360	U	<	360	U	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	<	360	U	<	360	UJ	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	<	360	U	<	360	UJ	<	370	U	<	370	U	<	380	U
Benzo(k)fluoranthene	<	360	U	<	360	UJ	<	370	U	<	370	U	<	380	U
bis(2-Ethylhexyl)phthalate	<	360	U	<	360	U	<	370	U	<	370	U	<	380	U
Chrysene	<	360	U	<	360	U	<	370	U	<	370	U	<	380	U
Fluoranthene	<	360	U	<	360	U	<	370	U	<	370	U	<	380	U
Phenanthrene	<	360	U	<	360	U	<	370	U	<	370	U	<	380	U
Pyrene	<	360	U	<	360	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)															
Aluminum	8540	11		15400	10.8		14700	11.1		12500	11.2		11500	11.4	
Arsenic	1.9	0.55		2.7	1.1		2.6	0.56		2.9	0.56		2.7	0.57	
Barium	90.8	1.1		122	1.1		97.5	1.1		109	1.1		1890	1.1	
Beryllium	0.42	0.22		0.62	0.22		0.59	0.22		0.52	0.22		0.73	0.23	
Cadmium	<	0.55	U	0.48	0.54	J	<	0.56	U	<	0.56	U	<	0.57	U
Calcium	28700	22		21300	21.5		51300	22.3		80500	22.4		101000	22.9	
Chromium	8	1.1		12.5	1.1		10.6	1.1		9	1.1		7.2	1.1	
Cobalt	3.3	1.1		4	1.1		2.4	1.1		2.5	1.1		1.7	1.1	
Copper	6.5	2.2		17.8	2.2		6.6	2.2		6.1	2.2		4.6	2.3	
Iron	8170	11		12000	10.8		10100	11.1		8570	11.2		7370	11.4	
Lead	7.4	0.55	J	10.2	1.1	J	6.1	0.56	J	6.5	0.56	J	7.4	0.57	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-6.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.
(2) MS/MSD for preceding sample number.

TABLE 7-2

SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 093
CANNON AFB

LOCATOR	CAN093-9305-0010			CAN093-9306-0000			CAN093-9306-0005			CAN093-9306-6005[2]			CAN093-9306-0010		
LAB SAMPLE NUMBER	0397140007SA			0397140008SA			0397140009SA			0397140010SA			0397140011SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Magnesium	2050	22		2490	21.5		2540	22.3		2600	22.4		4070	22.9	
Manganese	209	1.1		168	1.1		112	1.1	J	98.2	1.1		86.6	1.1	J
Nickel	8.3	4.4		11.5	4.3		10.2	4.5		9.3	4.5		8.2	4.6	
Potassium	1730	550		2460	538		2190	557		1910	559		1970	572	
Thallium	0.15	1.1	J	0.12	1.1	J	<	1.1	UJ	0.13	0.56	J	<	1.1	UJ
Vanadium	14.4	1.1	J	22.3	1.1		19.7	1.1		16.5	1.1		18.5	1.1	
Zinc	21.5	2.2		38.4	2.2		23.7	2.2		21.2	2.2		19.5	2.3	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	<	44	U	1760	215		<	44.6	U	<	44.7	U	<	45.8	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-6.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.
(2) MS/MSD for preceding sample number.

TABLE 7-3

COMPARISON OF PHASE II MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 93, CANNON AFB
Oil/Water Separator 5121

Sample ID	Metal	Maximum detected concentration	Range of Background concentrations (2)	Upper tolerance limit (UTL) background concentration(3)	Reported Level in Clovis, NM Region (4)	Does maximum detected exceed background
CAN093-9306-0000	Aluminum	15,400	1,410 - 11,000	10,540	50,000	NO**
CAN093-9304-0000	Arsenic	2.8	0.67 - 28	15.5	6.5	NO
CAN093-9306-0010	Barium	1890	14.5 - 1200	642	500	YES
CAN093-9306-0010	Beryllium	0.73	0.17 - 0.77	0.73	1-2	NO
CAN093-9304-0000	Cadmium	0.68	<0.51 - 4.2	*	----	YES
CAN093-9306-0000	Chromium	12.5	4 - 15.4	12.5	30	NO
CAN093-9304-0005	Cobalt	4.5	0.85 - 5.3	4.5	3-7	NO
CAN093-9306-0000	Copper	17.8	<2 - 18.4	*	20	NO
CAN093-9304-0000	Lead	11.9	1.1 - 46	25.8	15	NO
CAN093-9305-0010	Manganese	209	22.4 - 216	164	500	NO**
CAN093-9306-0000	Nickel	11.5	1.3 - 9.8	9	15	YES
CAN093-9305-0010	Thallium	0.15	0.14 - 0.22	*	----	YES
CAN093-9306-0000	Vanadium	22.3	5.2 - 28.3	25.3	30-70	NO
CAN093-9304-0000	Zinc	46.7	<4.3 - 27.5	21.9	45	YES

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1993) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).
Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1994).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

(4) USGS 1984.

*Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 7-4

COMPARISON OF PHASE II SOIL CONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCs
SWMU 93, CANNON AFB
Oil/Water Separator 5121

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II Concentration Treater than Phase I Concentration	Residential Soil Risk-Based Concentration[1] (mg/kg)	Phase II Concentration Exceeds RBC?
Toluene	0.016	0.0049	NO	16,000	NA
Xylenes	0.0035	ND	NO	160,000	NA
Benzo(a)anthracene	0.077	0.049	NO	0.88	NA
Benzo(a)pyrene	0.084	0.069	NO	0.088	NA
Benzo(b)fluoranthene	0.14	0.05	NO	0.88	NA
Benzo(k)fluoranthene	ND	0.16	YES	8.80	NO
Benzo(g,h,i)perylene	0.073	ND	NA	NA(a)	NA
Bis(2-ethylhexyl)phthalate	ND	0.12	YES	46	NO
Chrysene	0.12	0.078	NO	88	NA
Fluoranthene	0.15	0.13	NO	3,100	NA
Indeno(1,2,3-cd)pyrelene	0.055	ND	NO	0.88	NA
Pentachlorophenol	0.045	ND	NO	5	NA
Phenanthrene	0.13	0.038	NO	NA(a)	NA
Pyrene	0.19	0.073	NO	2,300	NA
TPH	325	1760	YES	NA(a)	NA
Antimony	2.3	ND	NO	31	NA
Barium	1110	1890	YES	5,500	NO
Cadmium	3	0.68	NO	39	NA
Copper	158	17.8	NO	2900	NA
Lead*	32.4	11.9	NO	400	NO
Nickel	8.2	11.5	YES	1600	NO
Silver	4.8	ND	NO	390	NA
Zinc	77.2	46.7	NO	23000	NA

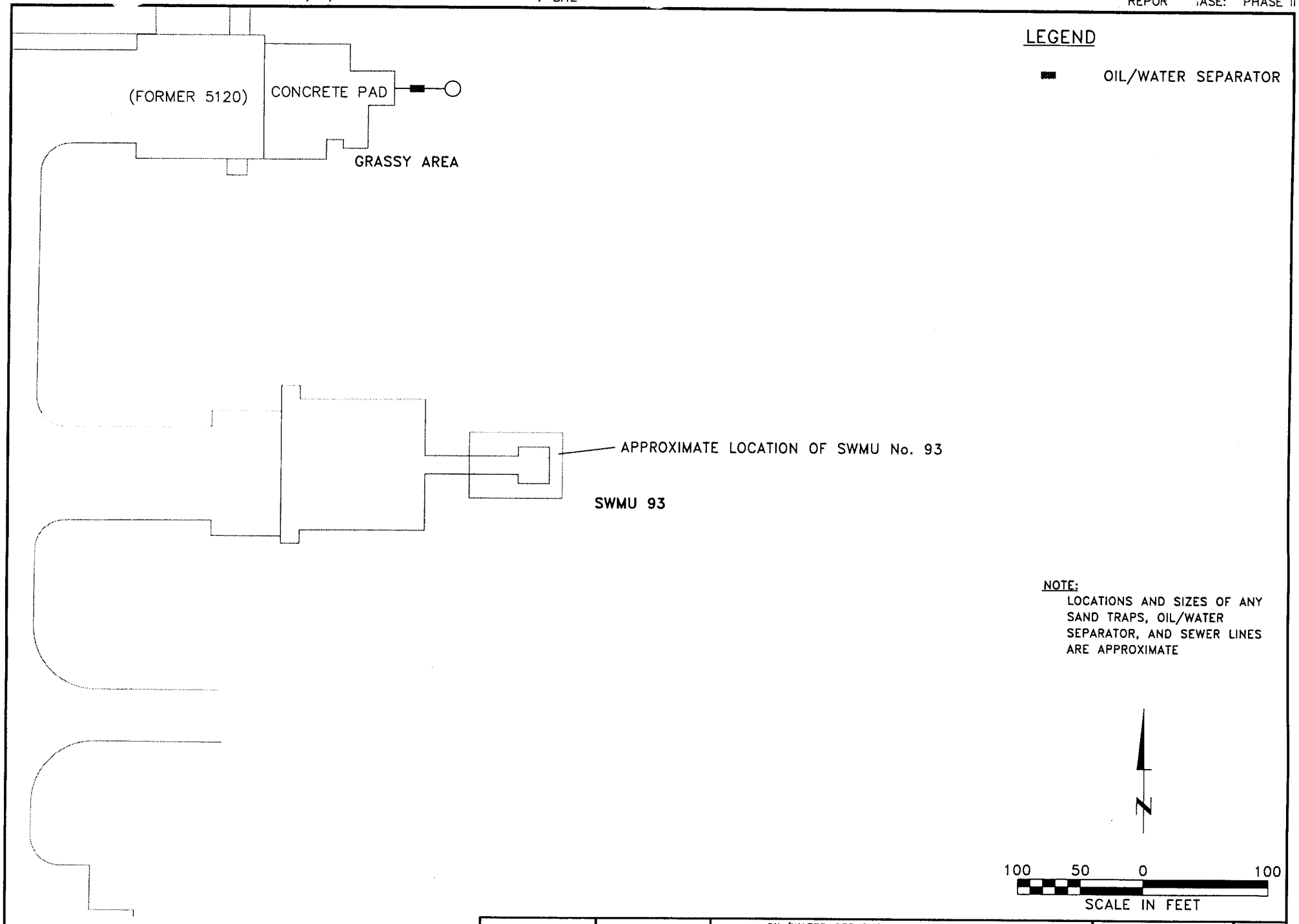
[1] EPA Region III Risk-Based Concentrations for residential soil (EPA 1994).

(a) EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.

*No RBC has been calculated for lead; however, EPA recommends an interim residential soil lead concentration of 400 mg/kg (EPA 1994)

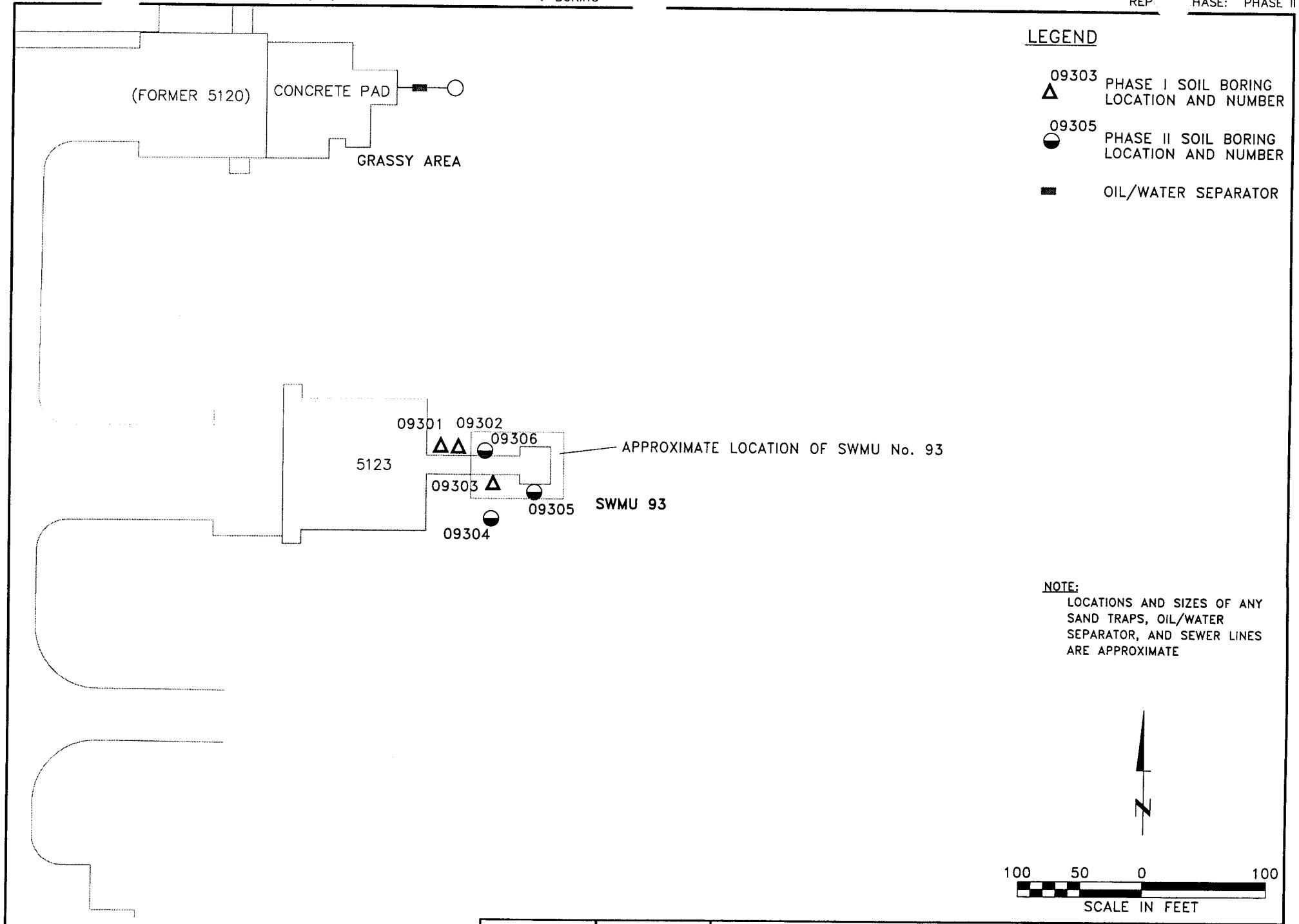
ND = Not Detected

NA = Not Applicable



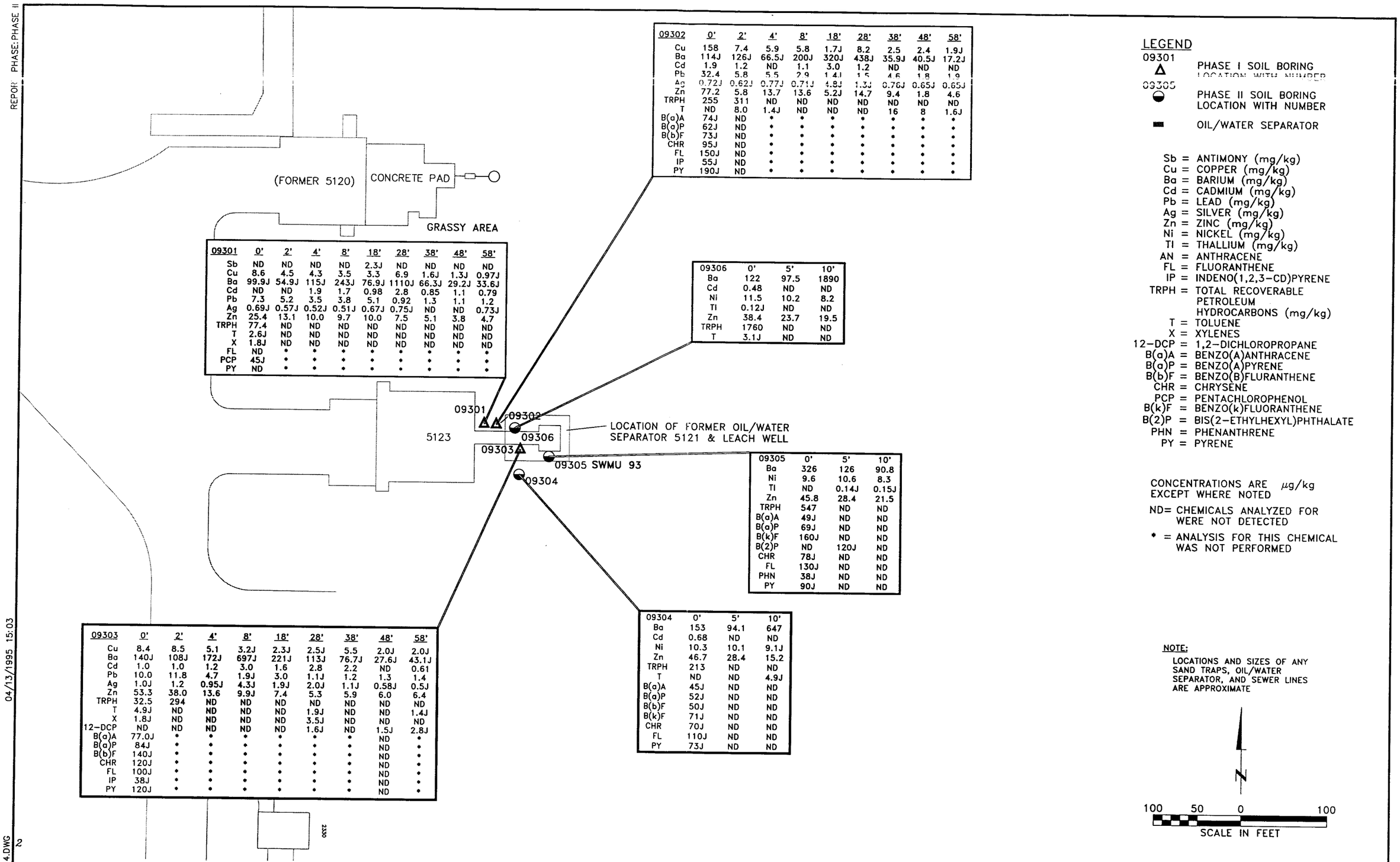
SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	OIL/WATER SEPARATOR No. 5121 – SWMU 93 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 7–1



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	OIL/WATER SEPARATOR No. 5121 – SWMU 93 SITE PLAN WITH BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 7–2



09301	0'	2'	4'	8'	18'	28'	38'	48'	58'
Sb	ND	ND	ND	ND	2.3J	ND	ND	ND	ND
Cu	8.6	4.5	4.3	3.5	3.3	6.9	1.6J	1.3J	0.97J
Ba	99.9J	54.9J	115J	243J	76.9J	1110J	66.3J	29.2J	33.6J
Cd	ND	ND	1.9	1.7	0.98	2.8	0.85	1.1	0.79
Pb	7.3	5.2	3.5	3.8	5.1	0.92	1.3	1.1	1.2
Ag	0.69J	0.57J	0.52J	0.51J	0.67J	0.75J	ND	ND	0.73J
Zn	25.4	13.1	10.0	9.7	10.0	7.5	5.1	3.8	4.7
TRPH	77.4	ND	ND	ND	ND	ND	ND	ND	ND
T	2.6J	ND	ND	ND	ND	ND	ND	ND	ND
X	1.8J	ND	ND	ND	ND	ND	ND	ND	ND
FL	ND	*	*	*	*	*	*	*	*
PCP	45J	*	*	*	*	*	*	*	*
PY	ND	*	*	*	*	*	*	*	*

09302	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	158	7.4	5.9	5.8	1.7J	8.2	2.5	2.4	1.9J
Ba	114J	126J	66.5J	200J	320J	438J	35.9J	40.5J	17.2J
Cd	1.9	1.2	ND	1.1	3.0	1.2	ND	ND	ND
Pb	32.4	5.8	5.5	2.9	1.4J	1.5	4.6	1.8	1.9
Ag	0.72J	0.62J	0.77J	0.71J	4.8J	1.3J	0.76J	0.65J	0.65J
Zn	77.2	5.8	13.7	13.6	5.2J	14.7	9.4	1.8	4.6
TRPH	255	311	ND	ND	ND	ND	ND	ND	ND
T	ND	8.0	1.4J	ND	ND	ND	16	8	1.6J
B(a)A	74J	ND	*	*	*	*	*	*	*
B(a)P	62J	ND	*	*	*	*	*	*	*
B(b)F	73J	ND	*	*	*	*	*	*	*
CHR	95J	ND	*	*	*	*	*	*	*
FL	150J	ND	*	*	*	*	*	*	*
IP	55J	ND	*	*	*	*	*	*	*
PY	190J	ND	*	*	*	*	*	*	*

09306	0'	5'	10'
Ba	122	97.5	1890
Cd	0.48	ND	ND
Ni	11.5	10.2	8.2
Tl	0.12J	ND	ND
Zn	38.4	23.7	19.5
TRPH	1760	ND	ND
T	3.1J	ND	ND

09305	0'	5'	10'
Ba	326	126	90.8
Ni	9.6	10.6	8.3
Tl	ND	0.14J	0.15J
Zn	45.8	28.4	21.5
TRPH	547	ND	ND
B(a)A	49J	ND	ND
B(a)P	69J	ND	ND
B(k)F	160J	ND	ND
B(2)P	ND	120J	ND
CHR	78J	ND	ND
FL	130J	ND	ND
PHN	38J	ND	ND
PY	90J	ND	ND

09304	0'	5'	10'
Ba	153	94.1	647
Cd	0.68	ND	ND
Ni	10.3	10.1	9.1J
Zn	46.7	28.4	15.2
TRPH	213	ND	ND
T	ND	ND	4.9J
B(a)A	45J	ND	ND
B(a)P	52J	ND	ND
B(b)F	50J	ND	ND
B(k)F	71J	ND	ND
CHR	70J	ND	ND
FL	110J	ND	ND
PY	73J	ND	ND

09303	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	8.4	8.5	5.1	3.2J	2.3J	2.5J	5.5	2.0J	2.0J
Ba	140J	108J	172J	697J	221J	113J	76.7J	27.6J	43.1J
Cd	1.0	1.0	1.2	3.0	1.6	2.8	2.2	ND	0.61
Pb	10.0	11.8	4.7	1.9J	3.0	1.1J	1.2	1.3	1.4
Ag	1.0J	1.2	0.95J	4.3J	1.9J	2.0J	1.1J	0.58J	0.5J
Zn	53.3	38.0	13.6	9.9J	7.4	5.3	5.9	6.0	6.4
TRPH	32.5	294	ND	ND	ND	ND	ND	ND	ND
T	4.9J	ND	ND	ND	ND	1.9J	ND	ND	1.4J
X	1.8J	ND	ND	ND	ND	3.5J	ND	ND	ND
12-DCP	ND	ND	ND	ND	ND	1.6J	ND	1.5J	2.8J
B(a)A	77.0J	*	*	*	*	*	*	ND	*
B(a)P	84J	*	*	*	*	*	*	ND	*
B(b)F	140J	*	*	*	*	*	*	ND	*
CHR	120J	*	*	*	*	*	*	ND	*
FL	100J	*	*	*	*	*	*	ND	*
IP	38J	*	*	*	*	*	*	ND	*
PY	120J	*	*	*	*	*	*	ND	*

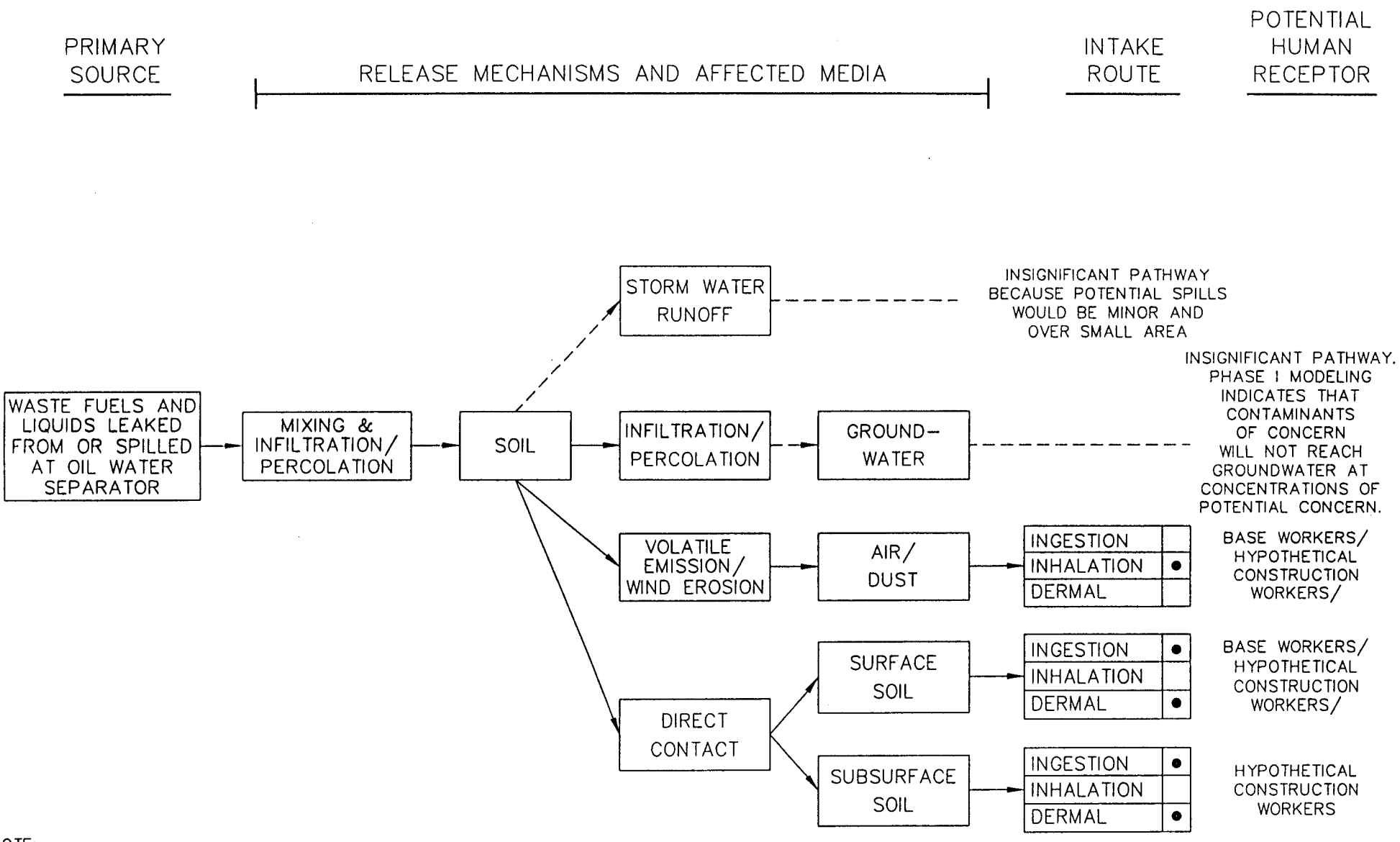
SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY TBS	DATE 03/24/95	OIL/WATER SEPARATOR No. 5121 – SWMU 93 CHEMICAL CONCENTRATIONS DETECTED IN SOIL CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 7-3
CHK'D BY	REVISION 0			

REPORT PHASE:PHASE II

04/13/1995 15:03

3M11MM14.DWG 2



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 08/19/93	SITE CONCEPTUAL EXPOSURE MODEL OIL WATER SEPARATOR No.5121 SWMU 93 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY .	REVISIONS: 0		C3M11MM	7-4

8.0
SAND TRAP AND LEACH FIELDS AT THE PETROLEUM, OIL, AND LUBRICANTS (POL) WASH RACK - SWMU NO. 127

8.1 SITE BACKGROUND

8.1.1 Site Description

This SWMU is a 135-gallon concrete sand trap and leach field that receives wash water from the POL refueling truck wash rack at Facility 4095 (Figure 16-1). The sand trap measure is 2.5 feet by 4.5 feet in plan and extends about 3.5 feet below the pavement. This unit has been active since 1977.

8.1.2 Site History

The sand trap reportedly received wash down water from fuel truck cleaning operations. This wastewater historically was discharged to a leach field located approximately 60-feet northeast of the wash rack. The leach field reportedly ceased to function in the late 1980s, a new leach field was installed approximately 20-feet northeast of the original in May 1991. A new OWS enclosed in a concrete vault was also installed at this time to recover jet fuel which may be released during wash rack operations. The original leach field remains in place, but is bypassed and not used. The OWS vault was inspected during the initial site visit. The unit consists of a three-compartment steel tank with clean-out access for each compartment. There was no evidence of any leakage or spillage, and this OWS was not a part of SWMU 127 investigation sampling.

8.1.3 Current Use

The wash rack sand trap continues to receive heavy usage. The wastewater from the recently installed OWS discharges to a new leach field located northeast of the former leach field and oils recovered are temporarily stored in the separator for future recycling.

8.1.4 Potential Contaminants

Potential contaminants in this SWMU include JP-4 fuel, grease, solvents, metals, and motor oil.

8.1.5 Previous Investigations

A Phase I RFI was completed at the SWMU by W-C (1994).

The objective of soil sampling at the wash rack sand trap and the associated leach fields was to evaluate whether or not a release of SWMU-related chemicals has occurred from the sand trap or seepage from the two leach fields.

Two 10-foot borings were drilled through holes cut in the concrete wash rack to sample the soil below the pad. Soil samples were collected at the 0.5- to 2-foot, 2- to 4-foot, 4- to 6-foot, and 8- to 10-foot depth intervals to characterize the vertical distribution of possible contaminants. Minor visual and olfactory indications of contamination, probably attributable to spillage of JP-4 jet fuel on the wash rack, was found in soils directly below the concrete pad. The locations of the Phase I soil borings are shown on Figure 8-2.

One 60-foot boring was drilled adjacent to the OWS and five 60-foot borings were drilled within the new and abandoned leach fields. Samples were collected at the surface and at the 1.5- to 3.5-foot, 4- to 6-foot, 8- to 10-foot, 18- to 20-foot, 28- to 30-foot, 38- to 40-foot, 48- to 50-foot, and 58- to 60-foot depth intervals to characterize the vertical distribution of possible leachate contaminants percolating into the soil. Only soils from boring 12708 located in the new leach field had indications of (olfactory) subsurface contamination beyond the wash rack.

Target analytes for all borings included VOCs, SVOCs, metals and TRPH. SVOCs were analyzed only for a limited number of samples to allow for risk assessment. These samples typically included surface samples and one selected sample at depth from each boring. Surficial samples were collected directly under the concrete wash rack and approximately at the 0.2- to 0.5-foot depth interval in areas of plant cover to provide a worst-case situation for risk assessment purposes in the event that VOC contamination was discovered during this investigation.

1,2-Dichloroethane was detected in boring No. 12706 at the surface. 1,2-Dichloropropane was detected in boring No. 12705 at the surface, boring No. 12705 at 40 feet, and boring No. 12704 at 50 and 60 feet. Toluene was detected in surface samples and subsurface samples to 60 feet in boring Nos. 12703 through 12707. Xylene was detected in boring Nos. 12703, 12704, 12706, and 12707 at the surface; in boring No 12707 at 3.5 feet; and in boring No. 12705 at 20 feet. Carbazole was detected in boring Nos. 12703 and 12705 at the surface. Anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluorene, fluoranthene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, phenanthrene, and pyrene were detected in one or more samples from the surface and 3.5 feet in boring Nos. 12703 through 12708. Butyl benzyl phthalate was detected in boring No. 12701 at 6 feet. Petroleum hydrocarbons were detected in boring Nos. 12702 through 12707 at the surface, in boring No. 12702 at 4 and 6 feet, in boring No. 12701 at 6 and 10 feet, and in boring No. 12708 at 10 and 20 feet. Aluminum, antimony, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc were detected above background in surface samples and subsurface samples to 60 feet in one or more of the borings. Antimony, barium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, beryllium, chrysene, and indeno(1,2,3-cd)pyrene exceeded the risk screening criteria. A summary of the Phase I analytical results is shown on Figure 8-3.

BRA Summary

A BRA was done at SWMU 127 based on the recommendations made in the Phase I RFI report. Potential receptors at SWMU 127 for human health risk included occupational workers, hypothetical future construction workers, and hypothetical future trespassers. These receptors were assumed to be exposed to soil via ingestion, dermal contact, and inhalation pathways. Potential human health risks from groundwater were evaluated using fate and transport modeling. The modeling indicated that contaminants would not reach groundwater at concentrations of potential concern. Therefore, this pathway was considered insignificant.

The maximum potential excess human health risk at SWMU 127 was 2×10^{-5} for occupational workers. This is within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} for risk from releases at hazardous waste sites indicating that no unacceptable risk is expected. The primary contributor to the risk was ingestion of PAHs in surface soils.

Results of the ecological risk assessment showed that no unacceptable ecological risks due to chemical releases are expected at the SWMU.

Since no unacceptable human health or ecological risks due to chemical releases are expected from this SWMU, no further action was recommended for this SWMU in the Phase I report.

8.1.6 Phase II Sampling Objectives

The overall objective of sampling at the site of the sand trap and the leach fields was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the sand trap and/or seepage from the leach fields which could pose a significant risk to human health or the environment. The analytical data collected from this investigation was used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU are to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the sand trap and the leach fields. Potential release points included spills at the surface that may have occurred during removal by pumping from the sand trap and leaks in either the sand trap or the associated underground piping and seepage from the leach fields.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

8.2 FIELD INVESTIGATION AND DATA COLLECTION

8.2.1 Soils Sampling

Eight soil borings were drilled and soil samples collected at the sand trap at the POL washrack. Two borings to a depth of 10 feet were drilled at the location of the POL washrack. Three borings to a depth of 60 feet were drilled in the historic leach field area and three borings to 60 feet were drilled in the new leach field area. The boring locations were

chosen to further assess the lateral presence and extent of site related soil contaminants to the 10-foot and 60-foot depth intervals. Phase II RFI boring numbers and sample descriptions are shown in Table 8-1 and on Figure 8-2.

Surface soil samples from all borings were collected from 0 to 0.5 feet. All borings were also sampled at intervals of 3 to 5 feet and 8 to 10 feet. Other samples collected from the 60-foot borings included depths of 13 to 15 feet, 18 to 20 feet, 23 to 25 feet, 28 to 30 feet, 33 to 35 feet, 38 to 40 feet, 48 to 50 feet, and 58 to 60 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 -Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile Organic Compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL Metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1

8.2.2 Geologic Summary of Boring Logs

Phase I RFI

Boring logs from Phase I boreholes in the POL wash rack indicate relatively minor petroleum staining with coincidentally high headspace measurements from just below the concrete pad to the base of the inferred fill at 2 feet. The soil ranges from a moist, red silty clay with moderate plasticity (fill) to a light yellow-white clay with some sand to the boring's total depth at 10 feet. This clay is firm and moist, and displays a red mottling in the lighter groundmass.

Soils below a depth of 10 feet in the area of the OWS and the leach fields consist of reddish to salmon pink interbedded sandy silts and clays. This soil displays moderate to high calcic content, manifested as white patches and stringers to tightly cemented tan and pink caliche. Extremely tight caliche formation is probably responsible for the sampler rejection experienced in boring 12703 (T.D. at 58.7 feet), boring 12705 (T.D. at 57.3 feet), boring

12707 (T.D. at 58.5 feet), and boring 12708 (T.D. at 57.8 feet), which prevented drilling and recovering the full sample at total depth.

While no deep boring had extensive visual indication of contamination, locally high headspace measurements were observed at 8- to 10-foot, 18- to 20-foot, and 28- to 30-foot depth intervals in boring 12708.

Phase II RFI

Logs from the eight Phase II RFI borings show a subsurface lithology consisting mostly of fine-grained Ogallala Formation sediments. Borings 2709 and 2710 encountered 4 to 5 inches of concrete pavement at the surface. Underneath the pavement, to a depth of 1-foot in both borings, is a silty clay fill (USCS symbol CL) described as dark grayish-brown, dry to moist, and low plastic. Below the fill, and to the completion depths of 10 feet, a clayey silt (USCS symbol ML) was encountered. This clayey silt is described as reddish-brown, dry, and loose.

The three Phase II RFI borings drilled through the historic leach field area, borings 2711, 2712, and 2713, encountered silty clay (USCS symbol CL) from the surface to depths of 23 feet, 13 feet, and 18.2 feet, respectively. The silty clay is described as various shades and mixtures of brown, red, and pink and is typically dry to moist, very stiff to hard, low to medium plastic with some calcium carbonate nodules and occasional caliche cemented zones. The upper 1.3 feet of silty clay in boring 2713 contained some small gravel indicating that this is fill material. Sandy silt (USCS symbol ML) was encountered below the silty clay in borings 2711 and 2713 to depths of 24.5 feet and 32 feet, respectively. The sandy silt is light red, dry, very dense, and very fine- to fine-grained with some caliche cementation. Sandy silt was again encountered below the silty sand in this boring, extending to a depth of 56.5 feet. Silt (USCS symbol ML) was encountered below the silty clay in boring 2712 to a depth of 21.5 feet. The silt is light reddish brown, dry to moist, and stiff to hard with some calcium carbonate nodules. Below this silt, and to a depth of 32.5 feet, the sandy silt described above was found in boring 2712. This is followed by the silty sand described above to a depth 38.3 feet. Sand (USCS symbol SP) was encountered to the termination depths of the three borings. A layer of sandy silt within the sand unit was observed from 50 to 54 feet in boring 2713. The sand is described as red, dry, very dense, and very fine- to fine-grained with some calcium carbonate cementation.

The three borings in the new leach field, borings 2714, 2715, and 2716, showed a similar stratigraphy as borings 2711 through 2713 described above. Silty sand was encountered from the surface to depths of 22 feet, 28 feet, and 20.2 feet, respectively. Silt was found below the silty clay in boring 2714 to a depth of 26.5 feet. This is followed by sandy silt to a depth of 38 feet in boring 2714 and from below the silty clay to 33 feet in boring 2715. Boring 2716 exhibited clayey silt below the silty clay followed by silty sand to a depth of 57.5 feet. The same silty sand is present below the sandy silt layers in borings 2714 and 2715 to depths of 57.5 feet in both borings. Sand was encountered below the silty sand layers in all borings to the completion depths of the borings.

No field screening (headspace) or visual indications of contamination were observed while drilling and sampling the 60-foot Phase II soil borings (borings 2711 through 2716). The surface soil samples in borings 2709 and 2710 showed relatively high headspace readings of 146 ppm and 210 ppm, respectively. Headspace readings below the surface samples were all below 10 ppm and decreased to the bottom of the borings at 10 feet. No odors were noted during drilling or sampling activities.

8.2.3 Site Topography

Drainage from the wash rack flows into the sand trap and the oil/water separator. The surface of the leach field is essentially flat with no discernable gradient.

The site is level and in a grassy area about 100 feet south of building 223. The area surrounding the washrack is paved with asphalt. The washrack is paved with concrete which slopes inward to the center for drainage. The historic and new leach fields are located in a level grassy area between the washrack and a fence at the eastern end of the site. Immediately east of the fence is a grass strip about 10 feet wide which slopes into a drainage ditch 3 to 4 feet deep at the western edge of an asphalt road. The area east of the road is grassy and level.

8.3 CHEMICAL INVESTIGATION RESULTS

8.3.1 General

Soil samples were collected from 6 borings (12709, 12710, 12711, 12712, 12713, 12714, 12715, and 12716). Sampling and analyses performed are summarized in Table 8-1. A summary of the analytical results for these soil samples are provided in Table 8-2. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

8.3.2 Organic Results For Near-surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN127-2709-0000, CAN127-2710-0000, CAN127-2711-0000, CAN127-2712-0000, CAN127-2713-0000, CAN127-2714-0000, CAN127-2715-0000, and CAN127-2716-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 8-1.

Except for acetone and methylene chloride, which were both qualified as undetected after they were determined to be laboratory contaminants, the only VOCs detected were ethylbenzene, toluene, and total xylenes. Ethylbenzene was reported in samples CAN127-2709-0000 and CAN127-2710-0000 at concentrations of 3,900 μg/kg (estimated) and 54,000 μg/kg, respectively. Toluene was reported in samples CAN127-2709-0000, CAN127-2710-0000, and CAN127-2713-0000 at concentrations of 14,000 μg/kg, 82,000 μg/kg, and 1.3 μg/kg (estimated), respectively. Total xylenes were reported in samples CAN127-2709-0000 and CAN127-2710-0000 at concentrations of 33,000 μg/kg and 260,000 μg/kg, respectively. Several SVOCs, mainly in the form of PAHs, were reported in many of the surface samples. Total PAH concentrations in samples CAN127-2710-0000, CAN127-2711-0000, CAN127-2712-0000, CAN127-2713-0000, CAN127-2714-0000, CAN127-2715-0000, and CAN127-2716-0000 were 21,000 μg/kg (estimated), 14,158 μg/kg, 10,026 μg/kg, 1,636 μg/kg, 7,632 μg/kg, 4,076 μg/kg, and 1,445 μg/kg, respectively. Other non-PAH SVOCs reported were bis(2-ethylhexyl)phthalate (CAN127-2712-0000, CAN127-2714-0000, CAN127-2715-0000, and CAN127-2716-0000 at concentrations of 68 μg/kg (estimated), 450 μg/kg, 44 μg/kg (estimated), and 41 μg/kg (estimated)), 2-methylnaphthalene (CAN127-2709-0000 and

CAN127-2710-0000 at concentrations of 4,900 μg/kg (estimated) and 40,000 μg/kg, respectively), carbazole (CAN127-2711-0000, CAN127-2712-0000, CAN127-2714-0000, and CAN127-2715-0000 at concentrations of 170 μg/kg (estimated), 120 μg/kg (estimated), 100 μg/kg, and 45 μg/kg (estimated), respectively), di-n-butyl phthalate (CAN127-2716-0000 at a concentration of 190 μg/kg (estimated)), and benzoic acid (CAN127-2715-0000 at a concentration of 48 μg/kg (estimated)). Petroleum hydrocarbons were detected in samples CAN127-2710-0000, CAN127-2711-0000, CAN127-2712-0000, CAN127-2713-0000, CAN127-2715-0000, and CAN127-2716-0000 at concentrations of 11,600 mg/kg, 130 mg/kg, 168 mg/kg, 66.5 mg/kg, 80.8 mg/kg, and 45.5 mg/kg, respectively.

8.3.3 Organic Results For Sub-surface Soil Samples

The subsurface samples collected at this SWMU (CAN127-2709-0005 and CAN127-2709-0010 for boring 02709, CAN127-2710-0005 and CAN127-2710-0010 for boring 02710, and samples at depths of 5 feet (0005), 10 feet (0010), 15 feet (0015), 20 feet (0020), 25 feet (0025), 30 feet (0030), 35 feet (0030), 40 feet (0040), 50 feet (0050), and 60 feet (0060) for borings CAN127-2711 through CAN127-2716) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 8-1.

Other than acetone and methylene chloride, which were qualified undetected after they were determined to be laboratory contaminants, the only VOCs reported were toluene and 2-butanone. Toluene was reported in samples CAN127-2713-0010, CAN127-2713-0030, CAN127-2713-0035, and CAN127-2716-0010 at concentrations of 1.2 μg/kg (estimated), 1.6 μg/kg (estimated), 9 μg/kg, and 2.8 μg/kg (estimated), respectively. 2-butanone was reported in samples CAN127-2713-0060 and CAN127-2714-0025 at concentrations of 6.2 μg/kg and 1.3 μg/kg (estimated), respectively. Several SVOCs, mainly in the form of PAHs, were reported for some of the subsurface samples. Total PAHs reported for samples CAN127-2713-0005, CAN127-2714-0005, CAN127-2714-0010, and CAN127-2715-0005 were 591 μg/kg, 1,733 μg/kg, 128 μg/kg, and 416 μg/kg, respectively. Other non-PAH SVOCs reported were di-n-butyl phthalate (CAN127-2713-0030, CAN127-2716-0005, CAN127-2716-0015, CAN127-2716-0020, CAN127-2716-0050, and CAN127-2716-0060 at estimated concentrations of 77 μg/kg, 170 μg/kg, 170 μg/kg, 130 μg/kg, 160 μg/kg, and 160 μg/kg, respectively; di-n-octyl phthalate (CAN127-2715-0005 at 64 μg/kg (estimated) and CAN127-2716-0020 at 310 μg/kg (estimated)); diethyl phthalate (CAN127-2716-0050 at

46 μg/kg (estimated)); and bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate was reported in all of the subsurface samples from boring CAN127-2714 in concentrations ranging from 830 μg/kg (50 feet) to 270 μg/kg (estimated at 30 feet). Bis(2-(ethylhexyl) phthalate was also reported in samples CAN127-2715-0025, CAN127-2715-0030, CAN127-2715-0040, CAN127-2715-0050, CAN127-2716-0005, and CAN127-2716-0050 at concentrations of 170 μg/kg (estimated), 40 μg/kg (estimated), 190 μg/kg (estimated), 54 μg/kg (estimated), 4,700 μg/kg, and 90 μg/kg (estimated), respectively. Petroleum hydrocarbons were reported for samples CAN127-2712-0015, CAN127-2712-0020, CAN127-2712-0040, CAN127-2713-0005, CAN127-2713-0050, CAN127-2715-0035, CAN127-2716-0020, CAN127-2716-0040, and CAN127-2716-0050 at concentrations of 48 mg/kg, 293 mg/kg, 67.4 mg/kg, 52.3 mg/kg, 47.9 mg/kg, 171 mg/kg, 60.7 mg/kg, 53.9 mg/kg, and 1,700 mg,kg, respectively. TRPH was not detected in any of the 60-foot subsurface soil samples.

8.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 8-1. The range of results for metals reported in these soil samples, combining Phase I and Phase II data, are summarized in Table 8-A.

TABLE 8-A

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Aluminum	134/134	2880 mg/kg	2711-0025	14,700 mg/kg	2713-0025
Antimony	1/134	4.6 mg/kg	2714-0020	(detected only once)	
Arsenic	134/134	.77 mg/kg	2714-0035	3 mg/kg	2709-0000
Barium	134/134	11.8 mg/kg	1273-0058	1540 mg/kg	2709-0010
Beryllium	2/134	0.15J mg/kg	2712-0035	0.83 mg/kg	1274-0002
Cadmium	22/134	0.49 mg/kg	1274-0000	4.2 mg/kg	1272-0002
Calcium	134/134	2490 mg/kg	2715-0060	254,000 mg/kg	2710-0005
Chromium	120/134	1.9 mg/kg	1274-0028	21.4 mg/kg	2712-0000
Cobalt	123/134	0.84J mg/kg	2715-0060	8 mg/kg	2709-0000
Copper	132/134	1.1 mg/kg	1274-0008	54.9 mg/kg	1277-0058
Iron	134/134	2190 mg/kg	2711-0025	11,500 mg/kg	2713-0000
Lead	123/134	1.60 mg/kg	1272-0002	83.9 mg/kg	2711-0000
Magnesium	134/134	1220 mg/kg	1278-0000	15,000 mg/kg	2712-0050
Manganese	134/134	15.7 mg/kg	2711-0025	340 mg/kg	2709-0000
Mercury	1/134	0.11 mg/kg	1278-0000	Hg detected only once	

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Nickel	132/134	2J mg/kg	2711-0060	12.4 mg/kg	1274-0002
Potassium	134/134	468 mg/kg	1272-0002	3230 mg/kg	2713-0025
Silver	23/134	0.35 mg/kg	1277-0058	3.6 mg/kg	1272-0002
Selenium	3/134	0.16 mg/kg	2715-0020	0.27 mg/kg	1274-0000
Sodium	2/134	248 mg/kg	2711-0015	52 mg/kg	2713-0030
Thallium	19/134	0.11 mg/kg	2712-0015	0.38 mg/kg	2714-0025
Vanadium	135/135	9.3 mg/kg	2714-0025	23.2 mg/kg	2711-0035
Zinc	134/134	5.2 mg/kg	1275-0004	41.1 mg/kg	2712-0000

Note: See Table 16-3 for comparison to background.

8.4 DATA ASSESSMENT

An assessment of the Sand Trap and Leach Fields (SWMU 127) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

8.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

8.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C, 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA, 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988). A detailed review of SWMU 127 data is provided in the QCSR.

For the organic analyses, qualification of data was required based on holding times, DCS recoveries, and blank contamination. The DCS and MS/MSD recoveries were outlying the criteria for SVOC analyses in one of the sample delivery groups. The associated samples were then re-extracted and reanalyzed outside of holding times with a new set of DCS samples. SVOC data for samples CAN127-2713-0000RA, CAN127-2713-0005RA,

CAN127-2713-0010RA, CAN127-2713-0020RA, CAN127-2713-0025RA, CAN127-2713-0030RA, CAN127-2713-0035RA, CAN127-2713-0040RA, CAN127-2713-0050RA, CAN127-2713-0060RA, and CAN127-2713-2763RA were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias and false negative results. The DCS recoveries for 1,2,4-trichlorobenzene and 1,4-dichlorobenzene were below evaluation criteria, and associated data were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Additionally, methylene chloride, acetone, and bis(2-ethylhexyl)phthalate data were qualified as nondetect **U** for the several samples based on blank contamination.

MS recoveries for antimony, calcium, chromium, selenium, silver, thallium, vanadium, and TRPH were reported below evaluation criteria, and MS recoveries for arsenic, barium, manganese, and magnesium were reported both above and below the evaluation criteria. The following data for the associated samples were qualified as estimated **J** (detects) or **UJ** (nondetects to indicate a potential low bias:

- Antimony and selenium data for all SWMU 127 samples
- Arsenic data for boring 2715 samples
- Barium data for boring 2714 and 2716
- Calcium, silver, and TRPH data for boring 2713 samples
- Chromium, manganese, and vanadium data for boring 2712 samples
- Magnesium data for boring 2715 samples
- Thallium data for boring 2716, 2710, and 2709 samples and samples from the 35' bgs to 60' bgs for boring 2711

MS recoveries for arsenic, barium, lead, magnesium, and manganese were reported above the evaluation criteria. The detected analytes associated with the MS recoveries were qualified as estimated **J** to indicate a potential high bias for the following analytes and samples:

- Arsenic for boring 2714 samples
- Barium for boring 2715, 2710, and 2709 samples and samples from 0' bgs to 30' bgs from boring 2711
- Manganese data for boring 2714 samples
- Magnesium data for samples from 35' bgs to 60' bgs for boring 2711

- Lead for boring 2710 and 2709 samples

The MS recovery for lead was greater than 200 percent for one of the sample delivery groups, and lead data for samples CAN127-2714-0000, CAN127-1714-2761, CAN127-2714-0005, CAN127-2714-0010, CAN127-2714-0015, CAN127-2714-0020, CAN127-2714-0025, CAN127-2714-0030, CAN127-2714-0035, CAN127-2714-0040, CAN127-2714-0050, and CAN127-2714-0050 were rejected **R** based on the high MS recovery. Finally, the laboratory reported a MS recovery of 0 percent for selenium in one of the sample delivery groups. Associated nondetect data was rejected **R**, and detected data was estimated **J** for samples CAN127-2715-0000, CAN127-2715-0005, CAN127-2715-0010, CAN127-2714-0015, CAN127-2715-0020, CAN127-2715-0025, CAN127-2715-0030, CAN127-2715-0035, CAN127-2715-0040, CAN127-2715-0050, and CAN127-2715-2762.

Precision parameters were outlying the evaluation criteria for the field duplicate samples and the inorganic analyses of the matrix duplicate samples. For the matrix duplicate samples, RPDs for aluminum, arsenic, barium, calcium, chromium, iron, lead, magnesium, manganese, vanadium, and TRPH were outlying evaluation criteria. Associated data for the respective samples were qualified as estimated **J** based on the outlying precision parameters. The following data were qualified on the basis of the outlying RPDs for the matrix duplicate samples:

- Aluminum, barium, iron, and manganese for boring 2711 samples collected from 0' bgs to 30 bgs.
- Arsenic, chromium, magnesium for boring 2715 samples
- Barium, lead, and vanadium for boring 2716 samples
- Lead and TRPH for boring 2711 samples collected from 35' bgs to 60' bgs
- Aluminum, calcium, iron, lead for boring 2712 samples

For field duplicate sample CAN127-2711-0000 and CAN127-2711-2764, benzo(b)fluoranthene was qualified as estimated **J** based on outlying evaluation criteria. For field duplicate samples CAN127-2713-0000 and CAN127-2713-2763, aluminum, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, manganese, potassium, and zinc were qualified as estimated **J** based on the outlying precision parameters, and lead data for field duplicate samples CAN127-2710-0005 and CAN127-2710-2766 were qualified as estimated **J**. The

field duplicate samples are a measure of the representativeness with which sample data accurately and precisely represent the characteristic of a population. For eleven metals, qualifications were required for one of the field duplicate sample sets due to outlying precision parameters. Overall, the representativeness of the data set was judged to be acceptable for SWMU 127 because the other field duplicate sample set were demonstrating acceptable precision.

8.4.3 Reporting Limits

Reporting limits were raised for several metals analyses and one TRPH analysis by no more than 10 times the nominal RL. Selenium and thallium analyses for several samples required dilutions due to either matrix interferences or dilutions. Selenium and thallium data, which had elevated reporting limits due to matrix interferences, were qualified as estimated **J** (detects) or **UJ** (nondetects). Lead analyses required dilutions due to matrix interferences or lead concentrations above the calibration range. Arsenic analyses also required dilutions due to matrix interferences, and Method 6010 analyses, and one TRPH analysis required dilutions due to calcium or TRPH concentrations above the calibration range.

Dilutions were required for two VOC and SVOC analyses and one lead analysis which elevated the reporting limit by a factor greater than ten. For VOC analysis, samples CAN127-2710-0000 and CAN127-2709-0000 were analyzed by the medium-level method and diluted by a factor of 10 due to concentrations of target VOCs above the calibration range. The reporting limits for the VOC analyses were elevated by a factor of 1000. For SVOC analyses of the same samples, dilutions were required due to concentrations of nontarget SVOCs above the calibration range which elevated the reporting limits by a factor of 100. Due to lead concentrations above the calibration range for sample CAN127-2711-7264, a dilution by a factor of 20 was required.

8.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 127 were determined to meet quality criteria except the lead and selenium data which were rejected. The dilution of the VOC and SVOC may be a limitation because low level analytes may have been diluted to concentrations which were below the elevated reporting limit. For the VOC analysis of the diluted samples,

benzene, toluene, ethylbenzene, and/or xylenes (total) were detected, and for the SVOC analysis, 2-methylnaphthalene and/or naphthalene were detected. For the elevated metal RLs, the RLs were judged not to limit the data usability because either the RLs were below the RBCs or the laboratory would report estimated concentrations below the RBCs. TRPH RLs were judged not to be a limitation because TRPH was detected in the samples with elevated RLs. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent and to be used for the human health risk screening.

8.5 NATURE AND EXTENT OF CONTAMINATION

SWMU 127 is a sand trap with two leach fields serving the POL truck wash. The sand trap and a new leach field installed in 1991 are currently being used, and the old leach field is no longer used but still in place. Two borings were advanced to a depth of 10 feet below the pavement adjacent to the sand trap, and three borings were advanced to 60 feet below ground at appropriate locations within each of the leach fields during the Phase I investigation. Two additional borings to a depth of 10 feet below the pavement adjacent to the sand trap and six additional borings to a depth of 60 feet below ground surface in the leach fields were drilled and sampled for the Phase II investigation. In general the Phase I and Phase II samples appeared relatively free of organic contamination. There was no visible evidence of spills or leaks in the vicinity. The entire area around the sand trap (the wash rack) is paved, and the area around the leach fields is grassy. Except for minor petroleum staining in the upper two feet of soil around the sand trap and a few of the samples in one Phase I boring (12708) and the surface samples from Phase II borings 12709 and 12710 in the leach field, no evidence of gross contamination was encountered during sampling. The chemical test results show low levels of organic contamination, including VOCs, PAHs, some other non-PAH SVOCs, and TRPH predominantly in the shallow samples. Where TRPH was detected at depth, such as in boring 12712, 12713, 12715, and 12716, other analyses show that no volatile target analytes were detected. TRPH was not detected in any of the soil samples at the maximum boring depths of 60 feet.

8.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals in soil were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels were not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 8-3 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, cadmium, nickel and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. The maximum concentrations of barium, chromium, cobalt, copper, lead, manganese, thallium, and zinc exceeded background levels; therefore, these metals were retained for further evaluation as chemicals of concern in soil. A brief discussion of the interpretation of the background comparison is presented here.

The maximum detected concentration of aluminum (14,700 mg/kg) exceeded the background UTL of 10,540 mg/kg. The maximum concentration also exceeded the range of detected Base-wide background concentrations. However, this concentration is well below the aluminum literature value for the region (50,000 mg/kg). Therefore, aluminum was considered to be within background levels and was not evaluated further.

The maximum detected concentration of barium (1,540 mg/kg) exceeded the background UTL of 642 mg/kg. The maximum concentration also exceeded the range of detected Base-wide background concentrations and was more than three times higher than the regional barium literature value of 500 mg/kg. While barium has been shown to substitute for calcium in caliche and may be naturally occurring (Klein and Hurlbutt 1985), to be conservative barium was considered to exceed background levels at this SWMU. This conservative approach was used because of the magnitude by which the regional and background values were exceeded.

The maximum detected concentrations of beryllium (0.76 mg/kg) exceeded the background UTL of 0.73 mg/kg. However, this concentration did not exceed the range of detected Base-wide background concentrations, and it is consistent with the regional literature values for beryllium (1-2 mg/kg). Therefore, beryllium was considered to be within background levels and was not evaluated further.

The maximum detected concentration of nickel (10.5 mg/kg) only slightly exceeded the background UTL of 9 mg/kg and the range of detected Base-wide background concentrations. Additionally, this concentration did not exceed the regional literature value for nickel (15 mg/kg). Therefore, nickel was considered to be within background levels and was not retained for further evaluation.

8.7 RISK SCREENING

8.7.1 Exposure Pathway Flow Chart

Figure 8-4 shows the site conceptual exposure model (SCEM) of chemical sources and potential human exposure pathways for the POL washrack sandtrap and leach field (SWMU 127). In the SCEM, potentially complete exposure pathways are indicated with solid lines; incomplete or insignificant pathways are indicated with broken lines.

The primary potential contaminant sources are waste fluids (e.g., wash water containing fuels, oils, and solvents) that may have been discharged to the sand trap and leach fields. Mixing and infiltration of the wastes with the soil is the primary chemical release mechanism. Once released to the soil the chemicals may then be released to groundwater by infiltration/percolation and to the atmosphere by volatilization or wind erosion. Chemicals could also be released directly to receptors via contact with soil. Storm water runoff is considered to be an insignificant pathway because the SWMU is primarily below ground, and it covers a small area. In addition, surface spills are not likely to be significant, and no developed drainageways are present near the SWMU.

As shown in Figure 8-4, surface soils may provide exposures to Base workers (occupational exposures), hypothetical future construction workers, or hypothetical trespassers (if the Base is closed in the future) via soil ingestion, dermal contact, or inhalation of air emissions

(volatile and particulates). Subsurface soils may provide exposures to construction workers (i.e.,during excavation) via ingestion, dermal contact and inhalation of air emissions.

Groundwater is used for domestic purposes on- and off-Base. However, groundwater is probably an insignificant pathway at this SWMU because fate and transport modeling in the Phase I investigation showed that chemicals would not be transported to groundwater at concentrations of concern. In addition, only low levels of contamination were found is subsurface soils indicating that vertical transport of groundwater is not occurring.

In summary, the potentially complete human exposure pathways at SWMU 127 are:

Occupational Workers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

Hypothetical Construction Workers

- Ingestion of and dermal contact with surface and subsurface soil
- Inhalation of volatile emissions and airborne particulate matter from surface and subsurface soil

Hypothetical Trespasser

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

8.7.2 Comparison of Phase II Concentrations to Phase I Concentrations and RBCs

The objective of the Phase II risk evaluation was to verify whether the recommendation for no further action based on the Phase I Baseline Risk Assessment (W-C 1994) is appropriate at this SWMU. To meet this objective, maximum detected Phase II concentrations were

compared to maximum detected Phase I concentrations. This comparison was made to evaluate whether the extent of contamination and potential risk had been adequately defined in Phase I and to assess whether the no further action recommendation was appropriate.

Phase II concentrations that exceeded Phase I concentrations were compared to highly conservative EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994). This comparison was made to evaluate if Phase II chemicals were detected at concentrations that could pose a significant human health risk (i.e., if the potential risk at the SWMU is higher than predicted in Phase I).

EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. Note that the RBCs are based on conservative residential exposure assumptions that significantly overestimate exposures that are likely to occur at this SWMU because the SWMU is in an industrial area. Therefore, risks predicted from the RBC comparison significantly overestimate actual risks at the SWMU. A discussion of the methodology used to derive the RBCs is given in section 3.4 and Appendix D.

Table 8-4 shows the comparison of the Phase II maximum concentrations with Phase I concentrations and with RBCs. As would be expected, some chemicals detected in Phase II exceeded Phase I concentrations while for others the Phase II concentrations were lower. Of these chemicals that exceeded Phase I concentrations, only dibenzo(a,h)anthracene was detected at a concentration (0.28 mg/kg) which exceeded the residential soil RBC (0.088 mg/kg). Residential RBCs are overly conservative for actual exposures at this SWMU. Additionally, those Phase II chemicals which did not exceed Phase I concentrations do not pose any unacceptable human health risks because their concentrations are below concentrations which were shown to pose no unacceptable risk in the Phase I Baseline Risk Assessment.

As stated in the previous paragraph, the maximum detected concentration of dibenzo(a,h)anthracene (0.28 mg/kg) exceeded the residential soil RBC of 0.088 mg/kg. The estimated risk from this concentration is 3×10^{-6} which is within the EPA target risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1, 10, 000) for exposure to chemicals released from hazardous waste sites (EPA 1990a, 1990d, 1991d, 1992d). However, this is a very

conservative comparison because SWMU 127 is located in an industrial area of the Base and is likely to remain an industrial area in the future. Therefore, the risk estimate based on a residential exposure scenario is conservative and overestimates actual risks at the SWMU. The maximum dibenzo(a,h)anthracene concentration does not exceed the industrial soil RBC of 0.39 mg/kg. Therefore, no unacceptable human health risks are expected due to the concentrations of chemicals detected at SWMU 127.

Reporting limits were elevated 1,000 times for VOCs in samples 2709-0000 and 2710-0000 due to high concentrations of target compounds. The reporting limits were elevated 100 times for SVOCs in these two surface samples due to high concentrations of nontarget compounds. Fuel-related target VOCs were detected in both of these samples; therefore, the elevated reporting limits for VOCs do not limit the usability of the data for the risk assessment (i.e., the target compounds were detected and evaluated).

The SVOC results for samples 2709-0000 and 2710-0000 were nondetect for most target compounds. Most of the target SVOCs (e.g., PAHs) were detected and evaluated in other samples and locations at this site; however, it is possible that significant concentrations of these target SVOCs may be present in these samples but were not evaluated in this risk evaluation because they were reported as nondetect. Therefore, the estimated potential risk discussed above may have been underestimated. Samples 2709-0000 and 2710-0000 were collected beneath the pavement surface at the wash rack; therefore, exposures to these samples are unlikely, and the uncertainty caused by these elevated reporting limits will not likely affect the results of the risk evaluation. In addition, the potentially impacted area is very small, limited to the area around the drain and limited to the depths between 0 and 5 feet. Therefore, because exposure would be very limited, no significant risk would be expected even if the pavement were removed in the future. Finally, as discussed in the next section, the potential for impacts to groundwater are insignificant based on the lack of contamination in the sample taken at a depth of 5 feet.

The potential cumulative risk at the SWMU was estimated by adding the incremental risk posed by Phase II concentrations to the risks calculated in the Phase I risk assessment. This is a very conservative approach that overestimates risk because it accounts for risk from the same chemical twice (i.e., in the Phase I risk assessment and in the Phase II risk evaluation. Chemicals for which the Phase II concentrations did not exceed Phase I concentrations were

not included because higher concentrations were already evaluated in the Phase I risk assessment. Table 8-4a presents the incremental risk due to the Phase II concentrations, the Phase I risks, and the potential cumulative risks. Table 8-4a shows that the incremental effects of the Phase II concentrations do not significantly impact the results of the risk assessment. In addition, the potential cumulative cancer risk of 2×10^{-5} and the potential cumulative noncancer hazard of 0.1 are below or within EPA's target risk range.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, naphthalene, pyrene, and toluene) were analyzed for individually in the soil samples at the SWMU.

In the Phase II investigation at SWMU 127, TRPH was detected in the surface soil sample 12710-0000 at a maximum concentration of 11,600 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Except for dibenzo(a,h)anthracene, potentially toxic constituents of the TRPH (e.g., BTEX, PAHs) were detected at concentrations which were below the Phase I concentrations or which did not exceed RBCs. In addition, the maximum detected concentration of dibenzo(a,h)anthracene did not result in an estimated potential risk which exceeded the EPA's target risk range, although some uncertainty exists regarding the potential risk from target PAHs which were reported as nondetect at elevated reporting limits. Since the known toxic constituents of TRPH were not detected at concentrations of concern, it is unlikely that other TRPH constituents would contribute significantly to risks at the SWMU. Furthermore, the SWMU area is relatively small (approximately 170 feet by 60 feet), and exposure to contaminated areas would be limited because the wash rack is covered by pavement, and there are no daily activities that occur at the leach field. Therefore, TRPH concentrations detected at this SWMU are not likely to pose any unacceptable human health risks.

8.7.3 Evaluation of the Groundwater Pathway

Fate and transport modeling done for the Phase I RFI indicated that chemicals detected at SWMU 127 would not be transported to groundwater at concentrations of potential concern.

The vertical distribution of contaminants detected in the soil during the Phase II investigation was used to evaluate whether chemical releases pose a threat to groundwater. Most of the chemicals of potential concern were detected only in the upper 5 feet of soil indicating that they are not infiltrating and being transported to the ground water (approximately 250 to 380 feet bgs). TRPH was detected at a maximum concentration of 11,600 mg/kg in the surface soil at boring 12710. The second highest detection of TRPH was 1,700 mg/kg in boring 12716 at 50 feet. All borings were nondetect for TRPH at a depth of 60 feet.

During the Phase I investigation, TRPH was detected at a maximum concentration of 334 mg/kg in the surface soil of Boring 1275, and the highest subsurface concentration was 170 mg/kg from Boring 1278 at 8 feet bgs. Boring 12710 is located at the wash rack. Boring 12716 is located at the end of the new leach field and is located farther out than Phase I borings. TRPH was not detected in the 10 foot to 30 foot interval of the eight new borings except for boring 12712 which contained detections of approximately 50 to 200 mg/kg. All of the borings located in the leach fields had detections of TRPH in the 35 to 50 foot intervals. Therefore, it appears that a release of TRPH has occurred and has been transported vertically. However, TRPH constituents that are likely to contribute to risk (i.e., those with toxicity factors) were nondetect in these deep samples, so the TRPH likely consists of relatively nontoxic fuel constituents (e.g., alkanes). Since no TRPH was detected at a depth of 60 feet, the major toxic constituents of TRPH were not detected in the deeper samples, low annual rainfall is reported, and the groundwater is deep (approximately 250 to 280 feet bgs), groundwater is unlikely to be impacted by the release of TRPH from this SWMU.

8.7.4 Conclusions

None of the Phase II chemicals were detected in soil at concentrations which would pose an unacceptable human health risk. In addition, although a release of TRPH has occurred, it is unlikely to impact groundwater. Therefore, no further action is recommended for this SWMU.

8.8 SUMMARY AND RECOMMENDATIONS

Seventy-one soil samples were collected and analyzed from six 60-foot and two 10-foot soil borings at SWMU 127 during the Phase II RFI. Maximum detected concentrations were

compared to Phase I results to assess whether any Phase II results exceeded Phase I results. If any Phase II results did exceed Phase I results, the maximum detected concentrations were compared to background levels and RBCs.

Phase II sampling results confirmed that contamination is mainly confined to shallow soils. However, TRPH was detected at depth in several borings. However, TRPH was not detected at the maximum depth of the borings 60 feet, and it is not likely that the TRPH would impact site groundwater. Eight metals detected during the Phase II investigation exceeded background ranges, six of these metals exceeded the Phase I results. Seventeen organic compounds also exceeded the concentrations detected during the Phase I investigation. Only one compound, dibenzo(a,h)anthracene, exceeded residential soil RBCs. However, the risk posed from this chemical is within the EPA target risk range of 10^{-6} to 10^{-4}.

Because there are no unacceptable health risks associated with the SWMU, it is recommended that no further investigation is necessary for this SWMU.

TABLE 8-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
SAND TRAP AND LEACH FIELDS (SWMU NO.127)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters				Sample Containers	
					VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 12709	0 - 0.5	CAN127-2709-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN127-2709-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN127-2709-2706	MRD	Soil	X	X	X	X	2	1
	8 - 10	CAN127-2709-0010		Soil	X	X	X	X	2	1
Boring 12710	0 - 0.5	CAN127-2710-0000		Soil	X	X	X	X	2	1
	3 - 5	CAN127-2710-0005		Soil	X	X	X	X	2	1
	3 - 5	CAN127-2710-2766	FD	Soil	X	X	X	X	2	1
	8 - 10	CAN127-2710-0010		Soil	X	X	X	X	2	1
Boring 12711	0 - 0.5	CAN127-2711-0000		Soil	X	X	X	X	2	1
	0 - 0.5	CAN127-2711-2764	FD	Soil	X	X	X	X	2	1
	0 - 0.5	CAN127-2711-2704	MRD	Soil	X	X	X	X	2	1
	3 - 5	CAN127-2711-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN127-2711-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN127-2711-0015		Soil	X	X	X	X	2	1
	18 - 20	CAN127-2711-0020		Soil	X	X	X	X	2	1
	18 - 20	CAN127-2711-2705	MRD	Soil	X	X	X	X	2	1
	23 - 25	CAN127-2711-0025		Soil	X	X	X	X	2	1
	28 - 30	CAN127-2711-0030		Soil	X	X	X	X	2	1
	28 - 30	CAN127-2711-6030	MS/MSD	Soil	X	X	X	X	2	1
	33 - 35	CAN127-2711-0035		Soil	X	X	X	X	2	1
	38 - 40	CAN127-2711-0040		Soil	X	X	X	X	2	1
	48 - 50	CAN127-2711-0050		Soil	X	X	X	X	2	1
	58 - 60	CAN127-2711-0060		Soil	X	X	X	X	2	1
Boring 12712	0 - 0.5	CAN127-2712-0000		Soil	X	X	X	X	1	1
	3 - 5	CAN127-2712-0005		Soil	X	X	X	X	1	1
	8 - 10	CAN127-2712-0010		Soil	X	X	X	X	1	1
	13 - 15	CAN127-2712-0015		Soil	X	X	X	X	1	1
	18 - 20	CAN127-2712-0020		Soil	X	X	X	X	1	1

TABLE 8-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
SAND TRAP AND LEACH FIELDS (SWMU NO.127)
CANNON AFB, NEW MEXICO

Sample	Target Interval	Sample Identification	QA/QC	Sample	Analytical Parameters				Sample Containers	
Location	(ft-bgs)	Number	Type	Matrix	VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 12712	23 - 25	CAN127-2712-0025		Soil	X	X	X	X	1	1
	28 - 30	CAN127-2712-0030		Soil	X	X	X	X	1	1
	33 - 35	CAN127-2712-0035		Soil	X	X	X	X	1	1
	38 - 40	CAN127-2712-0040		Soil	X	X	X	X	1	1
	48 - 50	CAN127-2712-0050		Soil	X	X	X	X	1	1
	58 - 60	CAN127-2712-0060		Soil	X	X	X	X	1	1
Boring 12713	0 - 0.5	CAN127-2713-0000		Soil	X	X	X	X	1	1
	0 - 0.5	CAN127-2713-2763	FD	Soil	X	X	X	X	1	1
	0 - 0.5	CAN127-2713-2703	MRD	Soil	X	X	X	X	1	1
	3 - 5	CAN127-2713-0005		Soil	X	X	X	X	2	1
	8 - 10	CAN127-2713-0010		Soil	X	X	X	X	2	1
	13 - 15	CAN127-2713-0015		Soil	X	X	X	X	2	1
	18 - 20	CAN127-2713-0020		Soil	X	X	X	X	2	1
	23 - 25	CAN127-2713-0025		Soil	X	X	X	X	2	2
	28 - 30	CAN127-2713-0030		Soil	X	X	X	X	2	2
	33 - 35	CAN127-2713-0035		Soil	X	X	X	X	2	2
	38 - 40	CAN127-2713-0040		Soil	X	X	X	X	2	2
	48 - 50	CAN127-2713-0050		Soil	X	X	X	X	2	1
	58 - 60	CAN127-2713-0060		Soil	X	X	X	X	2	1
Boring 12714	0 - 0.5	CAN127-2714-0000		Soil	X	X	X	X	2	2
	0 - 0.5	CAN127-2714-2701	MRD	Soil	X	X	X	X	2	2
	0 - 0.5	CAN127-2714-2761	FD							
	3 - 5	CAN127-2714-0005		Soil	X	X	X	X	2	2
	8 - 10	CAN127-2714-0010		Soil	X	X	X	X	2	2
	13 - 15	CAN127-2714-0015		Soil	X	X	X	X	2	2
	18 - 20	CAN127-2714-0020		Soil	X	X	X	X	2	2
	23 - 25	CAN127-2714-0025		Soil	X	X	X	X	2	2
	28 - 30	CAN127-2714-0030		Soil	X	X	X	X	2	2

TABLE 8-1

SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
SAND TRAP AND LEACH FIELDS (SWMU NO.127)
CANNON AFB, NEW MEXICO

Sample	Target Interval	Sample Identification	QA/QC	Sample	Analytical Parameters				Sample Containers	
Location	(ft-bgs)	Number	Type	Matrix	VOCs	SVOCs	Metals	TRPH	4 oz. jars	16 oz. jars
Boring 12714	33 - 35	CAN127-2714-0035		Soil	X	X	X	X	2	2
	38 - 40	CAN127-2714-0040		Soil	X	X	X	X	2	2
	48 - 50	CAN127-2714-0050		Soil	X	X	X	X	2	2
	58 - 60	CAN127-2714-0060		Soil	X	X	X	X	2	2
Boring 12715	0 - 0.5	CAN127-2715-0000		Soil	X	X	X	X	1	1
	3 - 5	CAN127-2715-0005		Soil	X	X	X	X	1	1
	3 - 5	CAN127-2715-2702	MRD	Soil	X	X	X	X	1	1
	8 - 10	CAN127-2715-0010		Soil	X	X	X	X	1	1
	8 - 10	CAN127-2715-2762	FD	Soil	X	X	X	X	1	1
	13 - 15	CAN127-2715-0015		Soil	X	X	X	X	1	1
	18 - 20	CAN127-2715-0020		Soil	X	X	X	X	1	1
	23 - 25	CAN127-2715-0025		Soil	X	X	X	X	1	1
	28 - 30	CAN127-2715-0030		Soil	X	X	X	X	1	1
	33 - 35	CAN127-2715-0035		Soil	X	X	X	X	1	1
	38 - 40	CAN127-2715-0040		Soil	X	X	X	X	1	1
	48 - 50	CAN127-2715-0050		Soil	X	X	X	X	1	1
	58 - 60	CAN127-2715-0060		Soil	X	X	X	X	1	1
Boring 12716	0 - 0.5	CAN127-2716-0000		Soil	X	X	X	X	2	2
	3 - 5	CAN127-2716-0005		Soil	X	X	X	X	2	2
	8 - 10	CAN127-2716-0010		Soil	X	X	X	X	2	2
	13 - 15	CAN127-2716-0015		Soil	X	X	X	X	2	2
	18 - 20	CAN127-2716-0020		Soil	X	X	X	X	2	2
	23 - 25	CAN127-2716-0025		Soil	X	X	X	X	2	2
	28 - 30	CAN127-2716-0030		Soil	X	X	X	X	2	2
	33 - 35	CAN127-2716-0035		Soil	X	X	X	X	2	2
	38 - 40	CAN127-2716-0040		Soil	X	X	X	X	2	2
	48 - 50	CAN127-2716-0050		Soil	X	X	X	X	2	2
	58 - 60	CAN127-2716-0060		Soil	X	X	X	X	2	2

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate
See Figure 8-2 for locations of the borings.

TABLE 8-2a

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2709-0000			CAN127-2709-0005			CAN127-2709-0010			CAN127-2710-0000			CAN127-2710-0005			CAN127-2710-0010		
LAB SAMPLE NUMBER	0398710011SA			0398710009SA			0398710008SA			0398710005SA			0398710003SA			0398710007SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	5000	14000	J	7.3	12	J	11	11		7500	14000	J	12	12		11	11	
Benzene	<	7000	U	<	5.8	U	<	5.7	U	3800	7200	J	<	5.9	U	<	5.5	U
Ethylbenzene	3900	7000	J	<	5.8	U	<	5.7	U	54000	7200		<	5.9	U	<	5.5	U
Methylene chloride	<	7000	U	<	5.8	U	<	5.7	U	<	7200	U	<	5.9	U	<	5.5	U
Toluene	14000	7000		<	5.8	U	<	5.7	U	82000	7200		<	5.9	U	<	5.5	U
Xylenes (total)	33000	7000		<	5.8	U	<	5.7	U	260000	7200		<	5.9	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Anthracene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Benzo(a)anthracene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Benzo(a)pyrene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Benzo(b)fluoranthene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Benzo(g,h,i)perylene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Benzo(k)fluoranthene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Carbazole	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Chrysene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Dibenz(a,h)anthracene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Fluoranthene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Fluorene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
2-Methylnaphthalene	4900	37000	J	<	380	U	<	380	U	40000	38000		<	390	U	<	360	U
Naphthalene	<	37000	U	<	380	U	<	380	U	21000	38000	J	<	390	U	<	360	U
Phenanthrene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U
Pyrene	<	37000	U	<	380	U	<	380	U	<	38000	U	<	390	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A-2a.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 8-2a

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2709-0000			CAN127-2709-0005			CAN127-2709-0010			CAN127-2710-0000			CAN127-2710-0005			CAN127-2710-0010		
LAB SAMPLE NUMBER	0398710011SA			0398710009SA			0398710008SA			0398710005SA			0398710003SA			0398710007SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	9240	11.2		7350	23.1		6950	22.8		11100	11.5		4530	58.8		4900	11	
Arsenic	3	0.56		2.3	0.58		1.3	0.57		2.4	0.58		1.6	0.59		0.88	0.55	
Barium	638	1.1	J	866	2.3	J	1540	2.3	J	205	1.2	J	329	5.9	J	128	1.1	J
Beryllium	0.43	0.22		0.43	0.46	J	0.4	0.46	J	0.55	0.23		<	1.2	U	0.34	0.22	
Cadmium	0.64	0.56		<	1.2	U	<	1.1	U	<	0.58	U	<	2.9	U	<	0.55	U
Calcium	53500	22.4		204000	46.2		135000	45.5		20500	23		254000	118		75700	22	
Chromium	11.3	1.1		4.4	2.3		4.6	2.3		10.5	1.2		<	5.9	U	3.9	1.1	
Cobalt	8	1.1		3.2	2.3		<	2.3	U	5.3	1.2		3	5.9	J	2.5	1.1	
Copper	8.5	2.2		4.5	4.6	J	3	4.6	J	8.8	2.3		<	11.8	U	2.1	2.2	J
Iron	10800	11.2		5780	23.1		5300	22.8		10400	11.5		3560	58.8		4120	11	
Lead	6.4	0.56	J	3.9	0.58	J	3.5	0.57	J	7.6	0.58	J	3.1	0.59	J	3.3	0.55	J
Magnesium	2220	22.4		3480	46.2		3490	45.5		2000	23		3600	118		2520	22	
Manganese	340	1.1		80.1	2.3		47	2.3		174	1.2		36.5	5.9		60.8	1.1	
Nickel	10.5	4.5		6.9	9.2	J	4.9	9.1	J	9	4.6		6.5	23.5	J	5.5	4.4	
Potassium	1330	560		1330	1150		1730	1140		1920	576		735	2940	J	1300	550	
Sodium	<	560	U	<	1150	U	<	1140	U	<	576	U	<	2940	U	<	550	U
Thallium	<	1.1	UJ	<	1.2	UJ	<	2.3	UJ	<	1.2	UJ	<	2.4	UJ	<	1.1	UJ
Vanadium	18.5	1.1		15.3	2.3		12.9	2.3		19.8	1.2		11.1	5.9		11.7	1.1	
Zinc	25.2	2.2		14.2	4.6		12	4.6		25.4	2.3		9.8	11.8	J	10	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.8	U	<	46.2	U	<	45.5	U	11600	1150		<	47	U	<	44	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A-2a.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 8-2a

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2711-0000			CAN127-2711-0005			CAN127-2711-0010			CAN127-2711-0015			CAN127-2711-0020		
LAB SAMPLE NUMBER	0397370007SA			0397370008SA			0397370009SA			0397370010SA			0397370011SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U	4.6	11	J	5.3	11	J	7	11	J	5	11	J
Benzene	<	5.4	U	<	5.3	U	<	5.7	U	<	5.5	U	<	5.6	U
Ethylbenzene	<	5.4	U	<	5.3	U	<	5.7	U	<	5.5	U	<	5.6	U
Methylene chloride	<	5.4	U	<	5.3	U	1.3	5.7	J	<	5.5	U	1.2	5.6	J
Toluene	<	5.4	U	<	5.3	U	<	5.7	U	<	5.5	U	<	5.6	U
Xylenes (total)	<	5.4	U	<	5.3	U	<	5.7	U	<	5.5	U	<	5.6	U
Semivolatile Organics (µg/kg)															
Acenaphthene	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Anthracene	68	360	J	<	350	U	<	370	U	<	370	U	<	370	U
Benzo(a)anthracene	910	360		<	350	U	<	370	U	<	370	U	<	370	U
Benzo(a)pyrene	1100	360		<	350	U	<	370	U	<	370	U	<	370	U
Benzo(b)fluoranthene	1100	360	J	<	350	UJ	<	370	UJ	<	370	UJ	<	370	UJ
Benzo(g,h,i)perylene	700	360		<	350	U	<	370	U	<	370	U	<	370	U
Benzo(k)fluoranthene	1600	360		<	350	U	<	370	U	<	370	U	<	370	U
Carbazole	170	360	J	<	350	U	<	370	U	<	370	U	<	370	U
Chrysene	1500	360		<	350	U	<	370	U	<	370	U	<	370	U
Dibenz(a,h)anthracene	280	360	J	<	350	U	<	370	U	<	370	U	<	370	U
Fluoranthene	2800	360		<	350	U	<	370	U	<	370	U	<	370	U
Fluorene	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Indeno(1,2,3-cd)pyrene	700	360		<	350	U	<	370	U	<	370	U	<	370	U
2-Methylnaphthalene	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Naphthalene	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Phenanthrene	1100	360		<	350	U	<	370	U	<	370	U	<	370	U
Pyrene	2300	360		<	350	U	<	370	U	<	370	U	<	370	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A-2a.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 8-2a

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2711-0000			CAN127-2711-0005			CAN127-2711-0010			CAN127-2711-0015			CAN127-2711-0020		
LAB SAMPLE NUMBER	0397370007SA			0397370008SA			0397370009SA			0397370010SA			0397370011SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)															
Aluminum	11000	10.8	J	7000	10.6	J	6940	22.7	J	10200	11.1	J	6390	11.2	J
Arsenic	2.4	0.54		1.6	0.53		1.5	0.57		2	0.55		1.9	0.56	
Barium	105	1.1	J	86.2	1.1	J	232	2.3	J	241	1.1	J	54.9	1.1	J
Beryllium	0.5	0.22		0.3	0.21		0.47	0.45		0.5	0.22		0.58	0.22	
Cadmium	<	0.54	U	<	0.53	U	<	1.1	U	<	0.55	U	<	0.56	U
Calcium	19300	21.6		63300	21.1		161000	45.3		63500	22.2		57400	22.4	
Chromium	15.5	1.1		6.4	1.1		4.7	2.3		7.4	1.1		5.3	1.1	
Cobalt	3.4	1.1		2.1	1.1		2.5	2.3		3	1.1		3.3	1.1	
Copper	7.5	2.2		4.5	2.1		2.6	4.5	J	4.8	2.2		4.7	2.2	
Iron	9760	10.8	J	6140	10.6	J	5560	22.7	J	7640	11.1	J	5610	11.2	J
Lead	83.9	5.4		4.5	0.53		4.1	0.57		6.9	0.55		6.2	0.56	
Magnesium	1980	21.6		2070	21.1		4690	45.3		4600	22.2		3890	22.4	
Manganese	183	1.1	J	83.9	1.1	J	55.9	2.3	J	111	1.1	J	111	1.1	J
Nickel	8.1	4.3		6.3	4.2		8.5	9.1	J	8	4.4		7.2	4.5	
Potassium	2030	541		1310	528		1600	1130		2620	554		2040	559	
Sodium	<	541	U	<	528	U	<	1130	U	248	554	J	<	559	U
Thallium	<	0.54	U	<	0.53	U	<	1.1	UJ	<	1.1	UJ	<	0.56	U
Vanadium	17.8	1.1		12.5	1.1		13.5	2.3		15.4	1.1		15.6	1.1	
Zinc	34.7	2.2		15.1	2.1		13.3	4.5		20.8	2.2		13.7	2.2	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	130	43.3		<	42.2	U	<	45.3	U	<	44.3	U	<	44.7	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A-2a.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 8-2a

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2711-0025			CAN127-2711-0030			CAN127-2711-0035			CAN127-2711-0040			CAN127-2711-0050			CAN127-2711-0060		
LAB SAMPLE NUMBER	0397370012SA			0397370013SA			0397740013SA			0397740014SA			0397740015SA			0397740016SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	8.6	11	J	<	11	U	1.3	11	J	<	11	U	<	11	U	<	11	U
Benzene	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.6	U
Ethylbenzene	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.6	U
Methylene chloride	<	5.6	U	<	5.6	U	1.6	5.6	UJ	1.2	5.5	UJ	1.5	5.6	UJ	1.6	5.6	UJ
Toluene	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.6	U
Xylenes (total)	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.6	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Anthracene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Benzo(b)fluoranthene	<	370	UJ	<	370	UJ	<	370	U	<	360	U	<	370	U	<	370	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Benzo(k)fluoranthene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Carbazole	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Chrysene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Fluoranthene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Fluorene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
2-Methylnaphthalene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Naphthalene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Phenanthrene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U
Pyrene	<	370	U	<	370	U	<	370	U	<	360	U	<	370	U	<	370	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A-2a_.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 8-2a

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2711-0025			CAN127-2711-0030			CAN127-2711-0035			CAN127-2711-0040			CAN127-2711-0050			CAN127-2711-0060		
LAB SAMPLE NUMBER	0397370012SA			0397370013SA			0397740013SA			0397740014SA			0397740015SA			0397740016SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	2880	22.3	J	7120	11.3	J	7040	11.2		5410	10.9		4770	11.1		3590	11.1	
Arsenic	1.7	0.56		1.4	0.56		1.3	0.56		2.2	0.55		1.6	0.56		1.8	0.56	
Barium	109	2.2	J	144	1.1	J	27	1.1		22.5	1.1		42.7	1.1		24.5	1.1	
Beryllium	0.29	0.45	J	0.21	0.23	J	0.27	0.22		0.27	0.22		0.24	0.22		0.19	0.22	J
Cadmium	<	1.1	U	<	0.56	U	<	0.56	U	<	0.55	U	<	0.56	U	<	0.56	U
Calcium	190000	44.6		81300	22.6		30700	22.3		30400	21.9		64400	22.3		32400	22.2	
Chromium	2.7	2.2		5.4	1.1		6.4	1.1		4.5	1.1		5.5	1.1		3.2	1.1	
Cobalt	<	2.2	U	1.1	1.1		1.3	1.1		1.7	1.1		2.3	1.1		1.4	1.1	
Copper	1.6	4.5	J	1.8	2.3	J	2.1	2.2	J	2.1	2.2	J	2.2	2.2		2.1	2.2	J
Iron	2190	22.3	J	4590	11.3	J	5200	11.2		4690	10.9		3930	11.1		3450	11.1	
Lead	3	0.56		3.3	0.56		2.8	0.56	J	3.5	0.55	J	2.3	0.56	J	1.9	0.56	J
Magnesium	5440	44.6		6760	22.6		6810	22.3	J	3670	21.9		5350	22.3	J	3520	22.2	J
Manganese	15.7	2.2	J	36.5	1.1	J	40.7	1.1		50.9	1.1		46.3	1.1		35.8	1.1	
Nickel	3.3	8.9	J	5.7	4.5		4.6	4.5		4	4.4	J	4.2	4.5	J	2	4.4	J
Potassium	842	1120	J	1250	564		1310	558		1180	547		936	557		665	556	
Sodium	<	1120	U	<	564	U	<	558	U	<	547	U	<	557	U	<	556	U
Thallium	<	1.1	UJ	0.16	0.56	J	<	1.1	UJ	<	1.1	UJ	<	0.56	UJ	<	0.56	UJ
Vanadium	11.8	2.2		17.1	1.1		23.2	1.1		17	1.1		19.8	1.1		15.1	1.1	
Zinc	5.6	4.5		10.7	2.3		10.8	2.2		10.6	2.2		8.8	2.2		7.8	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.6	U	<	45.1	U	<	44.7	UJ	<	43.8	UJ	<	44.6	UJ	<	44.4	UJ

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A-2a.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2712-0000			CAN127-2712-0005			CAN127-2712-0010			CAN127-2712-0015			CAN127-2712-0020		
LAB SAMPLE NUMBER	0397130001SA			0397130002SA			0397130003SA			0397130004SA			0397130005SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U	<	11	U	14	11		<	11	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	6	U	<	6.1	U	<	5.7	U	<	5.5	U	<	6.9	U
Toluene	<	5.5	U	<	5.5	U	<	5.4	U	<	5.5	U	<	5.6	U
Semivolatile Organics (µg/kg)															
Anthracene	56	360	J	<	370	U	<	360	U	<	360	U	<	370	U
Benzo(a)anthracene	660	360		<	370	U	<	360	U	<	360	U	<	370	U
Benzo(a)pyrene	800	360		<	370	U	<	360	U	<	360	U	<	370	U
Benzo(b)fluoranthene	1600	360		<	370	U	<	360	U	<	360	U	<	370	U
Benzo(g,h,i)perylene	640	360		<	370	U	<	360	U	<	360	U	<	370	U
bis(2-Ethylhexyl)phthalate	68	360	J	<	370	U	<	360	U	<	360	U	<	370	U
Carbazole	120	360	J	<	370	U	<	360	U	<	360	U	<	370	U
Chrysene	1000	360		<	370	U	<	360	U	<	360	U	<	370	U
Dibenz(a,h)anthracene	120	360	J	<	370	U	<	360	U	<	360	U	<	370	U
Fluoranthene	1800	360		<	370	U	<	360	U	<	360	U	<	370	U
Indeno(1,2,3-cd)pyrene	570	360		<	370	U	<	360	U	<	360	U	<	370	U
Phenanthrene	880	360		<	370	U	<	360	U	<	360	U	<	370	U
Pyrene	1900	360		<	370	U	<	360	U	<	360	U	<	370	U
Metals (mg/kg)															
Aluminum	11800	11	J	6970	22.1	J	4560	10.9	J	4270	11	J	9520	22.6	J
Arsenic	2.4	0.55		2.3	0.55		1.5	0.54		1.7	0.55		1.8	0.56	
Barium	108	1.1		197	2.2		169	1.1		360	1.1		337	2.3	
Beryllium	0.43	0.22		0.57	0.44		0.27	0.22		0.29	0.22		0.64	0.45	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2712-0000			CAN127-2712-0005			CAN127-2712-0010			CAN127-2712-0015			CAN127-2712-0020		
LAB SAMPLE NUMBER	0397130001SA			0397130002SA			0397130003SA			0397130004SA			0397130005SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Calcium	12200	21.9	J	173000	44.3	J	96200	21.7	J	80500	22	J	195000	45.1	J
Chromium	21.4	1.1	J	6	2.2	J	3.8	1.1	J	4	1.1	J	7	2.3	J
Cobalt	3.7	1.1		3.4	2.2		2.1	1.1		2.4	1.1		<	2.3	U
Copper	7.4	2.2		5.7	4.4		2.5	2.2		2.1	2.2	J	3.9	4.5	J
Iron	9550	11	J	6380	22.1	J	3870	10.9	J	3700	11	J	6720	22.6	J
Lead	60.9	5.5	J	6.4	1.1	J	3.9	0.54	J	4.2	0.55	J	3.8	0.56	J
Magnesium	1880	21.9		3290	44.3		2640	21.7		2690	22		7850	45.1	
Manganese	167	1.1	J	99.2	2.2	J	62.9	1.1	J	65.8	1.1	J	61.5	2.3	J
Nickel	7.5	4.4		8.8	8.9	J	5.3	4.3		5.3	4.4		4.8	9	J
Potassium	2090	548		1410	1110		1200	543		1230	551		2470	1130	
Thallium	0.16	0.55	J	0.12	1.1	J	0.12	1.1	J	0.11	1.1	J	0.11	1.1	J
Vanadium	17.5	1.1	J	17	2.2	J	12.5	1.1	J	10.9	1.1	J	15.7	2.3	J
Zinc	41.1	2.2		18.3	4.4		9.6	2.2		9.9	2.2		16.4	4.5	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	168	43.9		<	44.3	U	<	43.4	U	48	44.1		293	45.1	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2712-0025			CAN127-2712-0030			CAN127-2712-0035			CAN127-2712-0040			CAN127-2712-0050			CAN127-2712-0060		
LAB SAMPLE NUMBER	0397130006SA			0397130007SA			0397130008SA			0397130009SA			0397130010SA			0397130011SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	<	12	U	<	11	U	<	11	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	12	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	6	U	<	6.7	U	<	5.8	U	<	6	U	<	6	U	<	5.6	U
Toluene	<	5.6	U	<	5.6	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.6	U
Semivolatile Organics (µg/kg)																		
Anthracene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Benzo(a)anthracene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Benzo(a)pyrene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
bis(2-Ethylhexyl)phthalate	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Carbazole	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Chrysene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Fluoranthene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Phenanthrene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Pyrene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	370	U
Metals (mg/kg)																		
Aluminum	6100	11.1	J	6870	11.3	J	5210	11.5	J	5330	11.1	J	5480	11.3	J	4600	11.2	J
Arsenic	2	0.56		1.8	0.56		1.3	0.58		1.1	0.56		1.4	0.56		1.8	0.56	
Barium	108	1.1		91.4	1.1		28.6	1.2		24	1.1		59.9	1.1		28.4	1.1	
Beryllium	0.21	0.22	J	0.32	0.23		0.15	0.23	J	0.17	0.22	J	0.19	0.23	J	0.15	0.22	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2712-0025			CAN127-2712-0030			CAN127-2712-0035			CAN127-2712-0040			CAN127-2712-0050			CAN127-2712-0060		
LAB SAMPLE NUMBER	0397130006SA			0397130007SA			0397130008SA			0397130009SA			0397130010SA			0397130011SA		
COLLECT DATE	12/08/94			12/08/94			12/08/94			12/08/94			12/08/94			12/08/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Calcium	88400	22.2	J	66000	22.6	J	66700	23	J	35500	22.2	J	51100	22.5	J	26900	22.3	J
Chromium	4.8	1.1	J	5.4	1.1	J	4.2	1.2	J	5.8	1.1	J	6.1	1.1	J	5.2	1.1	J
Cobalt	2	1.1		2.2	1.1		1.5	1.2		1.5	1.1		2.7	1.1		1.2	1.1	
Copper	2.8	2.2		2.7	2.3		1.8	2.3	J	3.6	2.2		2.7	2.3		2.3	2.2	
Iron	4350	11.1	J	5080	11.3	J	3520	11.5	J	3690	11.1	J	4050	11.3	J	3700	11.2	J
Lead	3.8	0.56	J	3.3	0.56	J	2.3	0.58	J	1.9	0.56	J	2.5	0.56	J	2	2.8	J
Magnesium	6090	22.2		5900	22.6		6920	23		9070	22.2		15000	22.5		10000	22.3	
Manganese	56.5	1.1	J	57.8	1.1	J	34.2	1.2	J	48.4	1.1	J	80.8	1.1	J	37.1	1.1	J
Nickel	5.7	4.4		5.9	4.5		3.9	4.6	J	4.5	4.4		4.3	4.5	J	3.8	4.5	J
Potassium	1640	556		1630	565		1040	576		1040	555		1070	563		936	558	
Thallium	<	0.56	U	<	0.56	U	0.12	0.58	J	<	0.56	U	<	0.56	U	<	0.56	U
Vanadium	13.3	1.1	J	20.5	1.1	J	16.1	1.2	J	18.6	1.1	J	21.5	1.1	J	16	1.1	J
Zinc	10.5	2.2		12	2.3		8.1	2.3		9.8	2.2		9.5	2.3		14	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.5	U	<	45.2	U	<	46	U	67.4	44.4		<	45.1	U	<	44.6	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2713-0000			CAN127-2713-0000			CAN127-2713-0005			CAN127-2713-0010			CAN127-2713-0010			CAN127-2713-0015		
LAB SAMPLE NUMBER	0397380001SA			0397380013SA			0397380002SA			0397380003RA			0397380003SA			0397380004RA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U				<	11	U				<	11	U			
4-Methyl-2-pentanone (MIBK)	<	11	U				<	11	U				<	11	U			
Methylene chloride	6.7	6.7					<	6.5	U				<	7	U			
Toluene	1.3	5.5	J				<	5.5	U				1.2	5.6	J			
Semivolatile Organics (µg/kg)																		
Anthracene	<	360	U	<	360	UJ	<	360	UJ	<	370	UJ	<	370	U	<	380	UJ
Benzo(a)anthracene	95	360	J	89	360	J	91	360	J	<	370	UJ	<	370	U	<	380	UJ
Benzo(a)pyrene	130	360	J	110	360	J	100	360	J	<	370	UJ	<	370	U	<	380	UJ
Benzo(b)fluoranthene	310	360	J	230	360	J	250	360	J	<	370	UJ	<	370	U	<	380	UJ
Benzo(g,h,i)perylene	100	360	J	<	360	UJ	<	360	UJ	<	370	UJ	<	370	U	<	380	UJ
bis(2-Ethylhexyl)phthalate	<	780	U	<	360	UJ	<	360	UJ	<	370	UJ	<	410	U	<	380	UJ
Carbazole	<	360	U	<	360	UJ	<	360	UJ	<	370	UJ	<	370	U	<	380	UJ
Chrysene	190	360	J	160	360	J	150	360	J	<	370	UJ	<	370	U	<	380	UJ
Dibenz(a,h)anthracene	43	360	J	<	360	UJ	<	360	UJ	<	370	UJ	<	370	U	<	380	UJ
Fluoranthene	310	360	J	310	360	J	310	360	J	<	370	UJ	<	370	U	<	380	UJ
Indeno(1,2,3-cd)pyrene	88	360	J	<	360	UJ	<	360	UJ	<	370	UJ	<	370	U	<	380	UJ
Phenanthrene	110	360	J	100	360	J	100	360	J	<	370	UJ	<	370	U	<	380	UJ
Pyrene	260	360	J	260	360	J	250	360	J	<	370	UJ	<	370	U	<	380	UJ
Metals (mg/kg)																		
Aluminum	14500	11	J				11700	10.9	J				6930	22.4	J			
Arsenic	2.6	0.55					2.6	0.55					2.5	0.56				
Barium	170	1.1	J				176	1.1	J				253	2.2	J			
Beryllium	0.71	0.22	J				0.76	0.22	J				<	0.45	UJ			

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A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2713-0000			CAN127-2713-0000			CAN127-2713-0005			CAN127-2713-0010			CAN127-2713-0010			CAN127-2713-0015		
LAB SAMPLE NUMBER	0397380001SA			0397380013SA			0397380002SA			0397380003RA			0397380003SA			0397380004RA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Calcium	41400	21.9	J				40100	21.9	J				135000	44.8	J			
Chromium	12.9	1.1	J				11.6	1.1	J				11.7	2.2	J			
Cobalt	4.6	1.1	J				4.7	1.1	J				3	2.2	J			
Copper	8.5	2.2	J				8.6	2.2	J				5.6	4.5	J			
Iron	11500	11	J				10900	10.9	J				6410	22.4	J			
Lead	13.4	2.7	J				12.5	2.7	J				4.9	0.56	J			
Magnesium	2760	21.9					2560	21.9					2960	44.8				
Manganese	187	1.1	J				200	1.1	J				84.6	2.2	J			
Nickel	10.4	4.4					9.4	4.4					7	9	J			
Potassium	2390	548	J				2080	547	J				1360	1120	J			
Thallium	0.12	0.55	J				<	0.55	U				<	0.56	U			
Vanadium	20.8	1.1					22	1.1					16.1	2.2				
Zinc	30.3	2.2	J				26.4	2.2	J				15.8	4.5	J			
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	66.5	43.9					52.3	43.8					<	44.8	U			

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2713-0015			CAN127-2713-0020			CAN127-2713-0020			CAN127-2713-0025			CAN127-2713-0025		
LAB SAMPLE NUMBER	0397380004SA			0397380005RA			0397380005SA			0397380006RA			0397380006SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U				<	11	U				<	12	U
4-Methyl-2-pentanone (MIBK)	<	11	U				<	11	U				<	12	U
Methylene chloride	<	6.3	U				<	5.5	U				<	6.3	U
Toluene	<	5.7	U				<	5.5	U				<	5.8	U
Semivolatile Organics (µg/kg)															
Anthracene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Benzo(a)anthracene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Benzo(a)pyrene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Benzo(b)fluoranthene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Benzo(g,h,i)perylene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
bis(2-Ethylhexyl)phthalate	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Carbazole	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Chrysene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Dibenz(a,h)anthracene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Fluoranthene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Indeno(1,2,3-cd)pyrene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Phenanthrene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Pyrene	<	380	U	<	360	UJ	<	360	U	<	380	UJ	<	380	U
Metals (mg/kg)															
Aluminum	4600	22.8	J				7190	22.1	J				14700	23.3	J
Arsenic	1.8	0.57					1.7	0.55					2.3	0.58	
Barium	404	2.3	J				238	2.2	J				241	2.3	J
Beryllium	0.39	0.46	J				0.56	0.44	J				0.51	0.47	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2b

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2713-0015			CAN127-2713-0020			CAN127-2713-0020			CAN127-2713-0025			CAN127-2713-0025		
LAB SAMPLE NUMBER	0397380004SA			0397380005RA			0397380005SA			0397380006RA			0397380006SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Calcium	218000	45.6	J				121000	44.2	J				180000	46.5	J
Chromium	3.2	2.3	J				6.7	2.2	J				7.1	2.3	J
Cobalt	2.1	2.3	J				3.1	2.2	J				2.1	2.3	J
Copper	2.3	4.6	J				4.1	4.4	J				3.5	4.7	J
Iron	3720	22.8	J				6340	22.1	J				8010	23.3	J
Lead	3.8	0.57	J				4.9	0.55	J				4.4	0.58	J
Magnesium	4300	45.6					4560	44.2					12600	46.5	
Manganese	46.5	2.3	J				89.2	2.2	J				49.7	2.3	J
Nickel	6.5	9.1	J				5.4	8.8	J				9.2	9.3	J
Potassium	1230	1140	J				1990	1110	J				3230	1160	J
Thallium	<	1.1	UJ				<	0.55	U				<	1.2	UJ
Vanadium	12.5	2.3					16.3	2.2					22.2	2.3	
Zinc	10	4.6	J				16.2	4.4	J				19.4	4.7	J
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	<	45.6	U				<	44.2	U				<	46.5	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2b.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2713-0030			CAN127-2713-0030			CAN127-2713-0035			CAN127-2713-0035			CAN127-2713-0040			CAN127-2713-0040		
LAB SAMPLE NUMBER	0397380007RA			0397380007SA			0397380008RA			0397380008SA			0397380009RA			0397380009SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone				<	11	U				<	11	U				5.6	11	J
2-Butanone (MEK)				<	11	U				<	11	U				<	11	U
Methylene chloride				<	5.7	U				<	5.7	U				<	5.6	U
Toluene				1.6	5.6	J				9	5.7					<	5.6	U
Semivolatile Organics (µg/kg)																		
Anthracene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Benzo(a)anthracene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Benzo(a)pyrene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Benzo(b)fluoranthene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Benzo(g,h,i)perylene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Benzo(k)fluoranthene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
bis(2-Ethylhexyl)phthalate	<	370	UJ	<	950	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Carbazole	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Chrysene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Di-n-butyl phthalate	<	370	UJ	77	370	J	<	380	UJ	58	380	J	<	370	UJ	<	370	U
Dibenz(a,h)anthracene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Fluoranthene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Indeno(1,2,3-cd)pyrene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Phenanthrene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Pyrene	<	370	UJ	<	370	U	<	380	UJ	<	380	U	<	370	UJ	<	370	U
Metals (mg/kg)																		
Aluminum				8550	22.4	J				7010	23	J				6710	11.1	J
Antimony				<	13.4	UJ				<	13.8	UJ				<	6.7	UJ

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2713-0030			CAN127-2713-0030			CAN127-2713-0035			CAN127-2713-0035			CAN127-2713-0040			CAN127-2713-0040		
LAB SAMPLE NUMBER	0397380007RA			0397380007SA			0397380008RA			0397380008SA			0397380009RA			0397380009SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Arsenic				1.9	0.56					1.4	0.57					1.4	0.56	
Barium				290	2.2	J				445	2.3	J				62.3	1.1	J
Beryllium				0.5	0.45	J				0.25	0.46	J				0.32	0.22	J
Calcium				186000	44.8	J				149000	45.9	J				30900	22.2	J
Chromium				8.8	2.2	J				4.4	2.3	J				7.2	1.1	J
Cobalt				2.2	2.2	J				1.2	2.3	J				1.9	1.1	J
Copper				4.6	4.5	J				2	4.6	J				2.1	2.2	J
Iron				5670	22.4	J				4510	23	J				5290	11.1	J
Lead				3	0.56	J				3	0.57	J				2.9	0.56	J
Magnesium				6630	44.8					6520	45.9					4540	22.2	
Manganese				38.7	2.2	J				36.3	2.3	J				47.2	1.1	J
Nickel				6.9	9	J				3.7	9.2	J				4.3	4.4	J
Potassium				1730	1120	J				1250	1150	J				1270	556	J
Sodium				521	1120	J				<	1150	U				<	556	U
Thallium				<	1.1	UJ				<	0.57	U				<	0.56	U
Vanadium				19.3	2.2					18	2.3					18.9	1.1	
Zinc				13.1	4.5	J				10.1	4.6	J				11.1	2.2	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons				47.1	44.8					<	45.9	U				<	44.5	

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TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127 CANNON AFB

LOCATOR	CAN127-2713-0050			CAN127-2713-0050			CAN127-2713-0060			CAN127-2713-0060		
LAB SAMPLE NUMBER	0397380010RA			0397380010SA			0397380011RA			0397380011SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)												
Acetone				3.1	11	J				25	11	
2-Butanone (MEK)				<	11	U				6.2	11	J
Methylene chloride				<	5.7	U				<	5.6	U
Toluene				<	5.7	U				<	5.6	U
Semivolatile Organics (µg/kg)												
Anthracene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Benzo(a)anthracene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Benzo(a)pyrene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Benzo(b)fluoranthene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Benzo(g,h,i)perylene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Benzo(k)fluoranthene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
bis(2-Ethylhexyl)phthalate	<	370	UJ	<	600	U	<	370	UJ	<	590	U
Carbazole	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Chrysene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Di-n-butyl phthalate	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Dibenz(a,h)anthracene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Fluoranthene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Indeno(1,2,3-cd)pyrene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Phenanthrene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Pyrene	<	370	UJ	<	370	U	<	370	UJ	<	370	U
Metals (mg/kg)												
Aluminum				5550	11.3	J				5450	11.1	J
Antimony				<	6.8	UJ				<	6.7	UJ

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127 CANNON AFB

LOCATOR	CAN127-2713-0050			CAN127-2713-0050			CAN127-2713-0060			CAN127-2713-0060		
LAB SAMPLE NUMBER	0397380010RA			0397380010SA			0397380011RA			0397380011SA		
COLLECT DATE	12/09/94			12/09/94			12/09/94			12/09/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Arsenic				1.9	0.57					1.8	0.56	
Barium				23.8	1.1	J				132	1.1	J
Beryllium				0.29	0.23	J				0.28	0.22	J
Calcium				39800	22.7	J				53600	22.2	J
Chromium				6.1	1.1	J				13.4	1.1	J
Cobalt				1.4	1.1	J				2.2	1.1	J
Copper				2.7	2.3	J				9.3	2.2	J
Iron				4390	11.3	J				6110	11.1	J
Lead				3.2	0.57	J				3.1	0.56	J
Magnesium				6500	22.7					4910	22.2	
Manganese				48.2	1.1	J				75.4	1.1	J
Nickel				4.2	4.5	J				6.1	4.4	
Potassium				1110	566	J				1110	555	J
Sodium				<	566	U				<	555	U
Thallium				<	0.57	U				<	0.56	U
Vanadium				21.6	1.1					20.2	1.1	
Zinc				9.9	2.3	J				9.6	2.2	J
TRPH (mg/kg)												
Total Recoverable Petroleum Hydrocarbons				47.9	45.3					<	44.4	U

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U = Nondetected value. RL = Reporting Limit.

TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2714-0000			CAN127-2714-0005			CAN127-2714-0010			CAN127-2714-0015			CAN127-2714-0020			CAN127-2714-0025		
LAB SAMPLE NUMBER	0396880006SA			0396880008SA			0396880009SA			0396880010SA			0396880011SA			0396880012SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<		U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	1.3	11	J
Methylene chloride	<	5.6	U	4.4	5.4		<	8	U	4.2	5.4	J	<	5.5	U	<	5.5	J
Toluene	<	5.6	U	<	5.4	U	<	5.4	U	<	5.4	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Anthracene	52	370	J	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Benzo(a)anthracene	450	370		96	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Benzo(a)pyrene	640	370		140	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Benzo(b)fluoranthene	750	370		150	360	J	37	360	J	<	360	U	<	360	U	<	360	U
Benzo(g,h,i)perylene	340	370	J	90	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Benzo(k)fluoranthene	800	370		170	360	J	<	360	U	<	360	U	<	360	U	<	360	U
bis(2-Ethylhexyl)phthalate	450	370		300	360	J	290	360	J	290	360	J	310	360	J	550	360	
Carbazole	100	370	J	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Chrysene	820	370		170	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	370	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Dibenz(a,h)anthracene	150	370	J	43	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Fluoranthene	1400	370		330	360	J	50	360	J	<	360	U	<	360	U	<	360	U
Indeno(1,2,3-cd)pyrene	360	370	J	94	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Phenanthrene	570	370		160	360	J	<	360	U	<	360	U	<	360	U	<	360	U
Pyrene	1300	370		290	360	J	41	360	J	<	360	U	<	360	U	<	360	U
Metals (mg/kg)																		
Aluminum	7050	11.2		9210	10.9		6200	21.8		6230	10.8		7840	11		4610	22.1	
Antimony	<	6.7	UJ	<	6.5	UJ	<	13.1	UJ	<	6.5	UJ	4.6	6.6	UJ	<	13.3	UJ

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TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2714-0000			CAN127-2714-0005			CAN127-2714-0010			CAN127-2714-0015			CAN127-2714-0020			CAN127-2714-0025		
LAB SAMPLE NUMBER	0396880006SA			0396880008SA			0396880009SA			0396880010SA			0396880011SA			0396880012SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Arsenic	1.9	0.56		2	0.54	J	1.3	0.54		1.3	0.54	J	1.4	0.55	J	0.84	0.55	J
Barium	92.4	1.1	J	96.1	1.1	J	161	2.2	J	115	1.1	J	78.5	1.1	J	119	2.2	J
Beryllium	0.39	0.22		0.51	0.22		0.35	0.44	J	0.35	0.22		0.5	0.22		<	0.44	U
Calcium	18100	22.4		23600	21.7		135000	43.6		52600	21.6		69200	22.1		206000	44.2	
Chromium	9.2	1.1		11.9	1.1		3.7	2.2		5.5	1.1		6.4	1.1		5.8	2.2	
Cobalt	2.9	1.1		3.6	1.1		<	2.2	U	2.2	1.1		3.1	1.1		<	2.2	U
Copper	6.8	2.2		8.3	2.2		3.7	4.4	J	2.8	2.2		5	2.2		8.8	4.4	
Iron	7130	11.2		8550	10.9		4450	21.8		5640	10.8		6510	11		4210	22.1	
Lead	<		R	<		R	<		R	<		R	<		R	<		R
Magnesium	1470	22.4		1950	21.7		2780	43.6		2790	21.6		3840	22.1		5030	44.2	
Manganese	160	1.1		172	1.1		61.7	2.2		94.3	1.1		117	1.1		30.8	2.2	
Nickel	6.7	4.5		8.6	4.3		4.7	8.7	J	5.7	4.3		7	4.4		3.9	8.8	J
Potassium	1790	560		1830	543		1140	1090		1630	540		2040	552		959	1110	J
Sodium	<	560	U	<	543	U	<	1090	U	<	540	U	<	552	U	<	1110	U
Thallium	<	0.56	U	0.11	0.54	J	<	0.54	U	<	0.54	U	<	0.55	U	0.38	0.55	J
Vanadium	13.4	1.1		15.1	1.1		9.4	2.2		14.5	1.1		14.4	1.1		9.3	2.2	
Zinc	31.5	2.2		25.5	2.2		11.9	4.4		13.5	2.2		16.7	2.2		10.3	4.4	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbon	<	44.8	U	69.4	43.4		<	43.6	U	<	43.2	U	<	44.2	U	<	44.2	U

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TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2714-0030			CAN127-2714-0035			CAN127-2714-0040			CAN127-2714-0050			CAN127-2714-0060		
LAB SAMPLE NUMBER	0396880013SA			0396880014SA			0396880015SA			0396880016SA			0396880017SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U	<	13	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.5	U	<	5.5	U	<	5.4		<	5.4	U	<	5.4	U
Toluene	<	5.5	U	<	5.5	U	<	5.4	U	<	5.4	U	<	5.4	U
Semivolatile Organics (µg/kg)															
Anthracene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Benzo(a)anthracene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Benzo(a)pyrene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Benzo(b)fluoranthene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Benzo(g,h,i)perylene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Benzo(k)fluoranthene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
bis(2-Ethylhexyl)phthalate	270	360	J	710	360		550	360		830	360		640	350	
Carbazole	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Chrysene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Di-n-butyl phthalate	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Dibenz(a,h)anthracene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Fluoranthene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Indeno(1,2,3-cd)pyrene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Phenanthrene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Pyrene	<	360	U	<	360	U	<	360	U	<	360	U	<	350	U
Metals (mg/kg)															
Aluminum	6230	11		6000	11		5460	10.9		4980	10.9		4500	10.7	
Antimony	<	6.6	UJ	<	6.6	UJ	<	6.5	U	<	6.5	UJ	<	6.4	UJ

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TABLE 8-2c

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2714-0030			CAN127-2714-0035			CAN127-2714-0040			CAN127-2714-0050			CAN127-2714-0060		
LAB SAMPLE NUMBER	0396880013SA			0396880014SA			0396880015SA			0396880016SA			0396880017SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Arsenic	1.1	0.55	J	0.77	0.55	J	0.98	0.54	J	0.9	0.54	J	1.3	0.54	J
Barium	92.2	1.1	J	90.3	1.1	J	26.7	1.1		97.8	1.1	J	23.8	1.1	J
Beryllium	0.2	0.22	J	0.17	0.22	J	0.16	0.22	J	0.17	0.22	J	0.19	0.21	J
Calcium	104000	22.1		50300	22.1		49300	21.8		38400	21.8		18300	21.5	
Chromium	5.2	1.1		7.4	1.1		6.6	1.1		6.3	1.1		4.5	1.1	
Cobalt	1.3	1.1		1	1.1	J	1.3	1.1		1.6	1.1		2.2	1.1	
Copper	2.6	2.2		7.4	2.2		6.5	2.2		3.3	2.2		1.7	2.1	J
Iron	4080	11		4690	11		4500	10.9		4260	10.9		4150	10.7	
Lead	<		R	3.1	1.1	R	<		R	<		R	<		R
Magnesium	8130	22.1		7920	22.1		7530	21.8		5310	21.8		3610	21.5	
Manganese	33.7	1.1		37	1.1		49.5	1.1		50.5	1.1		58.2	1.1	
Nickel	4.4	4.4		4.8	4.4		5.1	4.4		3.1	4.4	J	3.3	4.3	J
Potassium	1110	552		1110	552		1030	545		949	545		908	537	
Sodium	<	552	U	<	552	U	<	545	U	<	545	U	<	537	U
Thallium	0.21	0.55	J	0.18	1.1	J	<	0.54	U	<	1.1	J	<	0.54	U
Vanadium	13.9	1.1		16.7	1.1		16.7	1.1		18.9	1.1		15.9	1.1	
Zinc	9.9	2.2		10.6	2.2		10.4	2.2		10.5	2.2		8.9	2.1	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	<	44.2	U	182	44.2		50.9	43.6		83.6	43.6		<	43	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2c.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2715-0000			CAN127-2715-0005			CAN127-2715-0010			CAN127-2715-2762[1]			CAN127-2715-0015		
LAB SAMPLE NUMBER	0396860001SA			0396860002SA			0396860003SA			0396860011SA			0396860004SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U	<	11	U	<	11	U	<	16	U	<	19	U
Methylene chloride	<	5.5	U	<	5.3	U	<	5.5		<	5.4	U	4.4	5.5	J
Toluene	<	5.5	U	<	5.3	U	<	5.5	U	<	5.4	U	<	5.5	U
Semivolatile Organics (µg/kg)															
Anthracene	<	360	U	<	350	U	<	360	U	<	360	U	<	360	U
Benzo(a)anthracene	260	360	J	<	350	U	<	360	U	<	360	U	<	360	U
Benzo(a)pyrene	400	360		43	350	J	<	360	U	<	360	U	<	360	U
Benzo(b)fluoranthene	420	360		74	350	J	<	360	U	<	360	U	<	360	U
Benzo(g,h,i)perylene	270	360	J	<	350	U	<	360	U	<	360	U	<	360	U
Benzo(k)fluoranthene	470	360		<	350	U	<	360	U	<	360	U	<	360	U
Benzoic acid	48	1800	J	<	1700	U	<	1700	U	<	1700	U	<	1800	U
bis(2-Ethylhexyl)phthalate	44	360	J	<	350	U	<	360	U	44	360	J	<	360	U
Carbazole	45	360	J	<	350	U	<	360	U	<	360	U	<	360	U
Chrysene	46	360	J	59	350	J	<	360	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	360	U	<	350	U	<	360	U	<	360	U	<	360	U
Di-n-octyl phthalate	<	360	U	64	350	J	<	360	U	<	360	U	<	360	U
Dibenz(a,h)anthracene	<	360	U	<	350	U	<	360	U	<	360	U	<	360	U
Diethyl phthalate	<	360	U	<	350	U	<	360	U	<	360	U	<	360	U
Fluoranthene	860	360		110	350	J	<	360	U	<	360	U	<	360	U
Indeno(1,2,3-cd)pyrene	260	360	J	<	350	U	<	360	U	<	360	U	<	360	U
Phenanthrene	380	360		53	350	J	<	360	U	<	360	U	<	360	U
Pyrene	710	360		77	350	J	<	360	U	<	360	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2715-0000			CAN127-2715-0005			CAN127-2715-0010			CAN127-2715-2762[1]			CAN127-2715-0015		
LAB SAMPLE NUMBER	0396860001SA			0396860002SA			0396860003SA			0396860011SA			0396860004SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)															
Aluminum	7730	11		7500	21.2		7090	10.9		5760	10.8		5900	11	
Arsenic	2.1	0.55	J	1.7	0.53	J	2.2	0.55	J	1.6	0.54	J	1.2	0.55	J
Barium	93	1.1	J	152	2.1	J	148	1.1	J	162	1.1	J	146	1.1	J
Beryllium	0.44	0.22		0.34	0.42	J	0.38	0.22		0.3	0.22		0.34	0.22	
Cadmium	<	0.55	U	0.77	1.1	J	<	0.55	U	<	0.54	U	<	0.55	U
Calcium	17800	22		141000	42.5		73600	21.8		78200	21.6		100000	22.1	
Chromium	9.2	1.1	J	6.9	2.1	J	6.4	1.1	J	5	1.1	J	4.7	1.1	J
Cobalt	3	1.1		2.1	2.1		2.8	1.1		2.4	1.1		1.7	1.1	
Copper	7.1	2.2		5.1	4.2		4.1	2.2		3.4	2.2		2.5	2.2	
Iron	7840	11		6140	21.2		5720	10.9		4730	10.8		4800	11	
Lead	36.4	5.5		7.6	5.3		5.1	0.55		4.8	0.54		3.9	0.55	
Magnesium	1550	22	J	2420	42.5	J	2940	21.8	J	2580	21.6	J	3080	22.1	J
Manganese	175	1.1		77.6	2.1		85.6	1.1		70.3	1.1		68	1.1	
Nickel	7.2	4.4		5.6	8.5	J	6.2	4.4		5.1	4.3		5.5	4.4	
Potassium	1830	550		1310	1060		1540	546		1220	540		1460	552	
Selenium	0.25	1.1	J	<		R	<		R	<		R	<		R
Thallium	0.3	0.55	J	0.2	0.53	J	0.13	0.55	J	0.13	0.54	J	0.13	0.55	J
Vanadium	14.5	1.1		13.7	2.1		15.2	1.1		12.7	1.1		13.5	1.1	
Zinc	30	2.2		17	4.2		14.8	2.2		12.6	2.2		12.3	2.2	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	80.8	44		<	42.5	U	<	43.6	U	<	43.2	U	<	44.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2715-0020			CAN127-2715-0025			CAN127-2715-0030			CAN127-2715-0035			CAN127-2715-0040			CAN127-2715-0050		
LAB SAMPLE NUMBER	0396860005SA			0396860006SA			0396860007SA			0396860008SA			0396860009SA			0396860010SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	9.5	11	J	8.5	11	J	26	11		<	11	U	15	11	
Methylene chloride	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.5	U
Toluene	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Anthracene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Benzo(k)fluoranthene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Benzoic acid	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U	<	1700	U
bis(2-Ethylhexyl)phthalate	<	370	U	170	370	J	40	370	J	<	360	U	190	360	J	54	360	J
Carbazole	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Chrysene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Di-n-octyl phthalate	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Diethyl phthalate	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Fluoranthene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Phenanthrene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U
Pyrene	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2715-0020			CAN127-2715-0025			CAN127-2715-0030			CAN127-2715-0035			CAN127-2715-0040			CAN127-2715-0050		
LAB SAMPLE NUMBER	0396860005SA			0396860006SA			0396860007SA			0396860008SA			0396860009SA			0396860010SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	9530	11.2		5640	22.2		5630	11.2		5480	10.9		5240	10.9		4640	10.9	
Arsenic	2.4	0.56	J	1.4	0.56	J	1.1	1.1	J	1	1.1	J	1.2	0.55	J	1.2	0.55	J
Barium	146	1.1	J	88.6	2.2	J	265	1.1	J	24.6	1.1	J	33.8	1.1	J	63.1	1.1	J
Beryllium	0.65	0.22		0.24	0.44	J	0.21	0.22	J	0.2	0.22	J	0.23	0.22		0.17	0.22	J
Cadmium	<	0.56	U	<	1.1	U	<	0.56	U	<	0.55	U	<	0.55	U	<	0.55	U
Calcium	69900	22.5		156000	44.4		85300	22.3		30500	21.8		46800	21.8		40700	21.9	
Chromium	6.8	1.1	J	4.3	2.2	J	5.2	1.1	J	5.9	1.1	J	5.2	1.1	J	5.7	1.1	J
Cobalt	3	1.1		2.1	2.2	J	<	1.1	U	1.2	1.1		1.3	1.1		0.87	1.1	J
Copper	5.5	2.2		2.8	4.4	J	2.1	2.2	J	2.3	2.2		1.9	2.2	J	2	2.2	J
Iron	7710	11.2		3970	22.2		3790	11.2		4490	10.9		4250	10.9		3850	10.9	
Lead	6.4	0.56		3.3	0.56		2.1	1.1		2.2	1.1		2.2	0.55		2.1	1.1	
Magnesium	4880	22.5	J	4120	44.4	J	5290	22.3	J	4590	21.8	J	5380	21.8	J	4660	21.9	J
Manganese	139	1.1		37.9	2.2		29	1.1		38.5	1.1		56.8	1.1		50.3	1.1	
Nickel	8.3	4.5		3.8	8.9	J	3.8	4.5	J	5.1	4.4		3.6	4.4	J	2.9	4.4	J
Potassium	2510	561		1220	1110		1000	558		1020	545		1020	546		879	547	
Selenium	0.16	1.1	J	<		R	<		R	<		R	<		R	<		R
Thallium	0.11	0.56	J	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	0.55	U	<	0.55	U
Vanadium	17.7	1.1		12.6	2.2		15.9	1.1		17	1.1		15.7	1.1		16.8	1.1	
Zinc	19.9	2.2		11.1	4.4		8.2	2.2		10.1	2.2		9.4	2.2		8.8	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.9	U	<	44.4	U	<	44.7	U	171	43.6		<	43.7	U	<	43.7	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2715-0060			CAN127-2716-0000			CAN127-2716-0005			CAN127-2716-0010			CAN127-2716-0015			CAN127-2716-0020		
LAB SAMPLE NUMBER	0397130012SA			0396550007SA			0396550008SA			0396550009SA			0396550010SA			0396550011SA		
COLLECT DATE	12/07/94			12/06/94			12/06/94			12/06/94			12/06/94			12/06/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	6	12	J	4.6	11	J	<	14	U	4	11	J
Methylene chloride	4.6	5.5	J	<	5.6	U	<	5.8	U	<	5.5	U	<	5.5	U	<	5.6	U
Toluene	<	5.5	U	<	5.6	U	<	5.8	U	2.8	5.5	J	<	5.5	U	<	5.6	U
Semivolatile Organics (µg/kg)																		
Anthracene	<	370	U	<	370	U	<	380	U	<	360	U	<	360	U	<	370	U
Benzo(a)anthracene	<	370	U	84	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Benzo(a)pyrene	<	370	U	110	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Benzo(b)fluoranthene	<	370	U	100	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Benzo(g,h,i)perylene	<	370	U	88	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Benzo(k)fluoranthene	<	370	U	190	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Benzoic acid	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
bis(2-Ethylhexyl)phthalate	<	370	U	41	370	J	<	380	U	<	360	U	<	360	U	4700	370	
Carbazole	<	370	U	<	370	U	<	380	U	<	360	U	<	360	U	<	370	U
Chrysene	<	370	U	140	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Di-n-butyl phthalate	<	370	U	190	370	J	170	380	J	<	360	U	170	360	J	130	370	J
Di-n-octyl phthalate	<	370	U	<	370	U	<	380	U	<	360	U	<	360	U	310	370	J
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	380	U	<	360	U	<	360	U	<	370	U
Diethyl phthalate	<	370	U	<	370	U	<	380	U	<	360	U	<	360	U	<	370	U
Fluoranthene	<	370	U	270	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Indeno(1,2,3-cd)pyrene	<	370	U	83	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Phenanthrene	<	370	U	120	370	J	<	380	U	<	360	U	<	360	U	<	370	U
Pyrene	<	370	U	260	370	J	<	380	U	<	360	U	<	360	U	<	370	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2715-0060			CAN127-2716-0000			CAN127-2716-0005			CAN127-2716-0010			CAN127-2716-0015			CAN127-2716-0020		
LAB SAMPLE NUMBER	0397130012SA			0396550007SA			0396550008SA			0396550009SA			0396550010SA			0396550011SA		
COLLECT DATE	12/07/94			12/06/94			12/06/94			12/06/94			12/06/94			12/06/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	3480	11.1		10600	11.3	J	10300	23.1	J	8940	11	J	9340	11	J	7330	22.5	J
Arsenic	1.4	1.1		2.6	0.56		2.2	0.58		1.6	0.55		2	0.55		2.1	0.56	
Barium	11.8	1.1		93	1.1	J	203	2.3	J	81.2	1.1	J	396	1.1	J	306	2.2	J
Beryllium	<	0.22	U	0.57	0.23		0.43	0.46	J	0.47	0.22		0.54	0.22		0.46	0.45	
Cadmium	<	0.55	U	<	0.56	U	<	1.2	U	<	0.55	U	<	0.55	U	<	1.1	U
Calcium	2490	22.1		9170	22.5		130000	46.1		79500	22		43800	22		126000	44.9	
Chromium	4.1	1.1		11.7	1.1		8.6	2.3		6.6	1.1		7.7	1.1		5.4	2.2	
Cobalt	0.84	1.1	J	4	1.1		2.6	2.3		2.6	1.1		3.2	1.1		1.9	2.2	J
Copper	1.2	2.2	J	8.3	2.3		6.3	4.6		4.4	2.2		4.9	2.2		5.6	4.5	
Iron	3320	11.1		9750	11.3		7880	23.1		6910	11		7990	11		5780	22.5	
Lead	2	0.55		20.8	5.6	J	7.4	0.58	J	4.8	0.55	J	5.4	0.55	J	4.3	1.1	J
Magnesium	3590	22.1		1820	22.5		2840	46.1		3430	22		3340	22		4180	44.9	
Manganese	22.8	1.1		207	1.1		100	2.3		99.1	1.1		144	1.1		89.9	2.2	
Nickel	2.6	4.4	J	9.6	4.5		9.9	9.2		7.5	4.4		7.6	4.4		5.9	9	J
Potassium	726	553		2350	563		1740	1150		1630	549		2040	550		1820	1120	
Selenium	<	1.1	U	<	1.1	UJ	<	2.3	UJ	<	1.1	UJ	<	1.1	UJ	<	2.2	UJ
Thallium	<	0.55	U	<	0.56	UJ	<	1.2	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	16.7	1.1		16.8	1.1	J	15.5	2.3	J	17.4	1.1	J	19.7	1.1	J	14.8	2.2	J
Zinc	6.9	2.2		29.2	2.3		21.3	4.6		17.7	2.2		20.4	2.2		15.5	4.5	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.3	U	45.7	45		<	46.1	U	<	43.9	U	<	44	U	60.7	44.9	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2716-0025			CAN127-2716-0030			CAN127-2716-0035			CAN127-2716-0040			CAN127-2716-0050			CAN127-2716-0060		
LAB SAMPLE NUMBER	0396550012SA			0396550013SA			0396550003SA			0396550004SA			0396550005SA			0396550006SA		
COLLECT DATE	12/06/94			12/06/94			12/06/94			12/06/94			12/06/94			12/06/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	13	U	3.6	11	J	6.5	11	J	<	11	U	5.3	11	J	4.8	11	J
Methylene chloride	<	6.4	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.5	U	<	5.5	U
Toluene	<	6.4	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Anthracene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Benzo(a)anthracene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Benzo(a)pyrene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Benzo(b)fluoranthene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Benzo(g,h,i)perylene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Benzo(k)fluoranthene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Benzoic acid	<	2000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U	<	1800	U
bis(2-Ethylhexyl)phthalate	<	420	U	<	360	U	<	370	U	<	350	U	90	360	J	<	360	U
Carbazole	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Chrysene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	420	U	<	360	U	<	370	U	<	350	U	160	360	J	160	360	J
Di-n-octyl phthalate	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Dibenz(a,h)anthracene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Diethyl phthalate	<	420	U	<	360	U	<	370	U	<	350	U	46	360	J	<	360	U
Fluoranthene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Phenanthrene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U
Pyrene	<	420	U	<	360	U	<	370	U	<	350	U	<	360	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-2d

SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 127
CANNON AFB

LOCATOR	CAN127-2716-0025			CAN127-2716-0030			CAN127-2716-0035			CAN127-2716-0040			CAN127-2716-0050			CAN127-2716-0060		
LAB SAMPLE NUMBER	0396550012SA			0396550013SA			0396550003SA			0396550004SA			0396550005SA			0396550006SA		
COLLECT DATE	12/06/94			12/06/94			12/06/94			12/06/94			12/06/94			12/06/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	8030	25.5	J	4940	10.9	J	6340	11.1	J	5800	10.8	J	5870	10.9	J	5800	11	J
Arsenic	1.7	0.64		2.1	0.55		2.1	0.56		1.4	0.54		1.4	0.55		1.4	0.55	
Barium	341	2.6	J	51.2	1.1	J	147	1.1	J	26.8	1.1	J	30.7	1.1	J	32.6	1.1	J
Beryllium	0.32	0.51	J	0.2	0.22	J	0.27	0.22		0.18	0.22	J	0.21	0.22	J	0.18	0.22	J
Cadmium	<	1.3	U	<	0.55	U	<	0.56	U	<	0.54	U	<	0.55	U	<	0.55	U
Calcium	138000	51		76400	21.8		89000	22.2		14200	21.5		26500	21.8		14200	22.1	
Chromium	6	2.6		3.8	1.1		5.1	1.1		5.8	1.1		10.1	1.1		7.2	1.1	
Cobalt	<	2.6	U	1.7	1.1		0.94	1.1	J	1.4	1.1		1.6	1.1		1.7	1.1	
Copper	2.9	5.1	J	2.3	2.2		2.4	2.2		2.2	2.2		45.8	2.2		2	2.2	J
Iron	5600	25.5		4020	10.9		4460	11.1		4950	10.8		5250	10.9		5160	11	
Lead	3.2	0.64		2.6	0.55	J	3.3	0.56	J	2.5	0.54	J	3.1	0.55	J	5.5	0.55	J
Magnesium	5070	51		2460	21.8		4280	22.2		3870	21.5		4510	21.8		4660	22.1	
Manganese	42.4	2.6		46.4	1.1		43.8	1.1		48.6	1.1		60.5	1.1		54	1.1	
Nickel	5.4	10.2	J	4.1	4.4	J	3.1	4.4	J	4.7	4.3		5.7	4.4		4.6	4.4	
Potassium	1680	1280		1070	546		1240	555		1180	538		1180	546		1100	552	
Selenium	<	1.3	UJ	<	2.2	UJ	<	1.1	U	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Thallium	<	1.3	UJ	<	1.1	UJ	<	1.1	UJ	<	0.54	UJ	<	1.1	UJ	<	0.55	U
Vanadium	14.2	2.6	J	13.6	1.1	J	16.2	1.1	J	16.5	1.1	J	17.3	1.1	J	17.9	1.1	J
Zinc	13.7	5.1		9.8	2.2		10.6	2.2		10.2	2.2		12.2	2.2		10.7	2.2	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	51	U	<	43.7	U	<	44.4	U	53.9	43		1700	436		<	44.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-2d.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 8-3

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND [1]
SWMU 127, CANNON AFB, NM

Sand Trap and Leach Fields at the POL Wash Rack

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations [2]	Upper tolerance limit (UTL) Background Concentration[3]	Reported Level in Clovis, NM Region [4]	Does maximum detected Exceed Background
CAN127-2713-0025	Aluminum	14,700	1,410 - 11,000	10,540	50,000	NO**
CAN127-2714-0020	Antimony	4.6	<4.9 - <13	*	<1	YES
CAN127-2709-0000	Arsenic	3	0.67 - 28	15.5	6.5	NO
CAN127-2709-0010	Barium	1540	14.5 - 1200	642	500	YES
CAN127-2713-0005	Beryllium	0.76	0.17 - 0.77	0.73	1-2	NO**
CAN127-2715-0005	Cadmium	0.77	<0.51 - 4.2	*	----	NO
CAN127-2712-0000	Chromium	21.4	4 - 15.4	12.5	30	YES
CAN127-2709-0000	Cobalt	8	0.85 - 5.3	4.5	3-7	YES
CAN127-2716-0050	Copper	45.8	<2 - 18.4	*	20	YES
CAN127-2711-0000	Lead	83.9	1.1 - 46	25.8	15	YES
CAN127-2709-0000	Manganese	340	22.4 - 216	164	500	YES
CAN127-2709-0000	Nickel	10.5	1.3 - 9.8	9	15	NO**
CAN127-2714-0025	Thallium	0.38	0.14 - 0.22	*	----	YES
CAN127-2711-0035	Vanadium	23.2	5.2 - 28.3	25.3	30-70	NO
CAN127-2712-0000	Zinc	41.1	<4.3 - 27.5	21.9	45	YES

[1] All units in mg/kg.

[2] Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1993) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).
Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1994).

[3] Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

[4] USGS 1984.

*Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 8-4

COMPARISON OF PHASE II SOILCONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCS
SWMU 127, CANNON AFB
Sand Trap and Leach Fields at the POL Wash Rack

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II concentration greater than Phase I Concentration	Residential Soil Risk-Based Concentration[1] (mg/kg)	Exceeds RBC?	Estimated Risk [3]	Risk Type	Industrial Soil Risk-based Concentration[2] (mg/kg)	Exceeds RBC?	Estimated Risk [3]
1,1,1-Trichloroethane	0.0018	ND	NO	7,000	----					
1,1-Dichloroethene	0.0019	ND	NO	1	----					
1,2-Dichloroethane	0.0019	ND	NO	7	----					
1,2-Dichloroethene (total	0.0013	ND	NO	700	----					
1,2-Dichloropropane	0.013	ND	NO	9.4	----					
2-Butanone	ND	0.0062	YES	47,000	NO					
Acetone	ND	7.5	YES	7,800	NO					
Benzene	0.0012	3.8	YES	22	NO					
Carbon Tetrachloride	0.0027	ND	NO	4.9	----					
Chlorobenzene	0.0013	ND	NO	1,600	----					
Ethylbenzene	0.0013	54	YES	7,800	NO					
Methylene Chloride	ND	0.0067	YES	85	NO					
Tetrachloroethene	0.0029	ND	NO	12	----					
Toluene	0.018	82	YES	16,000	NO					
Trichloroethene	0.0023	ND	NO	58	----					
Xylenes (total)	0.012	260	YES	160,000	NO					
2-Methylnaphthalene	0.25	40	YES	NA(a)	----					
Acenaphthene	0.15	ND	NO	4,700	----					
Anthracene	0.048	0.068	YES	23,000	NO					
Benzo(a)anthracene	8	0.91	NO	0.88	NA					
Benzo(a)pyrene	8.6	1.1	NO	0.088	NA					
Benzo(b)fluoranthene	17	1.6	NO	0.88	NA					
Benzo(g,h,i)perylene	5.1	0.7	NO	NA(a)	----					
Benzo(k)fluoranthene	ND	1.6	YES	8.80	NO					
Benzoic acid	ND	0.048	YES	310,000	NO					
Bis(2-ethylhexyl)phthalat	ND	4.7	YES	46	NO					
Butylbenzylphthalate	0.11	ND	NO	16,000	----					
Carbazole	1.5	0.17	NO	32	NA					
Chrysene	14	1.5	NO	88	NA					
Di-n-butylphthalate	ND	0.19	YES	NA(a)	----					
Di-n-octylphthalate	ND	0.31	YES	1,600	NO					

TABLE 8-4

COMPARISON OF PHASE II SOILCONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCS
SWMU 127, CANNON AFB
Sand Trap and Leach Fields at the POL Wash Rack

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II concentration greater than Phase I Concentration	Residential Soil Risk-Based Concentration[1] (mg/kg)	Exceeds RBC?	Estimated Risk [3]	Risk Type	Industrial Soil Risk-based Concentration[2] (mg/kg)	Exceeds RBC?	Estimated Risk [3]
Dibenzo(a,h)anthracene	ND	0.28	YES	0.088	YES	3×10^{-6}	Carcinogenic	0.39	NO	
Diethylphthalate	ND	0.046	YES	63,000	NO					
Fluoranthene	17	2.8	NO	3,100	NA					
Fluorene	0.29	ND	NO	3,100	----					
Indeno(1,2,3-cd)pyrene	5.1	0.7	NO	0.88	NA					
Phenanthrene	8.1	1.1	NO	NA(a)	----					
Pyrene	17	2.3	NO	2,300	NA					
TRPH	334	11,600	YES	NA(a)	----					
Aluminum	11600	14,700	NO	78,000	NA					
Antimony	7.8	ND	NO	31	NA					
Barium	971	1,540	YES	5,500	NO					
Beryllium	0.83	0.76	NO	0.15	NA					
Cadmium	4.2	0.77	NO	39	NA					
Chromium	16.6	21.4	YES	390	NO					
Cobalt	5.3	8	YES	4700	NO					
Copper	57.9	45.8	NO	2900	NA					
Lead*	48.2	83.9	YES	400	NO					
Manganese	ND	340	YES	390	NO					
Mercury	0.11	ND	NO	23	NA					
Nickel	12.4	10.5	NO	1600	NA					
Selenium	0.27	ND	NO	390	NA					
Silver	3.6	ND	NO	390	NA					
Thallium	0.14	0.38	YES	6.3	NO					
Zinc	38.5	41.1	YES	23000	NO					

[1] EPA Region III Risk-Based Concentrations for residential soil (EPA 1994).
[2] EPA Region III Risk-Based Concentrations for industrial soil (EPA 1994).
[3] Estimated risk based on maximum Phase II concentrations that exceeded previously evaluated Phase I levels.
Estimated risk = 1×10^{-6} * concentration/RBC.
(a) EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.
*No RBC has been calculated for lead; however, EPA recommends an interim residential soil concentration of 400 mg/kg (EPA 1994).
ND = Not Detected
NA = Not Applicable

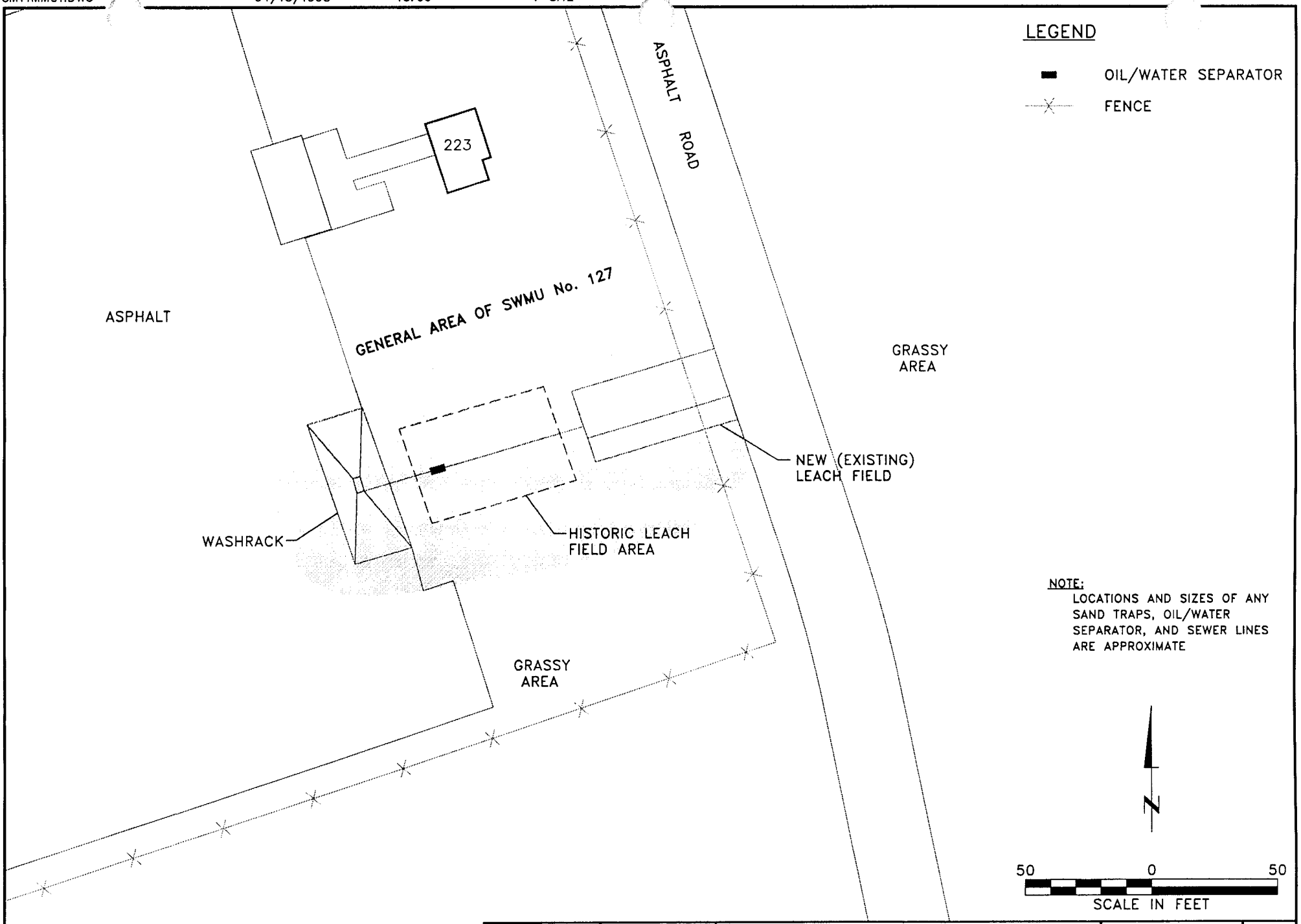
TABLE 8-4a

POTENTIAL CUMULATIVE RISK AT SWMU 127
CANNON AFB, NEW MEXICO

Chemical[1]	Carcinogen?	Phase II Concentration (mg/kg)	Residential RBC (mg/kg)	Industrial RBC (mg/kg)	Risk Residential[2]	Hazard Residential[3]	Risk Industrial[2]	Hazard Industrial[3]
Dibenzo(a,h)anthracene	Yes	0.28	0.088	0.39	3.18E-06		7.18E-07	
Diethyl phthalate	No	0.046	63,000	820,000		0.0000007		0.00000006
Barium	No	1,540	5,500	72,000		0.28		0.02
Chromium	No	21.4	390	5,100		0.05		0.0042
Cobalt	No	8	4,700	61,000		0.0017		0.00013
Lead	No	83.9	400*	NA*		NA*		NA*
Manganese	No	340	390	5,100		0.87		0.07
Thallium	No	0.38	6	92		0.06		0.0041
Zinc	No	41.1	23,000	310,000		0.0018		0.00013
Totals					3E-06	1	7E-07	0.1
Phase I Risk[4]					NA	NA	2E-05	0.007
Cumulative Risk[5]					NA	NA	2E-05	0.10

(1) Chemicals with maximum Phase II concentration exceeding Phase I concentrations
(2) Risk = 1E-06 x concentration/RBC
(3) Hazard = concentration/RBC
(4) Highest calculated risk and hazard for all receptors evaluated in risk assessment (W-C 1994d)
(5) Sum of Phase I risk and incremental risk from Phase II concentrations (i.e., that exceeded Phase I levels)
* No RBC is available for lead; 400 is residential level generally acceptable based on EPA lead uptake model.

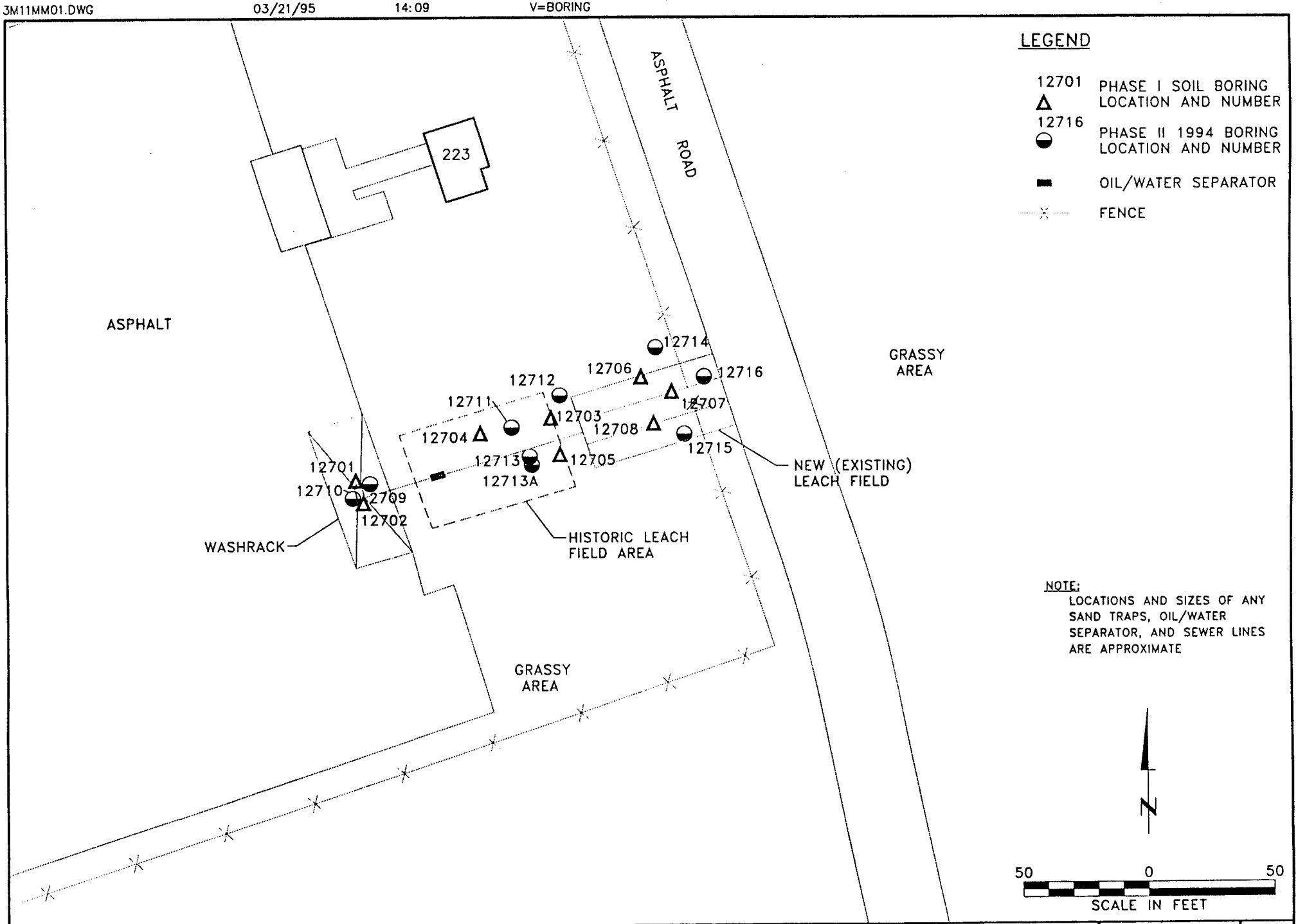
3M11MM01.DWG 04/13/1995 13:06 V=SITE



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

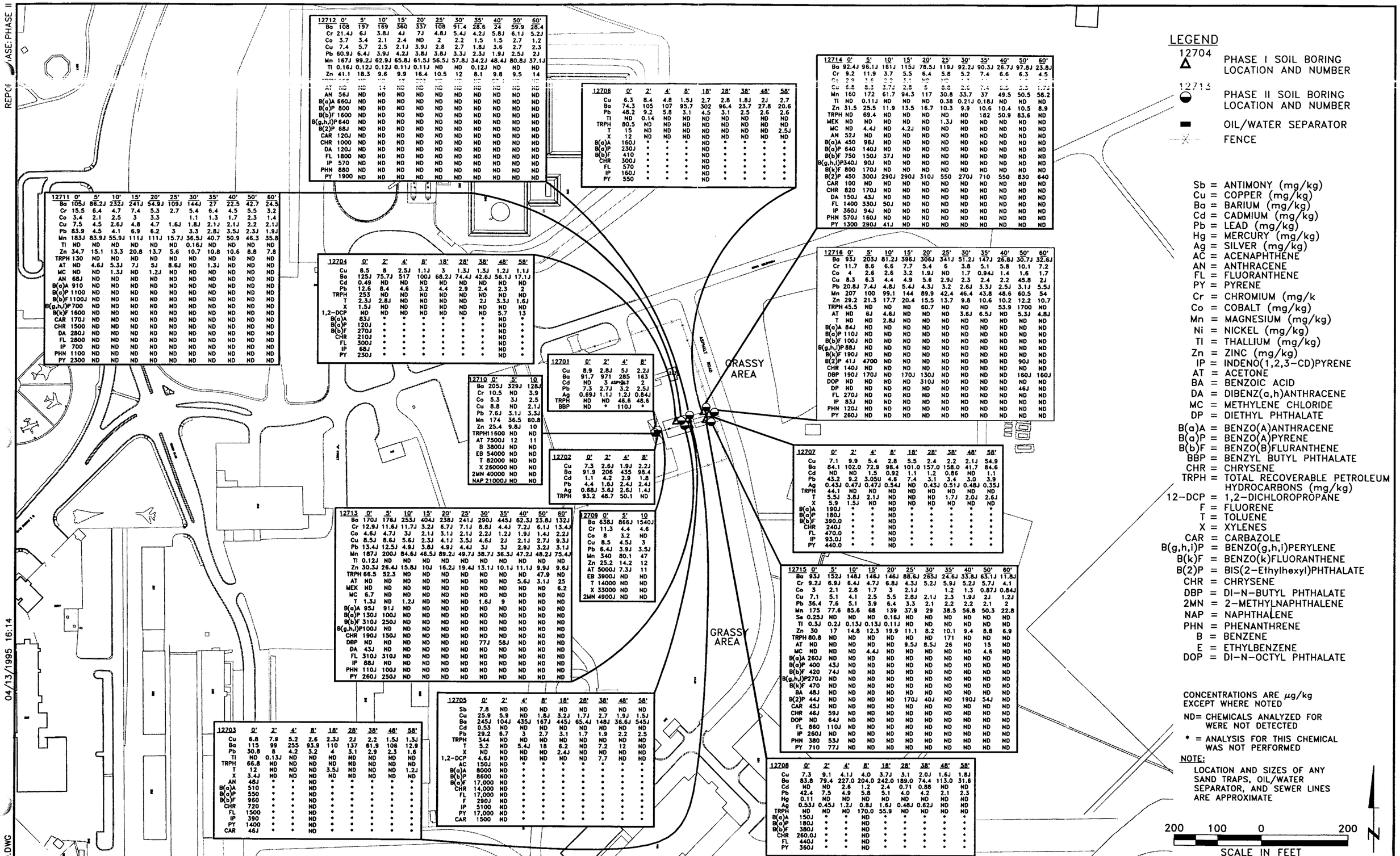
DRN BY: CJG	DATE: 08/17/93	SAND TRAP AT POL WASHRACK - SWMU 127 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 8-1
CHK'D BY: .	REVISION: 0			

3M11MM01.DWG 03/21/95 14:09 V=BORING



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	SAND TRAP AT POL WASHRACK – SWMU 127 SITE PLAN WITH BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO 8–2



12712	0'	5'	10'	15'	20'	25'	30'	35'	40'	50'	60'
Ba	108	197	169	360	337	108	91.4	28.6	24	59.9	28.4
Cr	21.4J	6J	3.8J	4J	7J	4.8J	5.4J	4.2J	5.8J	6.1J	5.2J
Co	3.7	3.4	2.1	2.4	ND	2	2.2	1.5	1.5	2.7	1.2
Cu	7.4	5.7	2.5	2.1J	3.9J	2.8	2.7	1.8J	3.6	2.7	2.3
Pb	60.9J	6.4J	3.9J	4.2J	3.8J	3.8J	3.3J	2.3J	1.9J	2.5J	2J
Mn	167J	99.2J	62.9J	65.8J	61.5J	56.5J	57.8J	34.2J	48.4J	80.8J	37.1J
Tl	0.16J	0.12J	0.12J	0.11J	0.11J	ND	ND	0.12J	ND	ND	ND
Zn	41.1	18.3	9.6	9.9	16.4	10.5	12	8.1	9.8	9.5	14
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AT	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND
AN	56J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)A	660J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P	800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(b)F	1600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(g,h,i)P	640	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(2)P	68J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CAR	120J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHR	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DA	120J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FL	1800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IP	570	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHN	880	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PY	1900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

12706	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	6.3	8.4	4.8	1.5J	2.7	2.8	1.8J	2J	2.7
Ba	74.3	105	107	95.7	302	96.4	23.7	27.8	20.6
Pb	48.2	9.2	5.8	3.1	4.5	3.1	2.5	2.6	2.6
Tl	ND	0.14	ND	ND	ND	ND	ND	ND	ND
TRPH	80.5	ND	ND	ND	ND	ND	ND	ND	ND
T	15	ND	ND	ND	ND	ND	ND	ND	2.5J
X	12	ND	ND	ND	ND	ND	ND	ND	ND
B(a)A	160J	*	*	*	ND	*	*	*	*
B(a)P	230J	*	*	*	ND	*	*	*	*
B(b)F	410	*	*	*	ND	*	*	*	*
CHR	300J	*	*	*	ND	*	*	*	*
FL	570	*	*	*	ND	*	*	*	*
IP	160J	*	*	*	ND	*	*	*	*
PY	550	*	*	*	ND	*	*	*	*

12714	0'	5'	10'	15'	20'	25'	30'	35'	40'	50'	60'
Ba	92.4J	96.1J	161J	115J	78.5J	119J	92.2J	90.3J	26.7J	97.8J	23.8J
Cr	9.2	11.9	3.7	5.5	6.4	5.8	5.2	7.4	6.6	6.3	4.5
Co	2.9	3.6	2.2	2.1	ND	ND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cu	6.8	8.3	3.7J	2.8	5	8.8	2.6	7.4	6.5	3.3	1.7J
Mn	160	172	61.7	94.3	117	30.8	33.7	37	49.5	50.5	58.2
Tl	ND	0.11J	ND	ND	ND	0.38	0.21J	0.18J	ND	ND	ND
Zn	31.5	25.5	11.9	13.5	16.7	10.3	9.9	10.6	10.4	10.5	8.9
TRPH	ND	69.4	ND	ND	ND	ND	ND	182	50.9	83.6	ND
MEK	ND	ND	ND	ND	ND	1.3J	ND	ND	ND	ND	ND
MC	ND	4.4J	ND	4.2J	ND	ND	ND	ND	ND	ND	ND
AN	52J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)A	450	96J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P	640	140J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(b)F	750	150J	37J	ND	ND	ND	ND	ND	ND	ND	ND
B(g,h,i)P	340J	90J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(k)F	800	170J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(2)P	450	300J	290J	290J	310J	550	270J	710	550	830	640
CAR	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHR	820	170J	ND	ND	ND	ND	ND	ND	ND	ND	ND
DA	150J	43J	ND	ND	ND	ND	ND	ND	ND	ND	ND
FL	1400	330J	50J	ND	ND	ND	ND	ND	ND	ND	ND
IP	360J	94J	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHN	570J	160J	ND	ND	ND	ND	ND	ND	ND	ND	ND
PY	1300	290J	41J	ND	ND	ND	ND	ND	ND	ND	ND

12711	0'	5'	10'	15'	20'	25'	30'	35'	40'	50'	60'
Ba	105J	86.2J	232J	241J	54.9J	109J	144J	27	22.5	42.7	24.5
Cr	15.5	6.4	4.7	7.4	5.3	2.7	5.4	6.4	4.5	5.5	3.2
Co	3.4	2.1	2.5	3	3.3		1.1	1.3	1.7	2.3	1.4
Cu	7.5	4.5	2.6J	4.8	4.7	1.6J	1.8J	2.1J	2.1J	2.2	2.1J
Pb	83.9	4.5	4.1	6.9	6.2	3	3.3	2.8J	3.5J	2.3J	1.9J
Mn	183J	83.9J	55.9J	111J	111J	15.7J	36.5J	40.7	50.9	46.3	35.8
Tl	ND	ND	ND	ND	ND	ND	0.16J	ND	ND	ND	ND
Zn	34.7	15.1	13.3	20.8	13.7	5.6	10.7	10.8	10.6	8.8	7.8
TRPH	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AT	ND	4.6J	5.3J	7J	5J	8.6J	ND	1.3J	ND	ND	ND
MC	ND	ND	1.3J	ND	1.2J	ND	ND	ND	ND	ND	ND
AN	68J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)A	910	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(b)F	1100J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(g,h,i)P	700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(k)F	1600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CAR	170J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHR	1500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DA	280J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FL	2800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IP	700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHN	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PY	2300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

12704	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	8.5	8	2.5J	1.1J	3	1.3J	1.3J	1.2J	1.1J
Ba	125J	75.7J	517	100J	68.2J	74.4J	42.6J	56.1J	17.1J
Cd	0.49	ND	ND	ND	ND	ND	ND	ND	ND
Pb	12.6	8.4	4.6	3.2	4.4	2.9	2.4	2.3	2
TRPH	253	ND	ND	ND	ND	ND	ND	ND	ND
T	2.3J	2.8J	ND	ND	ND	ND	2J	3.3J	1.6J
X	1.5J	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DCP	ND	ND	ND	ND	ND	ND	ND	5.7	13
B(a)A	83J	*	*	*	*	*	*	ND	*
B(a)P	120J	*	*	*	*	*	*	ND	*
B(b)F	270J	*	*	*	*	*	*	ND	*
CHR	210J	*	*	*	*	*	*	ND	*
FL	300J	*	*	*	*	*	*	ND	*
IP	68J	*	*	*	*	*	*	ND	*
PY	230J	*	*	*	*	*	*	ND	*

12716	0'	5'	10'	15'	20'	25'	30'	35'	40'	50'	60'
Ba	93J	203J	81.2J	396J	306J	341J	51.2J	147J	26.8J	30.7J	32.6J
Cr	11.7	8.6	6.6	7.7	5.4	6	3.8	5.1	5.8	10.1	7.2
Co	4	2.6	2.6	3.2	1.9J	ND	1.7	0.94J	1.4	1.6	1.7
Cu	8.3	6.3	4.4	4.9	5.6	2.9J	2.3	2.4	2.2	45.8	2J
Pb	20.8J	7.4J	4.8J	5.4J	4.3J	3.2	2.6J	3.3J	2.5J	3.1J	5.5J
Mn	207	100	99.1	144	89.9	42.4	46.4	43.8	48.6	60.5	54
Zn	29.2	21.3	17.7	20.4	15.5	13.7	9.8	10.6	10.2	12.2	10.7
TRPH	45.5	ND	ND	ND	60.7	ND	ND	ND	53.9	1700	ND
AT	ND	6J	4.6J	ND	ND	ND	3.6J	6.5J	ND	5.3J	4.8J
T	ND	ND	2.8J	ND	ND	ND	ND	ND	ND	ND	ND
B(a)A	84J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P	110J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(b)F	100J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(g,h,i)P	88J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(k)F	190J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(2)P	41J	4700	ND	ND	ND	ND	ND	ND	ND	90J	ND
CHR	140J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DBP	190J	170J	ND	170J	130J	ND	ND	ND	ND	160J	160J
DOP	ND	ND	ND	ND	310J	ND	ND	ND	ND	ND	ND
DP	ND	ND	ND	ND	ND	ND	ND	ND	ND	46J	ND
FL	270J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IP	83J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHN	120J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PY	260J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

12710	0'	5'	10
Ba	205J	329J	128J
Cr	10.5	ND	3.9
Co	5.3	3J	2.5
Cu	8.8	ND	2.1J
Pb	7.6J	3.1J	3.3J
Mn	174	36.5	60.8
Zn	25.4	9.8J	10
TRPH	11600	ND	ND
AT	7500J	12	11
B	3800J	ND	ND
EB	54000	ND	ND
T	82000	ND	ND
X	260000	ND	ND
2MN	40000	ND	ND
NAP	21000J	ND	ND

12701	0'	2'	4'	8'
Cu	8.9	2.8J	5J	2.2J
Ba	91.7	971	285	163
Cd	ND	3	29.4J	2
Pb	7.3	2.7J	3.2	2.5J
Ag	0.69J	1.1J	1.2J	0.84J
TRPH	ND	ND	46.6	48.6
BBP	ND	*	110J	*

12702	0'	2'	4'	8'
Cu	7.3	2.6J	1.9J	2.2J
Ba	91.9	206	435	98.4
Cd	1.1	4.2	2.9	1.8
Pb	4.4	1.6J	2.4J	2.4J
Ag	0.68J	3.6J	2.6J	1.4J
TRPH	93.2	48.7	50.1	ND

12707	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	7.1	9.9	5.4	2.8	5.5	2.4	2.2	2.1J	54.9
Ba	84.1	102.0	72.9	98.4	101.0	157.0	158.0	41.7	84.6
Cd	ND	ND	1.5	0.92	1.1	1.2	0.86	ND	1.1
Pb	43.2	9.2	3.05U	4.6	7.4	3.1	3.4	3.0	3.9
Ag	0.43J	0.47J	0.47J	0.54J	ND	0.43J	0.51J	0.48J	0.35J
TRPH	44.1	ND	ND	ND	ND	ND	ND	ND	ND
T	5.5J	3.8J	2.1J	ND	ND	ND	1.7J	2.0J	2.6J
X	5.9	1.5J	ND	ND	ND	ND	ND	ND	ND
B(a)A	190J	*	*	ND	*	*	*	*	*
B(a)P	180J	*	*	ND	*	*	*	*	*
B(b)F	390.0	*	*	ND	*	*	*	*	*
CHR	240J	*	*	ND	*	*	*	*	*
FL	470.0	*	*	ND	*	*	*	*	*
IP	93.0	*	*	ND	*	*	*	*	*
PY	440.0	*	*	ND	*	*	*	*	*

12709	0'	5'	10
Ba	638J	866J	1540J
Cr	11.3	4.4	4.6
Co	8	3.2	ND
Cu	8.5	4.5J	3
Pb	6.4J	3.9J	3.5J
Mn	340	80.1	47
Zn	25.2	14.2	12
AT	5000J	7.3J	11
EB	3900J	ND	ND
T	14000	ND	ND
X	33000	ND	ND
2MN	4900J	ND	ND

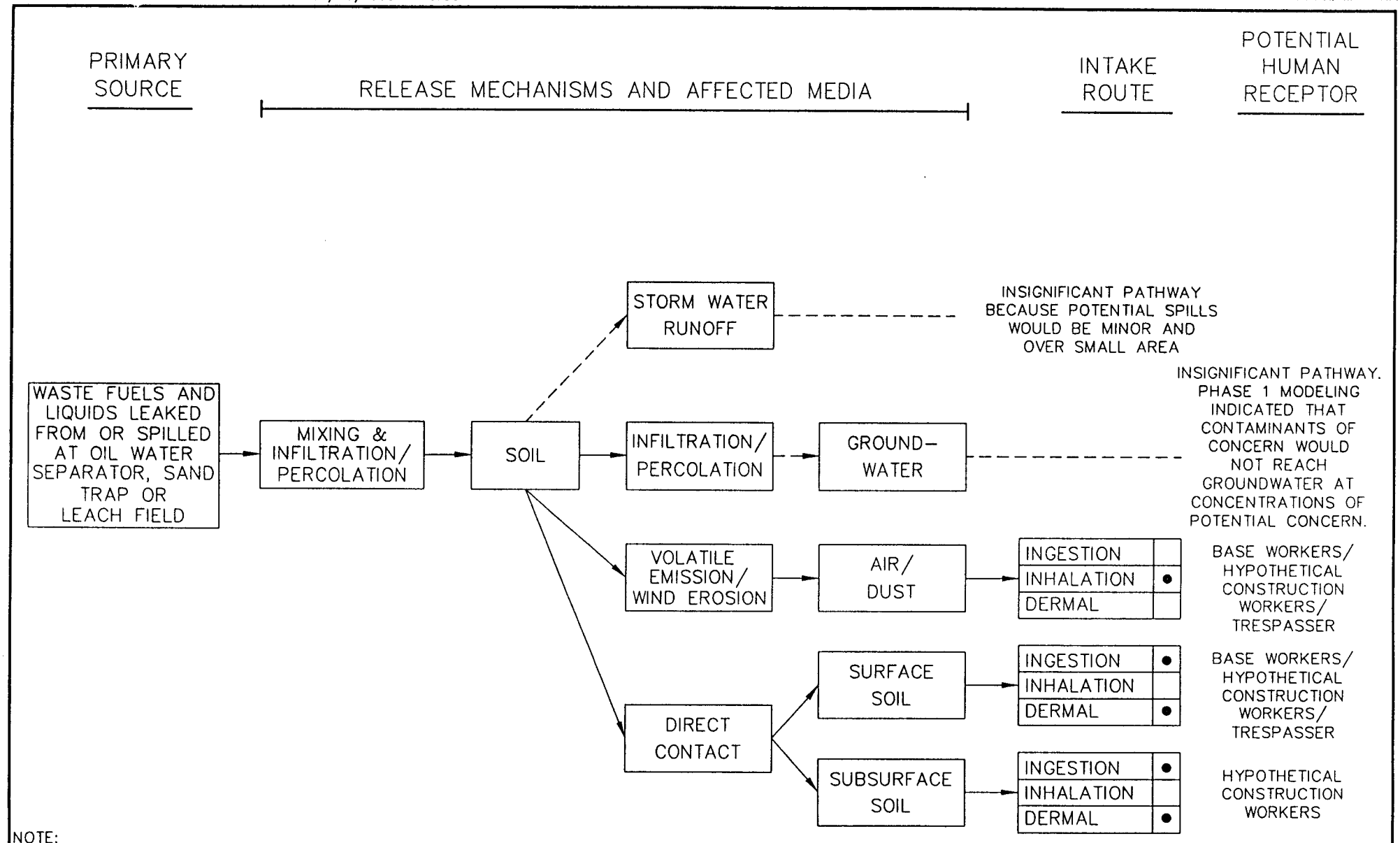
12713	0'	5'	10'	15'	20'	25'	30'	35'	40'	50'	60'
Ba	170J	176J	253J	404J	238J	241J	290J	445J	62.3J	23.8J	132J
Cr	12.9J	11.6J	11.7J	3.2J	6.7J	7.1J	8.8J	4.4J	7.2J	6.1J	13.4J
Co	4.6J	4.7J	3J	2.1J	3.1J	2.1J	2.2J	1.2J	1.9J	1.4J	2.2J
Cu	8.5J	8.6J	5.6J	2.3J	4.1J	3.5J	4.6J	2J	2.1J	2.7J	9.3J
Pb	13.4J	12.5J	4.9J	3.8J	4.9J	4.4J	3J	3J	2.9J	3.2J	3.1J
Mn	187J	200J	84.6J	46.5J	89.2J	49.7J	38.7J	36.3J	47.2J	48.2J	75.4J
Tl	0.12J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zn	30.3J	26.4J	15.8J	10J	16.2J	19.4J	13.1J	10.1J	11.1J	9.9J	9.6J
TRPH	66.5	52.3	ND	ND	ND	ND	ND	ND	ND	47.9	ND
AT	ND	ND	ND	ND	ND	ND	ND	ND	5.6J	3.1J	25
MEK	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.2
MC	6.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
T	1.3J	ND	1.2J	ND	ND	ND	1.6J	9	ND	ND	ND
B(a)A	95J	91J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P	130J	100J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(b)F	310J	250J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(g,h,i)P	100J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHR	190J	150J	ND	ND	ND	ND	ND	ND	ND	ND	ND
DBP	ND	ND	ND	ND	ND	ND	77J	58J	ND	ND	ND
DA	43J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FL	310J	310J	ND	ND	ND	ND	ND	ND	ND	ND	ND
IP	88J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHN	110J	100J	ND	ND	ND	ND	ND	ND	ND	ND	ND
PY	260J	250J	ND	ND	ND	ND	ND	ND	ND	ND	ND

12715	0'	5'	10'	15'	20'	25'	30'	35'	40'	50'	60'
Ba	93J	152J	148J	146J	146J	88.6J	265J	24.6J	33.8J	63.1J	11.8J
Cr	9.2J	6.9J	6.4J	4.7J	6.8J	4.3J	5.2J	5.9J	5.2J	5.7J	4.1
Co	3	2.1	2.8	1.7	3	2.1J		1.2	1.3	0.87J	0.84J
Cu	7.1	5.1	4.1	2.5	5.5	2.8J	2.1J	2.3	1.9J	2J	1.2J
Pb	36.4	7.6	5.1	3.9	6.4	3.3	2.1	2.2	2.2	2.1	2
Mn	175	77.6	85.6	68	139	37.9	29	38.5	56.8	50.3	22.8
Se	0.25J	ND	ND	ND	0.16J	ND	ND	ND	ND	ND	ND
Tl	0.3J	0.2J	0.13J	0.13J	0.11J	ND	ND	ND	ND	ND	ND
Zn	30	17	14.8	12.3	19.9	11.1	8.2	10.1	9.4	8.8	6.9
TRPH	80.8	ND	ND	ND	ND	ND	ND	171	ND	ND	ND
AT	ND	ND	ND	ND	ND	9.5J	8.5J	26	ND	15	ND
MC	ND	ND	ND	4.4J	ND	ND	ND	ND	ND	4.6	ND
B(a)A	260J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P	400	43J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(b)F	420	74J	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(g,h,i)P	270J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(k)F	470	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BA	48J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(2)P	44J	ND	ND	ND	ND	ND	170J	40J	ND	190J	54J
CAR	45J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHR	46J	59J	ND	ND	ND	ND	ND	ND	ND	ND	ND
DOP	ND	64J	ND	ND	ND	ND	ND	ND	ND	ND	ND
FL	860	110J	ND	ND	ND	ND	ND	ND	ND	ND	ND
IP	260J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHN	380	53J	ND	ND	ND	ND	ND	ND	ND	ND	ND
PY	710	77J	ND	ND	ND	ND	ND	ND	ND	ND	ND

12703	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	6.8	7.9	5.2	2.6	2.3J	2J	2.2	1.5J	1.3J
Ba	115	99	255	93.9	110	137	61.9	106	12.9
Pb	30.8	8	4.2	3.2	4	3.1	2.9	2.3	1.6
Tl	ND	0.13J	ND	ND	ND	ND	ND	ND	ND
TRPH	66.8	ND	ND	ND	ND	ND	ND	ND	ND
T	12	ND	ND	ND	3.5J	ND	ND	ND	1.2J
X	3.4J	ND	ND	ND	ND	ND	ND	ND	ND
AN	48J	*	*	ND	*	*	*	*	*
B(a)A	510	*	*	ND	*	*	*	*	*
B(a)P	550	*	*	ND	*	*	*	*	*
B(b)F	960	*	*	ND	*	*	*	*	*
CHR	720	*	*	ND	*	*	*	*	*
FL	1500	*	*	ND	*	*	*	*	*
IP	390	*	*	ND	*	*	*	*	*
PY	1400	*	*	ND	*	*	*	*	*
CAR	46J	*	*	ND	*	*	*	*	*

12705	0'	2'	4'	8'	18'	28'	38'	48'	58'
Sb	7.8	ND	ND	ND	ND	ND	ND	ND	ND
Cu	25.9	5.9	ND	1.8J	3.2J	1.7J	2.7	1.9J	1.5J
Ba	245J	104J	435J	167J	445J	65.4J	148J	36.6J	545J
Cd	0.53	ND	ND	ND	ND	ND	ND	ND	ND
Pb	29.2	6.7	3	2.7	3.1	1.7	1.9	2.2	2.5
TRPH	344	ND	ND	ND	ND	ND	ND	ND	ND
T	5.2	ND	5.4J	18	6.2	ND	7.2	12	ND
X	ND	ND	ND	ND	2.4J	ND	ND	ND	ND
1,2-DCP	4.6J	ND	ND	ND	ND	ND	7.7	ND	ND
AC	150J	ND	*	*	*	*	*	*	*
B(a)A	8000	ND	*	*	*	*	*	*	*
B(b)P	8600	ND	*	*	*	*	*	*	*
B(a)F	17,000	ND	*	*	*	*	*	*	*
CHR	14,000	ND	*	*	*	*	*	*	*
FL	17,000	ND	*	*	*	*	*	*	*
F	290J	ND	*	*	*	*	*	*	*
IP	5100	ND	*	*	*	*	*	*	*
PY	17,000	ND	*	*	*	*	*	*	*
CAR	1500	ND	*	*	*	*	*	*	*

12708	0'	2'	4'	8'	18'	28'	38'	48'	58'
Cu	7.3	9.1	4.1J	4.0	3.7J	3.1	2.0J	1.6J	1.8J
Ba	83.8	79.4	227.0	204.0	242.0	189.0	74.4	113.0	31.6
Cd	ND	ND	2.6	1.2	2.4	0.71	0.88	ND	ND
Pb	42.4	7.5	4.9	5.8	5.1	4.0	4.2	2.1	2.3
Hg	0.11	ND	ND	ND	ND	ND	ND	ND	ND
Ag	0.53J	0.45J	1.2J	0.8J	1.6J	0.48J	0.62J	ND	ND
TRPH	ND	ND	ND	170.0	55.9	ND	ND	ND	ND
B(a)A	150J	*	*	ND	*	*	*	*	*
B(a)P	180J	*	*	ND	*	*	*	*	*
B(b)F	380J	*	*	ND	*	*	*	*	*
CHR	260.0J	*	*	ND	*	*	*	*	*
FL	440J	*	*	ND	*	*	*	*	*
PY	360J	*	*	ND	*	*	*	*	*



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 08/19/93	SITE CONCEPTUAL EXPOSURE MODEL SAND TRAP AT POL WASHRACK, LEACH FIELD SWMU 127 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY .	REVISIONS: 0		C3M11MM	8-4

LEAD-ACID BATTERY ACCUMULATION POINT - SWMU NO. 55

9.1 SITE BACKGROUND

9.1.1 Site Description

The lead-acid battery accumulation point consists of asphalt pavement measuring approximately 8 feet square located about 100 feet north of the Vehicle Maintenance Shop, Building 379 (Figure 17-1). The pavement is contiguous with the asphalt parking lot for Building 379 and slopes slightly toward the northwest.

9.1.2 Site History

Used lead-acid vehicle batteries were stored "wet" on pallets on the pavement until a sufficient number were accumulated for sale to a battery recycling company. The lead-acid battery accumulation point has been in operation since 1965.

The batteries were prepared for storage by securing the vent caps with tape and by taping the terminals to prevent shorts. The area under the pallets was lined with plastic sheeting covered with baking soda to neutralize any acid which may leak out during storage. The storage area was open to the elements.

9.1.3 Current Use

The storage area is apparently no longer used. On recent site visits by W-C and USACE personnel, no batteries have been observed to be stored at the SWMU.

9.1.4 Potential Contaminants

Potential contaminants of concern include lead and sulfuric acid.

9.1.5 Previous Investigations

The objective of sampling at the site of the Lead-Acid Battery Accumulation Point was to evaluate whether or not a release of SWMU-related chemicals posing a hazard to human health or the environment had occurred as a result battery leakage and spillage. Three 20-foot boreholes were drilled and sampled to investigate the vertical extent of any discovered target contaminants in the soil during the Phase I RFI (W-C 1994). The soil borings were located along a crack coinciding with the direction of drainage from this area, in a depression on the pavement where surface runoff accumulates, and in an area of suspected runoff accumulation north of the storage area.

Soil samples were collected from directly beneath the asphalt pavement from the 0.5- to 2-foot interval and at the 3- to 5-foot, 8- to 10-foot, 13- to 15-foot, and 18- to 20-foot depth intervals below ground surface.

Only minor iron oxide surface staining was found on the asphalt pavement, possibly attributable to a leak from the batteries once stored here.

Target analytes for the samples collected included lead and pH. Lead was detected in low concentrations in the surface and subsurface samples in all of the borings. The lead concentrations decreased with depth. Acidity was reported as nondetect for all of the samples. The sampling results are summarized on Figure 9-3. The recommendation made in the Phase I RFI report (W-C 1994) was for no further evaluation.

9.1.6 Phase II Sampling Objectives

The overall objective of sampling at the site of the Lead-Acid Battery Accumulation Point was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of spillage or leakage from the stored batteries which could pose a significant risk to human health or the environment. The analytical data collected from this investigation was used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the Lead-Acid Battery Accumulation Point. Potential release points included cracks and depressions in the pavement surface and at the pavement edge in areas of surface runoff.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

9.2 FIELD INVESTIGATION AND DATA COLLECTION

9.2.1 Soils Sampling

Three soil borings were drilled and soil samples collected at the lead acid battery accumulation point. The borings were drilled to a total depth of 20 feet in the area surrounding the historical and present day accumulation areas. The boring locations were chosen to further assess the lateral presence and extent of site-related soil contaminants to the 20-foot depth. Phase II RFI boring numbers and sample descriptions are shown in Table 9-1 and on Figure 9-2.

Surface soil samples from all borings were collected from 0 to 2 feet. All borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, and 18 to 20 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile Organic Compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL Metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1
- pH by EPA Method 9040

9.2.2 Geologic Summary of Boring Logs

Boring logs from the Phase I RFI indicate the soil under this SWMU progresses down-section through various thicknesses of red, brown, and light yellowish sandy clay/silt with occasional gravel. The log for boring 05503 indicates a reversal or repetition in the stratigraphy described above indicating an area backfilled during construction of nearby facilities. Minor structures such as reddish dendrites and mottling were noted in the brown and light colored soils, respectively. The soil is dry to damp, resulting in a firm to hard profile. No visual indications of soil contamination were noted for any of the borings drilled in this SWMU.

Logs from the three Phase II RFI borings show a subsurface lithology consisting of fine-grained fill material and Ogallala Formation sediments. All borings encountered a 3- to 4-inch layer of asphalt pavement at the surface. Silty clay fill (USCS symbol CL) was found below the pavement to depths of 0.8 to 1 foot. This fill is dark brown, dry to moist, and low plastic with a trace of asphalt and fine gravel. Below the fill, and to the completion depths of all borings, is clayey silt (USCS symbol ML) which is described as reddish-brown, dry, and loose to medium dense with some calcium carbonate nodules.

No field screening (headspace) or visual indications of contamination, with the exception of a headspace reading of 4.8 ppm at the 1-foot depth in boring 5505, were observed while drilling and sampling the Phase II soil borings. No odors were noted during drilling or sampling activities.

9.2.3 Site Topography

The site is mainly flat-lying in an asphalt-paved area about 50 feet north of building 379. The site is surrounded by barbed-wire fences and is bordered by parking areas to the southwest, southeast, and north. An open grassy area exists to the northwest of the site. Building 357 is located about 100 feet to the north of the site.

Storm water runoff flows off site to the northwest over the pavement and asphalt parking lot and ultimately into the D.L. Ingram Street drainage ditch.

9.3 CHEMICAL INVESTIGATION RESULTS

9.3.1 General

Soil samples were collected from three borings (05504, 05505, and 05506). Sampling and analyses performed are summarized in Table 9-1. A summary of the analytical results for these soil samples are provided in Table 9-2. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

9.3.2 Organic Results for Near-Surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN055-5504-0000, CAN055-5505-000 and CAN055-5506-0000) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 9-1.

Besides acetone and methylene chloride, which were qualified as nondetect after they were determined to be laboratory contaminants, the only VOC reported was toluene at concentrations of 7.4 μg/kg and 15 μg/kg (estimated), reported for samples CAN055-5504-0000 and CAN055-5506-0000, respectively. Several SVOC compounds in the form of PAHs were reported for sample CAN055-5506-0000. Total PAHs were detected at a concentration of 36,200 μg/kg. Bis(2-ethylhexyl)phthalate was reported in sample CAN055-5505-0000 at an estimated concentration of 860 μg/kg. While not detected in associated method blanks for this sample, bis(2-ethylhexyl)phthalate is considered a common laboratory contaminant and not expected to be present at this site. No other SVOCs were detected in the near-surface samples. Petroleum hydrocarbons were detected at concentrations of 1,650 mg/kg, 1,540 mg/kg, and 11,500 mg/kg in samples CAN055-5504-0000, CAN055-5505-0000 and CAN055-5506-0000, respectively.

9.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN055-5504-0005, CAN055-5505-0010, CAN055-5504-00145, and CAN055-5504-0020 for boring 05504, CAN055-5505-0005, CAN055-5505-0010, CAN055-5505-0015, and CAN055-5505-0020 for boring 05505, and

CAN055-5506-0005, CAN055-5506-0010, CAN055-5506-0015, and CAN055-5506-0020 for boring 05506) were analyzed for VOCs, SVOCs, metals, and TRPH as indicated in Table 9-1.

Besides acetone and methylene chloride, which were qualified as nondetect after they were determined to be laboratory contaminants, the only VOC reported was toluene at an estimated concentration of 1.8 μg/kg reported for sample CAN055-5504-0005. No SVOC compounds were reported in any of the subsurface samples collected at the site. Petroleum hydrocarbons were reported in only one subsurface sample, CAN055-5504-0005, at a concentration of 50.1 mg/kg.

9.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 9-1. The range of results, combining Phase I and Phase II data, for metals reported in the soil samples are summarized in Table 9-A.

TABLE 9-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	15/15	2,620	5505-0015	13,300	5504-0020
Antimony	2/15	2.9J	5506-0010	7.1J	5506-0000
Arsenic	15/15	1.5	5506-0015	4.5	5506-0000
Barium	15/15	90.7J	5504-0020	1120	5504-0010
Beryllium	13/15	.29J	5506-0000	.76	5504-0020
Cadmium	2/15	.34J	5506-0010	.82J	5506-0020
Calcium	15/15	11,000J	5504-0020	275,000	5505-0015
Chromium	13/15	3.3	5506-0000	9.9	5504-0020
Cobalt	14/15	1.6	5505-0020	4.4J	5504-0000
Copper	14/15	2.6	5505-0020	7	5506-0005
Iron	15/15	1,580	5505-0015	10,500	5504-0020
Lead	30/30	0.56	0551-0000	17.3	5506-0000
Magnesium	15/15	1,940	5505-0000	11,900	5505-0020
Manganese	15/15	22J	5505-0015	336J	5506-0000
Mercury	0/15				
Nickel	15/15	5.7	5506-0015	9.3	5506-0005
Potassium	15/15	336J	5505-0015	3,340	5504-0020
Silver	0/15				
Selenium	0/15				
Sodium	0/15				
Thallium	0/15				

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Vanadium	15/15	12.6	5505-0000	24.9	5504-0020
Zinc	15/15	5J	5505-0015	27.3	5504-0020

Note: See Table 9-3 for comparison to background.

9.4 DATA ASSESSMENT

An assessment of the Lead Acid Battery Accumulation Point (SWMU 55) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

9.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

9.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C, 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA, 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988). A detailed review of SWMU 55 data is provided in the QCSR.

For the organic analyses, qualification of data was required based on outlying internal standard areas. For VOC analysis of samples CAN055-5506-0000 and CAN055-5506-5562, internal standard areas were reported below evaluation criteria, and the surrogate recoveries were above evaluation criteria. Analytes associated with the outlying internal standards were qualified estimated **J** (detects) or **UJ** (nondetects). No qualifications were required based on the outlying surrogate recovery because associated data was reported as nondetect.

Additionally, acetone and methylene chloride data were qualified as nondetect **U** for several samples based on blank contamination.

The MS recoveries for antimony, barium, selenium, and thallium were below evaluation criteria, and the MS recovery for magnesium was reported above evaluation criteria. Antimony, barium, selenium, and thallium for boring 5504 samples were qualified estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected magnesium results were qualified as estimated **J** to indicate a potential high bias for boring 5504 samples. For manganese, one MS recovery was above criteria, and the second MS recovery was below criteria. Additionally, the RPD for the matrix duplicate was outlying criteria. Detected manganese data for boring 5504 samples were qualified as estimated **J** to indicate a potential high bias, and manganese data for boring 5505 and 5506 samples were qualified as estimated **J** to indicate a potential low bias.

For the field duplicate samples, CAN055-5506-0000 and CAN055-5506-5562, toluene data were qualified as estimated **J** based on the outlying precision parameter. The RPDs for the matrix duplicate samples were outlying criteria for barium, calcium, manganese, and magnesium. Calcium data were qualified was qualified as estimated **J** for boring 5504 samples. Associated barium, manganese, and magnesium data were qualified based on MS recoveries.

9.4.3 Reporting Limits

Reporting limits were raised for several metal and TRPH analyses by no more than 10 times the nominal RL. For selenium and thallium analyses, reporting limits were raised due to either matrix interference or dilutions. Selenium and thallium data, which had elevated reporting limits based on the matrix interferences, were qualified estimated **J** (detects) or **UJ** (nondetects). Lead analyses required dilutions for several samples due to either analyte concentrations above the calibration range or matrix interferences. Method 6010 and TRPH analyses required dilutions which elevated the reporting limits due to calcium or TRPH concentrations, respectively, above the calibration range, and one arsenic analysis required a dilution due to matrix interferences.

Dilutions which were greater than a factor of 10 were required for two TRPH analyses and one thallium analysis. TRPH analyses for samples CAN055-5506-0000 and CAN055-5506-5562 were diluted, elevating the reporting limits, by factors of 40 and 21, respectively. Dilutions were required for these analyses due to concentrations of TRPH above the calibration range. For sample CAN055-5506-0020, thallium analysis required a dilution by a factor of 20 due to matrix interferences.

9.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 55 were determined to meet quality criteria and the elevated reporting limits were judged not to impact the data usability for the metals (except thallium) because either the elevated RLs were below the RBCs or analytes would be reported as estimated concentration below the RBCs. For thallium only, one of seventeen RLs was above the RBCs, and thallium was reported as nondetect in all eighteen samples. For TRPH data, TRPH were reported at concentrations above the elevated RLs. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent of contamination and to be used for the human health risk screening.

9.5 NATURE AND EXTENT OF CONTAMINATION

SWMU 55 is a paved area in the motor pool compound where lead/acid batteries are stored on pallets awaiting disposal. There were three Phase I borings and three Phase II borings advanced through the pavement to depths of 20 feet below the surface. There was no visible evidence on the surface or in the samples of contamination. The Phase I samples were tested for lead and acidity, and no elevated levels of either analyte were detected. The Phase II samples were analyzed for VOCs, SVOCs, total metals, and TRPH. Low levels of toluene were detected only in the surface soils at two borings and in one sample at 5 feet of depth. Relatively high levels of PAHs and TRPH were detected in one of these surface samples. The other surface samples had lower levels of TRPH and SVOCs. Since the SWMU is capped with asphalt, the PAH and TRPH results in the surface soils may be due to the asphalt and may not be indicative of site-related contamination. TRPH was detected in only one subsurface sample at a depth of 5 feet at a relatively low concentration.

9.6 COMPARISON OF PHASE II METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals in soil were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values from regional soils (USGS 1984). The background data and calculation of UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D).

Table 9-3 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. The maximum concentrations of cadmium and manganese exceeded the background levels; therefore, these metals were retained for further evaluation as chemicals of concern in soil. A brief discussion of the interpretation of the background comparisons is given here.

Two of fifteen soil samples contained aluminum at concentrations (12,300 and 13,300 mg/kg) which slightly exceeded the background UTL of 10,540 mg/kg. These concentrations also slightly exceeded the range of detected Base-wide background concentrations. However, all other detected concentrations of aluminum were well below the background UTL, and the maximum detected concentrations were well below the regional literature value for aluminum (50,000 mg/kg). Therefore, aluminum was considered to be within background levels and was not retained for further evaluation.

Three of fifteen soil samples contained barium at concentrations (723, 867, and 1,120 mg/kg), which exceeded the background UTL of 642 mg/kg and the barium regional literature value of 500 mg/kg. However, these concentrations were within the range of detected Base-wide

background concentrations. In addition, barium has been shown to substitute for calcium, it is believed that the barium is a naturally occurring constituent of the caliche (Klein and Hurlbutt 1985). Therefore, barium was considered to be within background levels and was not evaluated further.

One of fifteen soil samples contained zinc at a concentration (27.3 mg/kg), which slightly exceeded the background UTL of 21.9 mg/kg. However, this concentration did not exceed the range of detected background Base-wide concentrations, and it did not exceed the regional literature value for zinc (45 mg/kg). Therefore, zinc was considered to be within background and was not evaluated further as a chemical of concern.

9.7 RISK EVALUATION

9.7.1 Site Conceptual Exposure Model

Figure 9-4 shows the site conceptual exposure model (SCEM) of chemical sources and potential human exposure pathways for the Lead-Acid Battery Storage Site. In the SCEM, the potentially complete exposure pathways are indicated with solid lines; incomplete or insignificant pathways are indicated with broken lines.

The primary potential contaminant source is fluid, which may have leaked from the batteries stored at the SWMU. Mixing and infiltration of the fluid with the soil is shown as the primary chemical release mechanism. Once released to the soil, the chemicals may then be released to groundwater by infiltration/percolation or to the atmosphere by volatilization or wind erosion. Chemicals could also be released directly to receptors via contact with soil. Storm water runoff is considered to be an insignificant pathway because there are no drainage channels in the area.

As shown in figure 9-4, surface soil may provide exposures to Base workers (occupational exposures), hypothetical future construction workers, or hypothetical future trespassers (if the Base is closed in the future) via soil ingestion, dermal contact, or inhalation of air emissions (volatile and particulates). Subsurface soils may provide exposures to construction workers (i.e., during excavation) via ingestion, dermal contact and inhalation of air emissions from subsurface soil.

Groundwater is used for domestic purposes on and off Base. However, groundwater is probably an insignificant pathway at this SWMU because fate and transport modeling in the Phase I investigation showed that chemicals would not be transported to groundwater at concentrations of concern. In addition, only low levels of contamination were found in subsurface soils, and the SWMU is covered by pavement which limits infiltration and vertical transport of contaminants.

In summary, the potentially complete human exposure pathways at SWMU 55 are:

Occupational Workers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

Hypothetical Construction Workers

- Ingestion of and dermal contact with surface and subsurface soil
- Inhalation of volatile emissions and airborne particulate matter from surface and subsurface soil

Hypothetical Trespassers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

9.7.2 Comparison of Phase II Concentrations to RBCs

The objective of the Phase II risk evaluation was to verify whether the recommendation for no further action based on the Phase I Risk-Screening Evaluation (W-C 1994) is appropriate for this SWMU. Since only lead and acidity were analyzed for in Phase I, Phase II concentrations were compared directly to highly conservative EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994). This comparison was made to

evaluate if chemicals detected in Phase II were at concentrations that could pose a significant human health risk. EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. Note that the RBCs are based on conservative residential exposure assumptions that significantly overestimate exposures that are likely to occur at this SWMU because the SWMU is in an industrial area. Therefore, risks predicted from the RBC comparison significantly overestimate actual risks at the SWMU. A discussion of the methodology used to derive the RBCs is given in section 3.4 and Appendix D.

Table 9-4 shows the comparison of the Phase II maximum concentrations with RBCs. The maximum detected concentrations of several chemicals (e.g., PAHs) exceeded the RBCs for residential soils. Comparing the Phase II maximum concentrations to residential RBCs is a very conservative approach because SWMU 55 is located in an industrial area of the Base and is likely to remain an industrial area in the future. Therefore, no residential exposures are likely to occur at this SWMU.

Two chemicals, benzo(a)pyrene and dibenzo(a,h)anthracene, were detected at concentrations (4,000 and 1,100 mg/kg, respectively) which exceeded the industrial soil RBC of 0.39 mg/kg for both benzo(a)pyrene and dibenzo(a,h)anthracene. These concentrations would result in an estimated potential risk of 1×10^{-5} for benzo(a)pyrene and 3×10^{-6} for dibenzo(a,h)anthracene. These concentrations are within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) for exposure to chemicals released from hazardous waste sites (EPA 1990a, 1990d, 1991d, 1992d). Therefore, no unacceptable human health risks are anticipated from exposure to chemicals detected in soil at SWMU 55.

The reporting limits for two samples (5505-000 and 5506-000) were elevated to 3.7 mg/kg and 3.6 mg/kg, respectively, for semivolatile compounds. The contract lab that analyzed the samples reported concentrations (J-qualified) at one-fifth the reporting limit. One-fifth of 3.7 mg/kg is 0.74 mg/kg. This concentration exceeds the residential RBCs for only the PAHs benzo(a)pyrene (0.088 mg/kg) and dibenzo(a,h)anthracene (0.088 mg/kg), but it is below industrial RBCs for all PAHs. All of the PAHs (including benzo(a)pyrene and dibenzo(a,h)anthracene) would have been reported at estimated (J-qualified) concentrations had they been present in the samples at concentrations above 0.74 mg/kg (below industrial RBCs). Since this is below RBCs, the data show that the compounds are not present at

concentrations of concern. Further, only samples from one boring (and only at the surface) had elevated reporting limits, so the potentially impacted area is quite limited in size. Since no significant contamination was detected in the 5-foot sample, there is no evidence of vertical transport to groundwater (at approximately 280 feet).

The potential cumulative risk at the SWMU was estimated by adding the incremental risks (based on RBC comparisons) posed by Phase II concentrations. This is a very conservative approach because the RBCs are based on conservative exposure assumptions that are likely to overestimate actual exposure at the SWMU (i.e., the paved parking area). Table 9-4a presents the incremental risk due to the Phase II concentrations and the potential cumulative risks. Table 9-4a shows that the potential cumulative cancer risk of 2×10^{-5} and the potential cumulative noncancer hazard of 0.09 are below or within EPA's target risk range.

Additionally, the SWMU and adjacent parking lot for Building 379 are covered with asphalt pavement. The PAHs which exceeded the RBCs were detected in the surface soil sample (boring 5506) collected immediately beneath the asphalt pavement. Since oils and other petroleum based products are constituents used in the preparation of and formation of asphalt, the concentrations of the detected PAHs are likely due to the presence of the asphalt and not due to a release from the SWMU. Finally, the SWMU and the surrounding sampled area are small (30 feet by 100 feet) and covered by asphalt. This would limit potential exposures to detected chemicals. Therefore, no unacceptable human health risks are anticipated from SWMU 55.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, naphthalene, pyrene, and toluene) were analyzed for individually in the soil samples at the SWMU.

In the Phase II investigation at SWMU 55, TRPH was detected in the surface soil of boring 5506 (beneath the asphalt paving) at a maximum concentration of 11,500 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. PAHs were the only potentially toxic constituents of TRPH which were detected at concentrations exceeding RBCs for residential and industrial soils. Other constituents of TRPH which are not known

to be toxic are unlikely to contribute significantly to risks at the SWMU. As discussed above, the presence of the PAHs (and TRPH) are likely due to the asphalt paving and are not SWMU-related. Since these chemicals are covered by pavement, exposures would be limited. Therefore, no unacceptable human health risks are expected from the TRPH detected in the soil.

9.7.3 Evaluation of the Groundwater Pathway

The vertical distribution of the soil contamination was used to evaluate whether chemical releases pose a threat to groundwater. The chemicals which exceeded RBCs were detected only in the surface soil indicating that they are not infiltrating and being transported to the groundwater. Since SWMU 55 is covered by pavement, future infiltration and vertical transport will be limited. Therefore, groundwater is not likely to be impacted by contaminants detected in the soil at SWMU 55.

9.7.4 Conclusion

Since none of the Phase II chemicals were detected at concentrations which would pose an unacceptable human health risk, and the vertical distribution of soil contamination indicated that groundwater would not be impacted, the results of the Phase I Risk-Screening Evaluation are confirmed, and no further action is recommended for SWMU 55.

9.8 SUMMARY AND RECOMMENDATIONS

Fifteen soil samples were collected and analyzed from three 20-foot soil borings at SWMU 55 during the Phase II RFI. Maximum concentrations were compared to Phase I results, background levels, and RBCs. Again, the highest concentration for lead was found in the surface soils at the SWMU. VOC, SVOC, and TRPH contamination detected was also confined to surface or shallow subsurface soils. Three metals exceeded background, but none of these exceeded RBCs. Five organic compounds, all PAHs, exceeded residential RBCs, and two of these compounds exceeded industrial RBCs. However, the estimated risks from these chemicals were all within the EPA target risk range of 1×10^{-6} to 1×10^{-4}. These chemicals are also likely related to the asphalt pavement on the surface of the site and may not be site related.

The vertical distribution of site contaminants appears to be well defined and potential impact to groundwater is considered to be low. Because no unacceptable health risks exist from any of the chemicals detected at the SWMU, it is recommended that no further investigation of this SWMU is necessary.

TABLE 9-1
SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
LEAD - ACID BATTERY ACCUMULATION POINT (SWMU NO. 55)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters					Sample Containers	
					VOCs	SVOCs	Metals	TRPH	pH	4 oz. jars	16 oz. jars
Boring 05504	0 - 2	CAN055-5504-0000		Soil	X	X	X	X	X	2	1
	0 - 2	CAN055-5504-5561	FD	Soil	X	X	X	X	X	2	1
	3 - 5	CAN055-5504-0005		Soil	X	X	X	X	X	2	1
	3 - 5	CAN055-5504-0010	MRD	Soil	X	X	X	X	X	2	1
	8 - 10	CAN055-5504-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN055-5504-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN055-5504-0020		Soil	X	X	X	X	X	2	1
Boring 05505	0 - 2	CAN055-5505-0000		Soil	X	X	X	X	X	2	1
	0 - 2	CAN055-5505-5502	MRD	Soil	X	X	X	X	X	2	1
	3 - 5	CAN055-5505-0005		Soil	X	X	X	X	X	2	1
	3 - 5	CAN055-5505-6005	MS/MSD	Soil	X	X	X	X	X	2	1
	8 - 10	CAN055-5505-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN055-5505-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN055-5505-0020		Soil	X	X	X	X	X	2	1
Boring 05506	0 - 2	CAN055-5506-0000		Soil	X	X	X	X	X	2	1
	0 - 2	CAN055-5506-5562	FD	Soil	X	X	X	X	X	2	1
	3 - 5	CAN055-5506-0005		Soil	X	X	X	X	X	2	1
	8 - 10	CAN055-5506-0010		Soil	X	X	X	X	X	2	1
	13 - 15	CAN055-5506-0015		Soil	X	X	X	X	X	2	1
	18 - 20	CAN055-5506-0020		Soil	X	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 9-2 for locations of the borings.

TABLE 9-2
SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 055
CANNON AFB

LOCATOR	CAN055-5504-0000			CAN055-5504-5561[1]			CAN055-5504-0005			CAN055-5504-0010			CAN055-5504-0015			CAN055-5504-0020		
LAB SAMPLE NUMBER	0398680012SA			0398680017SA			0398680013SA			0398680014SA			0398680015SA			0398680016SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	8.3	11	J	<	11	U	<	11	U	<	11	U
Methylene chloride	3	5.6	J	<	5.6	U	3	5.6	J	<	5.6	U	<	5.6	U	<	5.7	U
Toluene	7.4	5.6		3.1	5.6	J	1.8	5.6	J	<	5.6	U	<	5.6	U	<	5.7	U
Semivolatile Organics (µg/kg)																		
Anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(k)fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
bis(2-Ethylhexyl)phthalate	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Carbazole	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Chrysene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Diethyl phthalate	<	370	U	38	370	J	<	370	U	<	370	U	<	370	U	<	380	U
Fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Phenanthrene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)																		
Aluminum	6100	56		6930	22.5		12300	11.1		9930	11.3		8780	11.1		13300	11.5	
Antimony	<	33.6	UJ	<	13.5	UJ	<	6.7	UJ	<	6.8	U	<	6.7	UJ	<	6.9	UJ
Arsenic	3.4	0.56		3.6	0.56		2.3	0.56		2.3	0.56		1.9	0.56		3.2	0.57	

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R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 9-2
SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 055
CANNON AFB

LOCATOR	CAN055-5504-0000			CAN055-5504-5561[1]			CAN055-5504-0005			CAN055-5504-0010			CAN055-5504-0015			CAN055-5504-0020		
LAB SAMPLE NUMBER	0398680012SA			0398680017SA			0398680013SA			0398680014SA			0398680015SA			0398680016SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Barium	468	5.6	J	498	2.2	J	136	1.1	J	1120	1.1		115	1.1	J	90.7	1.1	J
Beryllium	<	1.1	U	0.26	0.45	J	0.54	0.22		0.44	0.23		0.42	0.22		0.76	0.23	
Cadmium	<	2.8	U	0.47	1.1	J	<	0.56	U	<	0.56	U	<	0.56	U	<	0.57	U
Calcium	230000	112	J	213000	44.9	J	41400	22.2	J	83000	22.5		60600	22.2	J	11000	22.9	J
Chromium	<	5.6	U	4.7	2.2		9.3	1.1		7.6	1.1		7	1.1		9.9	1.1	
Cobalt	4.4	5.6	J	2.3	2.2		3.6	1.1		3.3	1.1		2.4	1.1		3.4	1.1	
Copper	5	11.2	J	5.1	4.5		6.9	2.2		4.8	2.3		4.5	2.2		6.7	2.3	
Iron	4220	56		4860	22.5		9300	11.1		7120	11.3		6570	11.1		10500	11.5	
Lead	5.7	1.1		7.1	1.1		5.4	0.56		4.5	0.56		4.6	0.56		7.3	0.57	
Magnesium	5360	112	J	5100	44.9	J	2480	22.2	J	3750	22.5		3490	22.2	J	5460	22.9	J
Manganese	90.7	5.6	J	94	2.2	J	131	1.1	J	97.9	1.1		94.1	1.1	J	68.5	1.1	J
Nickel	7.9	22.4	J	9.4	9		9.1	4.4		7.5	4.5		5.9	4.4		8.2	4.6	
Potassium	788	2800	J	1150	1120		2110	556		1820	563		2190	556		3340	573	
Vanadium	13.2	5.6		15.2	2.2		16.8	1.1		17.8	1.1		14.8	1.1		24.9	1.1	
Zinc	11.2	11.2		12.7	4.5		22.1	2.2		17.8	2.3		15.8	2.2		27.3	2.3	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	1650	179		1640	180		50.1	44.5		<	45	U	<	44.5	U	<	45.9	U

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J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 9-2
SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 055
CANNON AFB

LOCATOR	CAN055-5505-0000			CAN055-5505-0005			CAN055-5505-0010			CAN055-5505-0015			CAN055-5505-0020			CAN055-5506-0000		
LAB SAMPLE NUMBER	0398700005SA			0398700007SA			0398700008SA			0398700012SA			0398700009SA			0398700002SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	13	11		12	12		<	11	U	<	12	U	18	11	J
Methylene chloride	<	5.6	U	<	5.7	U	2	5.8	J	<	5.6	U	2.7	5.9	J	4	5.4	J
Toluene	<	5.6	UJ	<	5.7	UJ	<	5.8	UJ	<	5.6	UJ	<	5.9	UJ	15	5.4	J
Semivolatile Organics (µg/kg)																		
Anthracene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	800	3600	J
Benzo(a)anthracene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	2700	3600	J
Benzo(a)pyrene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	4000	3600	
Benzo(b)fluoranthene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	3600	3600	
Benzo(g,h,i)perylene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	3000	3600	J
Benzo(k)fluoranthene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	3700	3600	
bis(2-Ethylhexyl)phthalate	860	3700	J	<	380	U	<	380	U	<	370	U	<	390	U	<	3600	U
Carbazole	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	<	3600	U
Chrysene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	3100	3600	J
Dibenz(a,h)anthracene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	1100	3600	J
Diethyl phthalate	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	<	3600	U
Fluoranthene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	5700	3600	
Indeno(1,2,3-cd)pyrene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	2600	3600	J
Phenanthrene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	3200	3600	J
Pyrene	<	3700	U	<	380	U	<	380	U	<	370	U	<	390	U	6200	3600	
Metals (mg/kg)																		
Aluminum	6020	11.2		6920	11.5		5950	23.1		2620	55.7		9790	11.8		3030	21.6	
Antimony	<	6.7	UJ	<	6.9	UJ	<	13.8	UJ	<	33.4	UJ	<	7.1	UJ	7.1	12.9	J
Arsenic	2.5	0.56		2.2	0.57		2.2	0.58		2.3	0.56		1.8	0.59		4.5	0.54	

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 9-2
SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 055
CANNON AFB

LOCATOR	CAN055-5505-0000			CAN055-5505-0005			CAN055-5505-0010			CAN055-5505-0015			CAN055-5505-0020			CAN055-5506-0000		
LAB SAMPLE NUMBER	0398700005SA			0398700007SA			0398700008SA			0398700012SA			0398700009SA			0398700002SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Barium	153	1.1	J	184	1.1	J	156	2.3	J	867	5.6	J	398	1.2	J	723	2.2	J
Beryllium	0.41	0.22		0.45	0.23		0.47	0.46		<	1.1	U	0.48	0.24		0.29	0.43	J
Cadmium	<	0.56	U	<	0.57	U	<	1.2	U	<	2.8	U	<	0.59	U	<	1.1	U
Calcium	41700	22.3		78300	22.9		127000	46.1		275000	111		55200	23.6		150000	43.1	
Chromium	5.9	1.1		5.5	1.1		3.8	2.3		<	5.6	U	6.8	1.2		3.3	2.2	
Cobalt	3.2	1.1		3.6	1.1		3.3	2.3		<	5.6	U	1.6	1.2		3.3	2.2	
Copper	5.9	2.2		5.7	2.3		3.3	4.6	J	<	11.1	U	2.6	2.4		5.5	4.3	
Iron	6210	11.2		6010	11.5		4760	23.1		1580	55.7		5990	11.8		3960	21.6	
Lead	5.9	0.56		5.3	0.57		4.1	0.58		0.85	0.56		3	0.59		17.3	2.7	
Magnesium	1940	22.3		2250	22.9		4750	46.1		6920	111		11900	23.6		3260	43.1	
Manganese	153	1.1	J	112	1.1	J	55.2	2.3	J	22	5.6	J	34.5	1.2	J	336	2.2	J
Nickel	7.3	4.5		8.5	4.6		8.6	9.2	J	7.3	22.3	J	8.5	4.7		7.6	8.6	J
Potassium	1140	558		1250	573		1410	1150		336	2780	J	1640	591		481	1080	J
Vanadium	12.6	1.1		13.1	1.1		17.8	2.3		13	5.6		24	1.2		14.8	2.2	
Zinc	16.3	2.2		14.5	2.3		12.5	4.6		5	11.1	J	11.9	2.4		18.4	4.3	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	1540	178		<	45.8	U	<	46.1	U	<	44.6	U	<	47.3	U	11500	1730	

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U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 9-2
SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 055
CANNON AFB

LOCATOR	CAN055-5506-5562[1]			CAN055-5506-0005			CAN055-5506-0010			CAN055-5506-0015			CAN055-5506-0020		
LAB SAMPLE NUMBER	0398700011SA			0398700004SA			0398700006SA			0398700010SA			0398700003SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	11	U	<	11	U	11	11		<	11	U	<	11	U
Methylene chloride	3.2	5.4	J	<	5.7	U	2	5.6	J	1.3	5.6	J	<	5.7	U
Toluene	28	5.4	J	<	5.7	UJ	<	5.6	UJ	<	5.6	UJ	<	5.7	UJ
Semivolatile Organics (µg/kg)															
Anthracene	780	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(a)anthracene	2600	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	3800	3600		<	370	U	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	2700	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(g,h,i)perylene	2400	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(k)fluoranthene	3900	3600		<	370	U	<	370	U	<	370	U	<	380	U
bis(2-Ethylhexyl)phthalate	<	3600	U	<	370	U	<	370	U	<	370	U	<	380	U
Carbazole	400	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Chrysene	2900	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Dibenz(a,h)anthracene	<	3600	U	<	370	U	<	370	U	<	370	U	<	380	U
Diethyl phthalate	<	3600	U	<	370	U	<	370	U	<	370	U	<	380	U
Fluoranthene	4800	3600		<	370	U	<	370	U	<	370	U	<	380	U
Indeno(1,2,3-cd)pyrene	2400	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Phenanthrene	3200	3600	J	<	370	U	<	370	U	<	370	U	<	380	U
Pyrene	5600	3600		<	370	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)															
Aluminum	3250	21.7		6470	11.3		4530	11.2		5420	11.2		6650	22.8	
Antimony	<	13	UJ	<	6.8	UJ	2.9	6.7	J	<	6.7	UJ	<	13.7	UJ
Arsenic	5.4	0.54		2.3	0.57		2.2	1.1		1.5	0.56		1.9	0.57	

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 9-2
SUMMARY OF COMPOUNDS DETECTED IN PHASE II SOIL SAMPLES COLLECTED AT SWMU 055
CANNON AFB

LOCATOR	CAN055-5506-5562[1]			CAN055-5506-0005			CAN055-5506-0010			CAN055-5506-0015			CAN055-5506-0020		
LAB SAMPLE NUMBER	0398700011SA			0398700004SA			0398700006SA			0398700010SA			0398700003SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Barium	851	2.2	J	148	1.1	J	254	1.1	J	97.7	1.1	J	111	2.3	J
Beryllium	0.28	0.43	J	0.44	0.23		0.31	0.22		0.42	0.22		0.55	0.46	
Cadmium	<	1.1	U	<	0.57	U	0.34	0.56	J	<	0.56	U	0.82	1.1	J
Calcium	172000	43.4		61800	22.7		96900	22.3		50400	22.4		137000	45.6	
Chromium	2.6	2.2		5.9	1.1		3.9	1.1		4.8	1.1		4.8	2.3	
Cobalt	3	2.2		4	1.1		2.9	1.1		2.6	1.1		1.7	2.3	J
Copper	6	4.3		7	2.3		2.9	2.2		3.3	2.2		3.7	4.6	J
Iron	4420	21.7		5970	11.3		4190	11.2		5060	11.2		4860	22.8	
Lead	18	2.7		6	0.57		4.1	0.56		4.5	0.56		4.2	0.57	
Magnesium	3840	43.4		1960	22.7		2930	22.3		3460	22.4		6380	45.6	
Manganese	258	2.2	J	122	1.1	J	69.7	1.1	J	51.7	1.1	J	40.9	2.3	J
Nickel	8.7	8.7		9.3	4.5		6	4.5		5.7	4.5		6.5	9.1	J
Potassium	482	1080	J	1310	567		1120	558		1550	561		1780	1140	
Vanadium	16.9	2.2		13.6	1.1		14.1	1.1		15	1.1		13.7	2.3	
Zinc	18.8	4.3		15.1	2.3		10.6	2.2		12.7	2.2		12.5	4.6	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	10700	911		<	45.3	U	<	44.7	U	<	44.9	U	<	45.6	U

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U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 9-3
COMPARISON OF PHASE II MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 55, CANNON AFB
Lead-Acid Battery Accumulation Area

Sample ID	Metal	Maximum detected concentration	Range of Background concentrations (2)	Upper tolerance limit (UTL) background concentration(3)	Reported Level in Clovis, NM Region (4)	Does maximum detected exceed background
CAN055-5504-0020	Aluminum	13,300	1,410 - 11,000	10,540	50,000	NO**
CAN055-5506-0000	Antimony	7.1	<4.9 - <13	*	<1	YES
CAN055-5506-0000	Arsenic	4.5	0.67 - 28	15.5	6.5	NO
CAN055-5504-0010	Barium	1120	14.5 - 1200	642	500	NO**
CAN055-5504-0020	Beryllium	0.76	0.17 - 0.77	0.73	1-2	NO**
CAN055-5506-0020	Cadmium	0.82	<0.51 - 4.2	*	----	YES
CAN055-5504-0020	Chromium	9.9	4 - 15.4	12.5	30	NO
CAN055-5504-0000	Cobalt	4.4	0.85 - 5.3	4.5	3-7	NO
CAN055-5506-0005	Copper	7.0	<2 - 18.4	*	20	NO
CAN055-5506-0000	Lead	17.3	1.1 - 46	25.8	15	NO
CAN055-5506-0000	Manganese	336	22.4 - 216	164	500	YES
CAN055-5506-0005	Nickel	9.3	1.3 - 9.8	9	15	NO**
CAN055-5504-0020	Vanadium	24.9	5.2 - 28.3	25.3	30-70	NO
CAN055-5504-0020	Zinc	27.3	<4.3 - 27.5	21.9	45	NO**

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1993) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).
Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1994).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

(4) USGS 1984.

*Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 9-4

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SWMU 55 TO RBCs FOR RESIDENTIAL SOIL

Lead-Acid Battery Accumulation Area

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Estimated Risk(3)	Risk Type	Industrial Soil Risk-based Concentration(2) (mg/kg)	Exceeds RBC?	Estimated Risk(3)
Acetone	0.018	7,800	NO					
Methylene Chloride	0.004	85	NO					
Toluene	0.015	16,000	NO					
Anthracene	0.8	23,000	NO					
Benzo(a)anthracene	2.7	0.88	YES	3 x 10-6	Carcinogenic	3.9	NO	
Benzo(a)pyrene	4	0.088	YES	5 x 10-5	Carcinogenic	0.39	YES	1 x 10-5
Benzo(b)fluoranthene	3.6	0.88	YES	4 x 10-6	Carcinogenic	3.9	NO	
Benzo(k)fluoranthene	3.7	8.80	NO					
Benzo(g,h,i)perylene	3	NA(a)	NA					
Bis(2-ethylhexyl)phthalate	0.86	46	NO					
Chrysene	3.1	88	NO					
Dibenzo(a,h)anthracene	1.1	0.088	YES	1 x 10-5	Carcinogenic	0.39	YES	3 x 10-6
Fluoranthene	5.7	3,100	NO					
Indeno(1,2,3-cd)pyrene	2.6	0.88	YES	3 x 10-6	Carcinogenic	3.9	NO	
Phenanthrene	3.2	NA(a)	NA					
Pyrene	6.2	2,300	NO					
TRPH	11,500	NA(a)	NA					
Antimony	7.1	31	NO					
Cadmium	0.82	39	NO					
Manganese	336	390	NO					

(1) EPA Region III Risk-Based Concentrations for residential soil (EPA 1994).

(2) EPA Region III Risk-Based Concentrations for industrial soil (EPA 1994).

(3) Estimated risk based on residential exposures to the maximum Phase II concentrations that exceeded previously evaluated Phase I levels.

Estimated risk = 1×10^{-6} * concentration/RBC.

(a) EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.

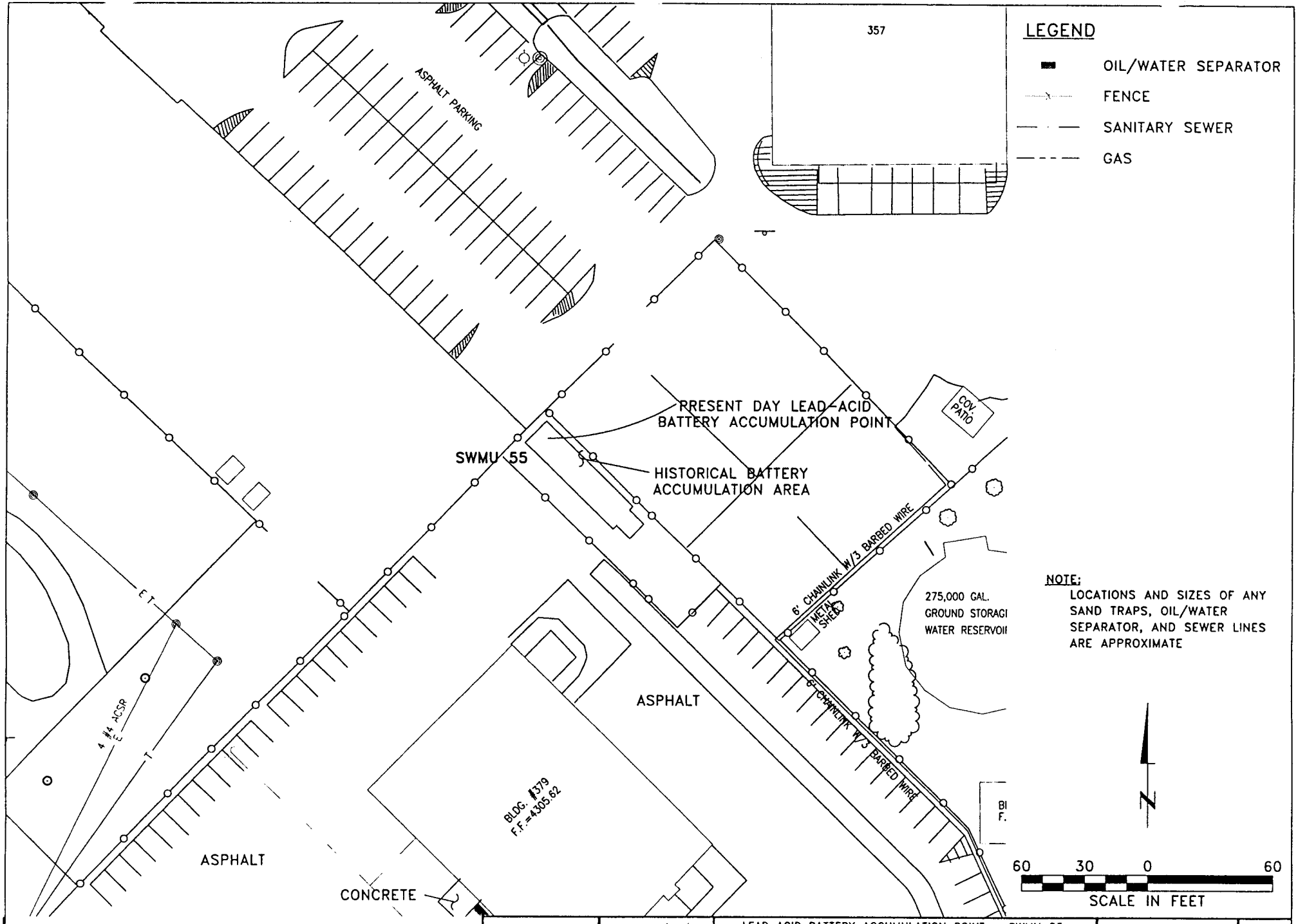
NA = Not Applicable

TABLE 9-4a

POTENTIAL CUMULATIVE RISK AT SWMU 55
CANNON AFB, NEW MEXICO

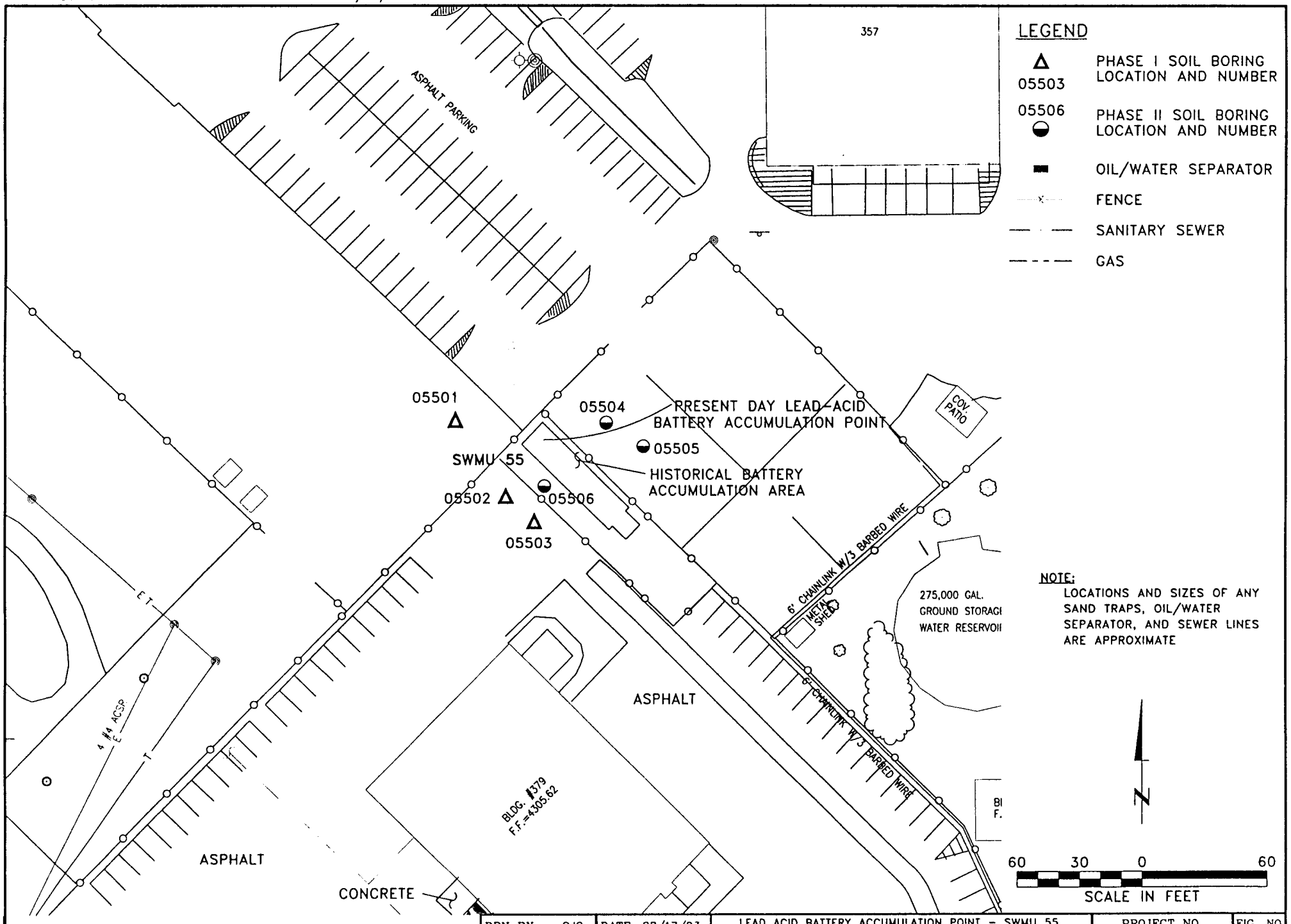
Chemical[1]	Carcinogen?	Phase II Concentration (mg/kg)	Residential RBC (mg/kg)	Industrial RBC (mg/kg)	Risk Residential[2]	Hazard Residential[3]	Risk Industrial[2]	Hazard Industrial[3]
Acetone	No	0.018	7,800	100,000		0.000002		0.0000002
Methylene chloride	Yes	0.004	85	380	4.71E-11		1.05E-11	
Toluene	No	0.015	16,000	200,000		0.000001		0.00000008
Anthracene	No	0.8	23,000	310,000		0.00003		0.000003
Benzo(a)anthracene	Yes	2.7	0.88	3.9	3.07E-06		6.92E-07	
Benzo(a)pyrene	Yes	4	0.088	0.39	4.55E-05		1.03E-05	
Benzo(b)fluoranthene	Yes	3.6	0.88	3.9	4.09E-06		9.23E-07	
Benzo(k)fluoranthene	Yes	3.7	8.8	39	4.20E-07		9.49E-08	
Benzo(g,h,i)perylene		3	NA	NA				
Bis(2-ethylhexyl) phthalate	Yes	0.86	46	200	1.87E-08		4.30E-09	
Chrysene	No	3.1	88	390		0.04		0.008
Dibenzo(a,h)anthracene	Yes	1.1	0.088	0.39	1.25E-05		2.82E-06	
Fluoranthene	No	5.7	3,100	41,000		0.002		0.00014
Indeno(1,2,3-c,d)pyrene	Yes	2.6	0.88	3.9	2.95E-06		6.67E-07	
Phenanthrene	No	3.2	NA	NA				
Pyrene	No	6.2	2,300	31,000		0.003		0.0002
Antimony	No	7.1	31	410		0.2		0.02
Cadmium	No	0.82	39	510		0.02		0.002
Manganese	No	336	390	5,100		0.9		0.07
Totals					7E-05	1	2E-05	0.09
Phase I Risk[4]					NA	NA	NA	NA
Cumulative Risk[5]					NA	NA	NA	NA

(1) Chemicals with maximum Phase II concentration exceeding Phase I concentrations
(2) Risk = 1E-06 x concentration/RBC
(3) Hazard = concentration/RBC
(4) Not Applicable: Phase I risk assessment was not conducted.
(5) Not Applicable: Phase I risk assessment was not conducted.



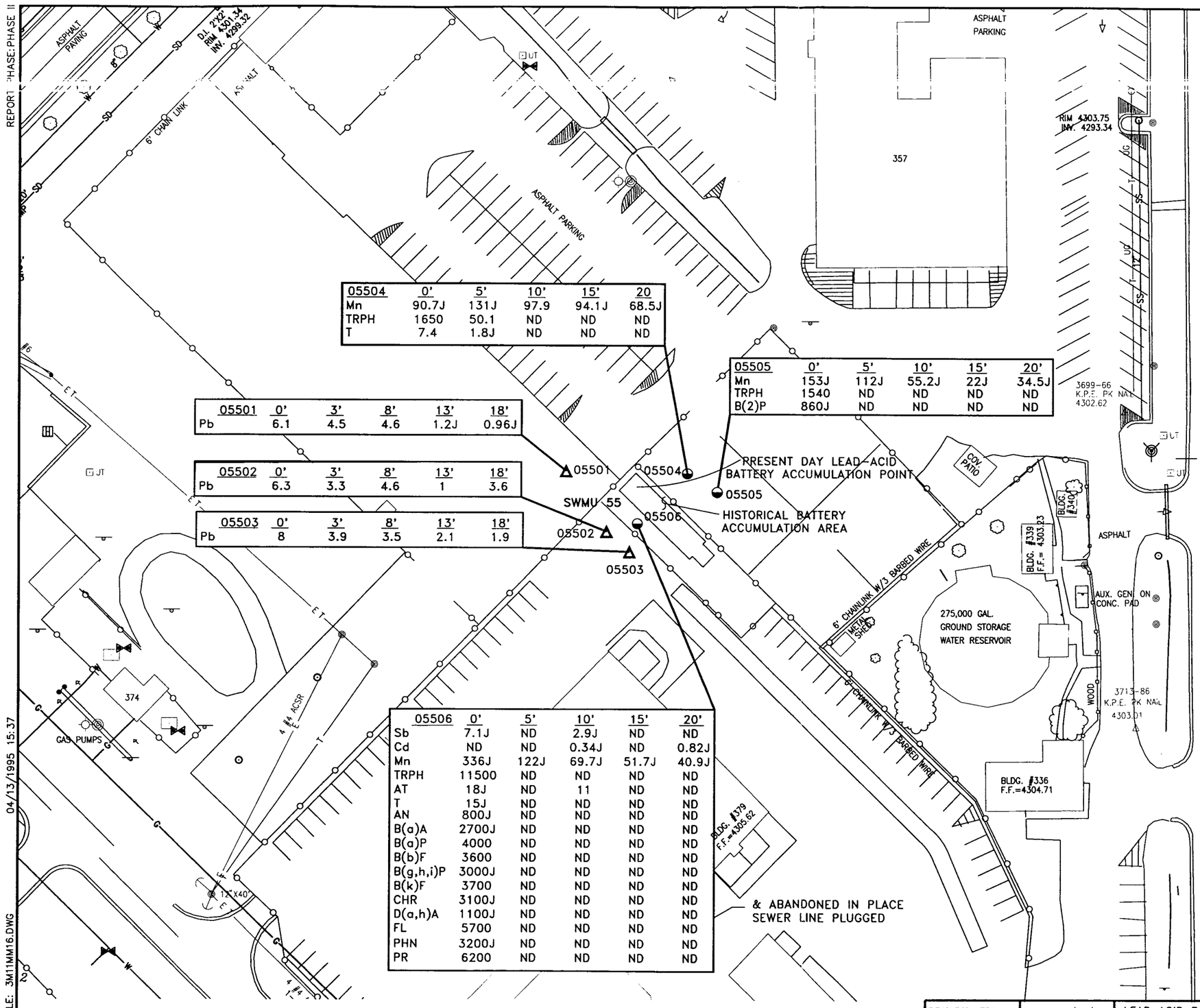
SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	LEAD ACID BATTERY ACCUMULATION POINT – SWMU 55 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 9–1



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	LEAD ACID BATTERY ACCUMULATION POINT – SWMU 55 SITE PLAN WITH BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 9-2



05504	0'	5'	10'	15'	20
Mn	90.7J	131J	97.9	94.1J	68.5J
TRPH	1650	50.1	ND	ND	ND
T	7.4	1.8J	ND	ND	ND

05505	0'	5'	10'	15'	20'
Mn	153J	112J	55.2J	22J	34.5J
TRPH	1540	ND	ND	ND	ND
B(2)P	860J	ND	ND	ND	ND

05501	0'	3'	8'	13'	18'
Pb	6.1	4.5	4.6	1.2J	0.96J

05502	0'	3'	8'	13'	18'
Pb	6.3	3.3	4.6	1	3.6

05503	0'	3'	8'	13'	18'
Pb	8	3.9	3.5	2.1	1.9

05506	0'	5'	10'	15'	20'
Sb	7.1J	ND	2.9J	ND	ND
Cd	ND	ND	0.34J	ND	0.82J
Mn	336J	122J	69.7J	51.7J	40.9J
TRPH	11500	ND	ND	ND	ND
AT	18J	ND	11	ND	ND
T	15J	ND	ND	ND	ND
AN	800J	ND	ND	ND	ND
B(a)A	2700J	ND	ND	ND	ND
B(a)P	4000	ND	ND	ND	ND
B(b)F	3600	ND	ND	ND	ND
B(g,h,i)P	3000J	ND	ND	ND	ND
B(k)F	3700	ND	ND	ND	ND
CHR	3100J	ND	ND	ND	ND
D(a,h)A	1100J	ND	ND	ND	ND
FL	5700	ND	ND	ND	ND
PHN	3200J	ND	ND	ND	ND
PR	6200	ND	ND	ND	ND

LEGEND

05503 — PHASE I SOIL BORING LOCATION AND NUMBER

05506 — PHASE II SOIL BORING LOCATION AND NUMBER

OIL/WATER SEPARATOR

FENCE

SANITARY SEWER

GAS

Cr = CHROMIUM (mg/kg)
Co = COBALT (mg/kg)
Cu = COPPER (mg/kg
Pb = LEAD (mg/kg)
Mn = MANGANESE (mg/kg)
Ni = NICKEL (mg/kg)
Zn = ZINC (mg/kg)
AN = ANTHRACENE
DA = DIBENZ(a,h)ANTHRACENE
DB = DIBENZOFURAN
FL = FLUORANTHENE
PR = PYRENE
T = TOLUENE
B(a)A = BENZO(a)ANTHRACENE
B(a)P = BENZO(a)PYRENE
B(b)F = BENZO(b)FLUORANTHENE
B(g,h,i)P = BENZO(g,h,i)PERYLENE
B(k)F = BENZO(k)FLUORANTHENE
B(2)P = BIS(2-Ethylhexyl)PHTHALATE
CHR = CHRYSENE
PHN = PHENANTHRENE
TRPH = TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (mg/kg)

NOTE: ALL RESULTS ARE IN μG/KG UNLESS OTHERWISE NOTED.

NOTE:
LOCATIONS AND SIZES OF ANY SAND TRAPS, OIL/WATER SEPARATOR, AND SEWER LINES ARE APPROXIMATE

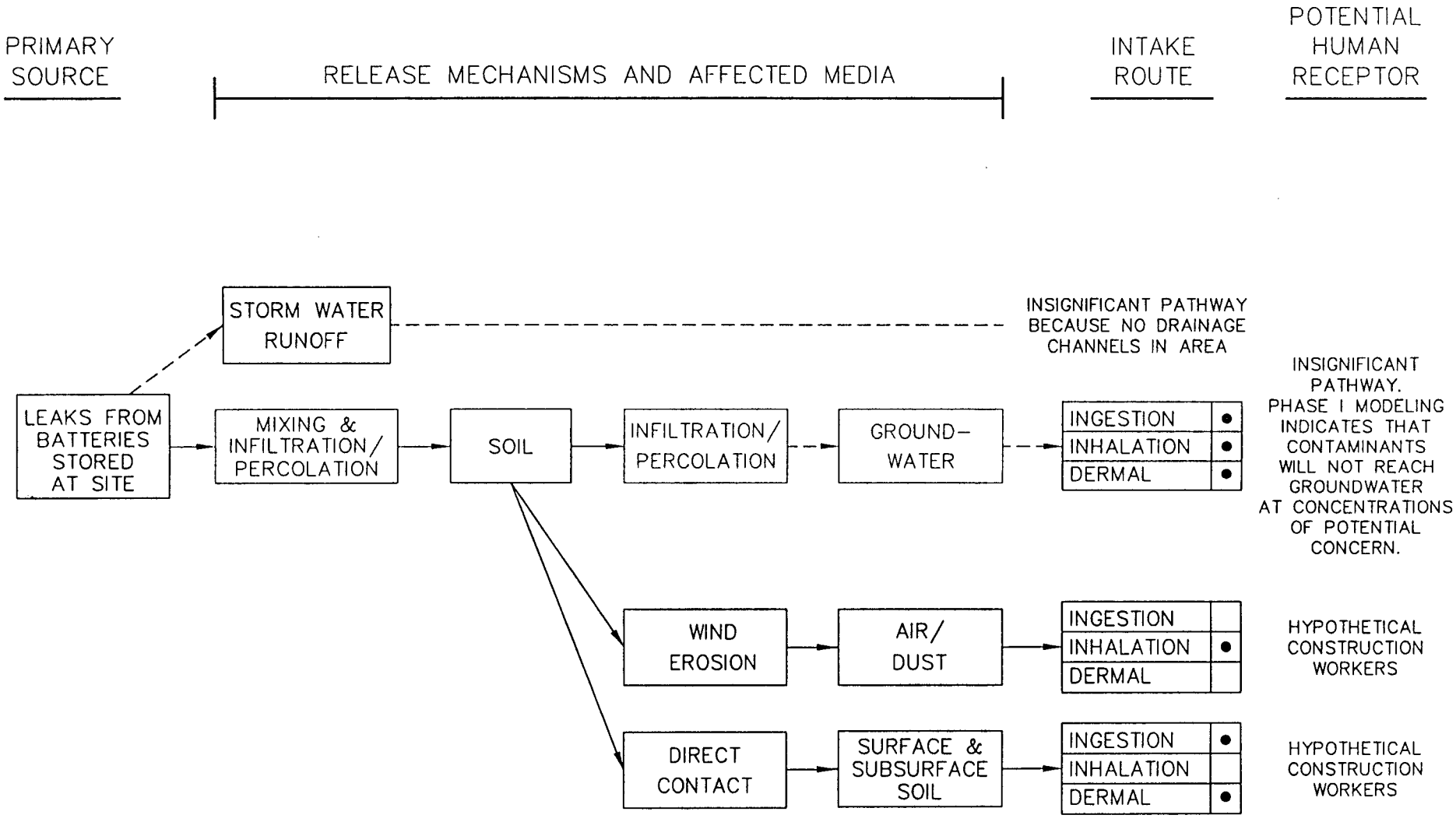
SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY TBS	DATE 01/18/95	LEAD ACID BATTERY ACCUMULATION POINT – SWMU 55 CONCENTRATIONS OF CHEMICALS DETECTED IN SOILS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 9-3
CHK'D BY	REVISION 0			

REPORT PHASE: PHASE II

04/13/1995 15:37

CAD FILE: 3M11MM16.DWG



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 08/19/93	SITE CONCEPTUAL EXPOSURE MODEL LEAD ACID BATTERY STORAGE SITE SWMU – 55 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY .	REVISIONS: 0		C3M11MM	9–4

10.0
CIVIL ENGINEERING CONTAINER STORAGE AREA - SWMU NO. 77

10.1 SITE BACKGROUND

10.1.1 Site Description

The Civil Engineering Container Storage Area (Facility No. 4038) is an open concrete pad measuring approximately 150 feet by 250 feet and is located east of Building 252 and south of the north boundary fence of the base (Figure 10-1). The concrete pad is secured by an 8-foot-high fence with a locked gate. The pad is the remaining floor of the old Portair Airfield Hangar dating back to the 1930s.

10.1.2 Site History

This facility was a passenger terminal for Portair Field during the 1930s and was removed by the Army in 1942. According to historical photographs, the concrete foundation slab had been vacant until the 1970s, and it appears to have been used for storage since that time. Approximately 100 55-gallon drums were stored at the facility during the RFA Visual Site Inspection (Kearney 1987). A preliminary inspection referenced in the A.T. Kearney report indicated that the drums contained varying amounts of water, oil, solvents, and asphaltic material.

10.1.3 Current Use

The Civil Engineering Squadron currently stores supplies and used materials on the concrete pad. The stored items include used transformers, street lights and street signs, PVC piping, and heavy equipment parts.

10.1.4 Potential Contaminants

Potential contaminants at this site include waste oil, solvents, aviation fuel, waste paint materials, PCBs, and pesticides.

10.1.5 Previous Investigations

The objective of sampling at the Civil Engineering Container Storage Area was to determine if a release of SWMU-related chemicals had occurred due to leakage of stored materials and equipment. To test for this occurrence and determine the vertical extent of possible contaminants, six 20-foot soil borings were drilled to sample soils within and at the perimeter of the Storage Area. The locations of the borings are shown on Figure 10-2. Borings were located where it appeared that the likelihood of encountering contamination was maximized, such as channels and low spots where storage pad runoff would flow and collect. Surficial samples were collected from the 0.2- to 0.5-foot depth interval in areas of soil cover to provide a worst-case situation for risk assessment purposes in the event that SVOC contamination was detected during this investigation. The 0.5- to 2-foot depth interval was collected immediately under the concrete pad. Subsurface samples were collected from the 3- to 5-foot, 8- to 10-foot, 13- to 15-foot, and 18- to 20-foot depth intervals. Target analytes for all borings include VOCs, SVOCs, metals, TRPH, PCBs, pesticides, and herbicides. SVOCs were analyzed only for a limited number of samples to allow for risk assessment. Typically, the samples were located at the surface and at a selected depth interval from each boring.

Tetrachloroethene was detected in Boring No. 07705 at 5 feet. Toluene was detected in Boring Nos. 07701 and 07703 at the surface. Xylene was detected in Boring Nos. 07701 through 07703 at the surface. Carbazole was detected in Boring No. 07706 at the surface and in Boring No. 07705 at 5 feet. Butyl benzyl phthalate was detected in Boring No. 07702 at the surface and in Boring No. 07702 at 5 feet. Di-n-octyl phthalate was detected in Boring No. 07702 at the surface. Anthracene, benzo(a)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pentachlorophenol, and pyrene were detected in one or more samples from the surface and 5 feet in Boring Nos. 07701, 07702, 07705, and 07706. 4-Nitrophenol was detected in Boring No. 07702 at 20 feet. Petroleum hydrocarbons were detected in Boring Nos. 07701, 07702, 07704, and 07705 at the surface and in Boring 07704

at 5 feet. 4,4-DDE was detected in Boring Nos. 07705 and 07706 at the surface. 4,4-DDT was detected in Boring No. 07706 at the surface. Alpha-chlordane and gamma-chlordane were detected in Boring Nos. 07702 and 07706 at the surface. Antimony, cadmium, cobalt, copper, lead, silver, and zinc were detected above background in surface samples and subsurface samples to 10 feet in one or more of the borings. Antimony, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and petroleum hydrocarbons exceeded the risk screening criteria.

BRA Summary

A BRA was done at SWMU 77 based on the recommendations made in the Phase I RFI report. Potential receptors at SWMU 77 for human health risk included occupational workers, hypothetical future construction workers, and hypothetical future trespassers. These receptors were assumed to be exposed to soil via ingestion, dermal contact and inhalation pathways. Potential human health risks from groundwater were evaluated using fate and transport modeling. The modeling indicated that contaminants would not reach groundwater at concentrations of potential concern. Therefore, this pathway was considered insignificant.

The maximum potential excess human health risk at SWMU 77 was 6×10^{-7} for occupational workers. This is below the EPA's target risk range of 1×10^{-6} to 1×10^{-4} for risk from releases at hazardous waste sites indicating that no unacceptable risk is expected. The primary contributor to the risk was ingestion of PAHs in surface soils.

Results of the ecological risk assessment showed that no unacceptable ecological risks due to chemical releases are expected at the SWMU.

Since no unacceptable human health or ecological risks due to chemical releases are expected from this SWMU, no further action was recommended for this SWMU.

10.1.6 Sampling Objectives

The overall objective of sampling at the site of the Civil Engineering Container Storage Area was to evaluate whether or not a release of SWMU-related chemicals has occurred as a result of leakage from the stored materials and equipment which could pose a significant risk to

human health or the environment. The analytical data collected from this investigation was used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in surface and subsurface soils at the site of the Civil Engineering Container Storage Area. Potential release points included grass-covered areas adjacent to the concrete pad.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

10.2 FIELD INVESTIGATION AND DATA COLLECTION

10.2.1 Soils Sampling

Five soil borings were drilled and soil samples collected at the Civil Engineering Container Storage Area. The borings were drilled to a total depth of 20 feet in the area surrounding the storage area. The boring locations were chosen to further assess the lateral presence and extent of site-related soil contaminants to the 20-foot depth. Phase II RFI boring numbers and sample descriptions are shown in Table 10-1 and on Figure 10-2.

Surface soil samples from all borings were collected from 0 to 2 feet. All borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, and 18 to 20 feet as specified in the field sampling plan and the sample summary tables. The samples were collected in accordance with QAPP SOP No. 6 -Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile Organic Compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL Metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1
- Chlorinated Herbicides by EPA Method 8150 (Appendix IX)

- Pesticides and PCBs by EPA Method 8080

10.2.2 Geologic Summary of Boring Logs

The Phase I investigation indicated that soils at this site consist of silty/sandy clays from the surface to the boring's total depth at 20 feet. The soil is varicolored, with brown prevalent at the surface, lightening to salmon pink and buff down section. A light to locally heavy, white to buff caliche matrix cements the grains at depth. More abundant fine sand with silt and clay noted at 11 feet in Boring 07703 suggests that the soil profile consists of thin, interbedded units varying between fine sand and sandy clay. Some thin zones of extremely hard caliche, tan to buff in color are scattered erratically between the 6-foot and 20-foot intervals of Borings 07701 and 07706.

Logs from the five Phase II RFI borings show a subsurface lithology consisting of fine-grained fill material and Ogallala Formation sediments. Boring 7707 encountered a 6-inch layer of asphalt pavement at the surface. Silty sand fill (USCS symbol SP) was found below the pavement to a depth of 1.2 feet. This fill is brown, dry, loose, fine-grained, and poorly graded with a trace of asphalt and fine gravel. Borings 7709 and 7710 encountered 0.6 feet and 0.5 feet of silty clay (USCS symbol CL) and silty sand (SP) fill material, respectively. Both types of fill contained trace amounts of fine sand and gravel. Below the fill in borings 7707, 7709 and 7710 to depths of 5.2 feet, 17 feet, and 4.8 feet, respectively, is a silty clay (USCS symbol CL) described as brown and reddish-brown, dry, stiff, and low plastic with some caliche. This silty clay is present from the surface of boring 7711 to a depth of 4.7 feet. Below the silty clay in borings 7707 through 7711 is a clayey silt (USCS symbol ML) to the completion depths of the borings at 20 feet. The clayey silt is described as light reddish-brown, dry, and loose to dense with some caliche.

No field screening (headspace) or visual indications of contamination, with the exception of a headspace reading of 0.5 ppm at the 1-foot depth in boring 7707, were observed while drilling and sampling the Phase II soil borings. No odors were noted during drilling or sampling activities.

10.2.3 Site Topography

The site is a level concrete-paved pad with a surrounding fence. Grassy areas surround the pad with a driveway leading into the south side of the pad. The concrete storage pad is nearly flat, so that precipitation runs off on all sides. Native surfaces in the area have no discernable slope.

10.3 CHEMICAL INVESTIGATION RESULTS

10.3.1 General

Samples were collected as identified in Section 10.2 to comply with permit and compliance agreement requirements. Soil samples were collected from six Phase I borings (07701, 07702, 07703, 07704, 07705, and 07706) and five Phase II borings (07707, 07708, 07709, 07710, and 07711). Sampling and analyses performed for Phase II samples are summarized in Table 10-1. Summaries of the analytical results for the Phase II soil samples is provided in Table 10-2. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU group. Complete analytical summary results are provided in Appendix A.

10.3.2 Organic Results For Near-surface Soil Samples

The near-surface soil samples collected at this SWMU (CAN077-7707-0000, CAN077-7708-0000 CAN077-7709-0000, CAN077-7710-0000, and CAN077-7711-0000) were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, and TRPH as indicated in Table 10-1.

Besides acetone and methylene chloride, which were qualified as nondetect after they were determined to be laboratory contaminants, the only VOCs reported were toluene and 1,2-dichloropropane. Toluene was reported in estimated concentrations of 28 μg/kg and 3.5 μg/kg for samples CAN077-7707-0000 and CAN077-7711-0000, respectively. 1,2-Dichloropropane was reported only in sample CAN077-7707-0000 at an estimated concentration of 2 μg/kg. Several SVOC compounds, mainly in the form of PAHs, were reported in the surface samples. Total PAHs were detected at concentrations of

276,780 μg/kg, 463 μg/kg, 120 μg/kg, and 513 μg/kg in samples CAN077-7707-0000, CAN077-7708-0000, CAN077-7709-0000, and CAN077-7711-0000, respectively. Other SVOCs detected in sample CAN077-7707-0000 were carbazole (7,200 μg/kg), dibenzofuran (1,200 μg/kg, estimated), and 2-methylnaphthalene (3,200 μg/kg, estimated). Other SVOCs detected in sample CAN077-7708-0000 included bis(2-ethylhexyl)phthalate (770 μg/kg). Bis(2-ethylhexyl)phthalate was also reported in sample CAN077-7710-0000 at an estimated concentration of 73 μg/kg. Other SVOCs reported in sample CAN077-7711-0000 included di-n-butyl phthalate (910 μg/kg). No other SVOCs were detected in the near-surface samples. Pesticides and PCBs reported in site surface samples included endrin ketone (CAN077-7707-0000 at 120 μg/kg, estimated), 4,4′-DDE (CAN077-7709-0000 and CAN077-7711-0000 at 3.7 μg/kg and 14 μg/kg, respectively), 4,4′-DDT (CAN077-7709-0000 and CAN077-7711-0000 at 6.8 μg/kg and 10 μg/kg, respectively), and Aroclor-1260 (CAN077-7710-0000 at 140 μg/kg). No herbicides were reported for any of the near-surface samples collected at the site. Petroleum hydrocarbons were detected at concentrations of 9,700 mg/kg, 84.3 mg/kg, 1,320 mg/kg, 105 mg/kg, and 113 mg/kg in samples CAN077-7707-0000, CAN077-7708-0000 CAN077-7709-0000, CAN077-7710-0000, and CAN077-7711-0000, respectively.

10.3.3 Organic Results for Subsurface Soil Samples

The subsurface samples collected at this SWMU (CAN077-7707-0005, CAN077-7707-0010 CAN077-7707-0014, and CAN077-7707-0020 for boring 07707; CAN077-7708-0005, CAN077-7708-0010 CAN077-7708-0014, and CAN077-7708-0020 for boring 07708; CAN077-7709-0005, CAN077-7709-0010 CAN077-7709-0014, and CAN077-7709-0020 for boring 07709; CAN077-7710-0005, CAN077-7710-0010 CAN077-7710-0014, and CAN077-7710-0020 for boring 07710; CAN077-7711-0005, CAN077-7711-0010 CAN077-7711-0014, and CAN077-7711-0020 for boring 07711 were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, and TRPH as indicated in Table 10-1.

Besides acetone and methylene chloride, which were qualified as nondetect after they were determined to be laboratory contaminants, the only VOC reported was toluene at an estimated concentration of 2.2 μg/kg reported for sample CAN077-7711-0005. The only SVOCs reported in subsurface samples were fluoranthene (CAN077-7707-0005 at 74 μg/kg, estimated) and bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate was reported in samples

CAN077-7707-0010 (180 μg/kg, estimated), CAN077-7707-0014 (200 μg/kg, estimated), CAN077-7708-0005 (660 μg/kg), CAN077-7708-0010 (540 μg/kg), CAN077-7708-0015 (740 μg/kg), and CAN077-7708-0020 (350 μg/kg, estimated). Two pesticides, 4,4',DDE and 4,4',DDT were reported in sample CAN077-7711-0005 at concentrations of 4.1 μg/kg and 2.1 μg/kg (estimated), respectively. No herbicides were reported for any of the soil samples collected at the site. Petroleum hydrocarbons were reported in only one subsurface sample, CAN077-7707-0005, at a concentration of 63.6 mg/kg.

10.3.4 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 10-1. The range of results, combining Phase I and Phase II data, for metals reported in these soil samples are summarized in Table 10-A.

TABLE 10-A

Analyte	Frequency Reported	Lowest Detection (mg/kg)	Sample Location	Highest Detection (mg/kg)	Sample Location
Aluminum	51/51	2300	0775-0000	11,600	7710-0020
Antimony	2/51	3.1	0772-0003	5.9	0776-0003
Arsenic	5/51	0.93	7709-0020	3.6	7707-0000
Barium	25/25	81.1	7707-0005	2,840	7710-0010
Beryllium	43/51	0.13	7710-0000	0.69	7711-0010
Cadmium	17/51	0.36	7708-000	3.0	0772-0003
Calcium	51/51	18,300	7711-0000	294,000	7704-0014
Chromium	45/51	2.1	0775-0000	25.4	7708-0020
Cobalt	46/51	1.1	7708-0000	4.8	0774-0000
Copper	48/51	1.6	7707-0020	14.5	7708-0020
Iron	51/51	1,760	7707-0014	10,800	0774-0000
Lead	44/51	0.85	7707-0014	40.5	7709-0000
Magnesium	51/51	1070	0776-0000	9,840	7707-0014
Manganese	51/51	12.4	0776-0013	440	7708-0000
Mercury	0/51	--	--	--	--
Nickel	48/51	2.5	7709-0015	13.9	7708-0020
Potassium	51/51	383	0776-0013	2,500	7710-0020
Silver	20/51	0.49	0774-0018	2.0	0772-0003
Selenium	0/51	--	--	--	--
Sodium	4/51	171	0773-0013	389	0774-0013
Thallium	4/51	0.12	7707-0005	.25	7710-0015
Vanadium	51/51	8.0	0772-0008	27.5	7710-0020
Zinc	25/26	4.4	7707-0014	73.8	7710-0000

Note: See Table 18-3 for comparison to background.

10.4 DATA ASSESSMENT

An assessment of the Civil Engineering Container Area (SWMU 77) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

10.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

10.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C, 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA, 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988). A detailed review of SWMU 77 data is provided in the QCSR.

For the organic analyses, qualification of data was required based on surrogates, internal standard areas, and blank contamination. For SVOC analysis of sample CAN077-7707-0014, an internal standard area was below the evaluation criteria, and associated SVOCs were qualified as estimated nondetect **UJ**. For VOC analysis of sample CAN077-7707-0000, surrogate recoveries were reported above and below the evaluation criteria. Associated VOC data were qualified as estimated **J** (detects) or **UJ** (nondetects). Additionally, methylene chloride data were qualified as nondetect **U** for the several samples based on blank contamination (as listed in the QCSR).

The MS recoveries for antimony, selenium, silver, and magnesium were reported below evaluation criteria, and the MS recoveries for lead, manganese, and zinc were below the evaluation criteria. Antimony data for all SWMU 77 samples were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Selenium for borings 7708,

7709, 7710, and 7711 samples; silver data for borings 7709, 7710, and 7711 samples, and magnesium data for boring 7707 samples were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. Detected manganese and zinc data for borings 7709, 7710, and 7711 samples were qualified as estimated **J** to indicate a potential high bias. The MS recoveries for arsenic and barium were reported both above and below the evaluation criteria in the sample delivery groups. Arsenic data for boring 7709 samples and barium data for borings 7708, 7709, 7710, and 7711 samples were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate the potential low bias. Detected barium data for boring 7707 samples and detected arsenic data for borings 7708 samples were qualified as estimated **J** to indicate potential high bias. The MS recovery for lead was greater than 200 percent for one of the sample delivery groups. Lead data for samples CAN077-7708-0000, CAN077-7708-0005, CAN077-7708-0010, and CAN077-7708-0020 were rejected **R** based on the high MS recovery. Finally, the laboratory reported a MS recovery of 0 percent for selenium for one of the sample delivery groups. Associated nondetect data was rejected **R**, and detected data was estimated **J** for samples CAN077-7701-0000, CAN077-7701-0005, CAN077-7701-0014, CAN077-7701-0010, and CAN077-7701-7762.

Precision parameters met the evaluation criteria for the organic analyses. For one set of the field duplicate samples (CAN077-7710-000 and CAN077-7710-7761), the RPD for barium was outlying evaluation criteria. Barium data for the field duplicate samples were qualified as estimated **J** based on the outlying precision parameters. RPDs for arsenic, chromium, manganese, and lead were outlying the evaluation criteria for the matrix duplicate samples. Associated arsenic and magnesium data were qualified as estimated based on low MS recoveries. Chromium data for boring 7707 samples and lead data for borings 7709, 7710, and 7711 samples were qualified as estimated **J** (detects) or **UJ** (nondetects) based on the outlying precision parameters.

10.4.3 Reporting Limits

Reporting limits were raised for several metals and one TRPH analyses by no more than 10 times the nominal RL. Selenium and thallium analyses for several samples required dilutions due to either matrix interferences or dilutions. Selenium and thallium data, which had elevated reporting limits due to matrix interferences, were qualified as estimated **J** (detects) or **UJ** (nondetects). Lead analyses required dilutions due to matrix interferences or lead

concentrations above the calibration range, and Method 6010 analyses and one TRPH analysis required dilutions due to calcium or TRPH concentrations above the calibration range.

Dilutions were required for pesticide/PCB, SVOC, and TRPH analyses for sample CAN077-7707-0000, which raised the reporting limits by factors of 20, 50, and 20, respectively. Dilutions were required due to concentrations of target and nontarget compounds above the calibration range.

10.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 77 were determined to meet quality criteria, except the lead and selenium data which were rejected. The elevated reporting limits were not judged not to limit the use of the data. The elevated RL for the metals did not limit the data usability because either the elevated RLs were below the RBCs or the laboratory would report estimated concentrations below the RBC if the target analyte was present. For the elevated RLs for the SVOCs, several SVOCs were detected in sample CAN077-7707-0000, and for the pesticide/PCBs, endrin ketone was detected. These RLs may cause some uncertainties because low-level analytes may not be detected with the elevated RLs and the RLs were above the RBCs for some of the target analytes. Based on the data review and other information, including field observations, data were judged to be acceptable to determine the nature and extent and to be used for the human health risk screening.

10.4.5 Summary

Overall, data generated during the study of SWMU 77 were determined to meet quality criteria. In conjunction with the analytical data review, other information including field observations were evaluated in the assessment of the usability of SWMU 77 data. The data support identification of the nature and extent of contamination and provide reasonable concentration, except barium data, for use in risk assessment.

10.5 NATURE AND EXTENT OF CONTAMINATION

SWMU 77 is a paved, fenced area used by the Civil Engineering Squadron for storage. Six Phase I borings were advanced to a depth of 20 feet below the surface, two of them through

the paved surface and four of them just off the edge of the paving at visible drainage locations. Five Phase II borings were advanced to a depth of 20 feet below the surface in areas just outside of the fence surrounding the SWMU. One boring was drilled through the asphalt pavement west of the facility. Although there was no visible evidence of contamination during the sampling process, the chemical testing found elevated levels of PAHs and TRPH in several of the Phase I and Phase II borings. The highest concentrations of PAHs were detected in the surface sample from the boring drilled through the asphalt pavement. This sample also contained asphalt fragments. Because asphalt is a source of PAHs, this sample was not used in the risk evaluation. Relatively low levels of pesticides and other non-PAH SVOCs were also detected. The highest levels of contamination occurred in surface or near-surface soils (Figure 10-3).

10.6 COMPARISON OF PHASE II METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals in soil were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values from regional soils (USGS 1984). The background data and the basis for the UTLs are presented in Appendix D. (The background UTL was defined as the mean plus two times the standard deviation; see Appendix D). A brief discussion of the background interpretations is given below.

Table 10-3 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, beryllium, cobalt, copper, and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. The maximum concentrations of barium, cadmium, chromium, lead, manganese, nickel, thallium, and zinc exceeded background levels; therefore, these metals were retained for further evaluation as chemicals of concern in soil.

One of twenty-five soil samples contained aluminum at a concentration (11,600 mg/kg) which exceeded the background UTL of 10,540 mg/kg. However, this concentration only slightly exceeded the range of detected Base-wide background concentrations and was well below the regional literature value for aluminum (50,000 mg/kg). Therefore, aluminum was considered to be within background levels and was not retained for further evaluation.

Six of twenty-five soil samples contained barium at concentrations (ranging from 674 mg/kg to 2,840 mg/kg) which exceeded the background UTL of 642 mg/kg. These concentrations also exceeded the range of detected Base-wide background concentrations. The maximum detected concentration exceeded the regional barium literature value (500 mg/kg) by a factor greater than 5. While barium has been shown to substitute for calcium caliche and may be naturally occurring (Klein and Hurlbutt 1985), to be conservative barium was considered to exceed background levels at this SWMU. This conservative approach was used because of the magnitude by which the regional and background values were exceeded.

The maximum detected concentration of cobalt (4.6 mg/kg) slightly exceeded the background UTL of 4.5 mg/kg. The maximum concentration was within the range of detected Base-wide background concentrations (0.85 to 5.3 mg/kg) and regional literature values for cobalt (3-7 mg/kg). Therefore, cobalt was considered to be within background levels and was not retained for further evaluation.

A UTL for copper could not be calculated due to a large number of nondetects in the background data set; therefore, copper was compared to only the Base-wide background range and literature values. The maximum detected concentration of copper (14.5 mg/kg) was within the range of detected Base-wide background concentrations and was below the regional literature value for copper (20 mg/kg). Therefore, copper was considered to be within background levels and was not retained for further evaluation.

The maximum detected concentration of vanadium (27.5 mg/kg) exceeded the background UTL of 21.9 mg/kg. However, this concentration was within the range of detected Base-wide background concentrations and the regional literature values for vanadium (30-70 mg/kg). Therefore, vanadium was considered to be within background levels and was not retained for further evaluation.

10.7 RISK EVALUATION

10.7.1 Site Conceptual Exposure Model

Figure 10-4 shows the site conceptual exposure model (SCEM) of chemical sources and potential human exposure pathways for the Civil Engineering Container Storage Area. In the SCEM, potentially complete exposure pathways are indicated with solid lines; incomplete or insignificant pathways are indicated with broken lines.

The primary potential contaminant sources are waste fluids (e.g., fuels, oils, and solvents) that may have leaked or been spilled from storage containers or equipment onto surface soil. Mixing and infiltration of the waste fluids with the soil is shown as the primary chemical release mechanism. Once released to the soil, the chemicals may then be released to groundwater by infiltration/percolation or to the atmosphere by volatilization or wind erosion. Chemicals could also be released directly to receptors via contact with soil. Storm water runoff is considered to be an insignificant pathway because the area is flat and there are no drainage channels in the area.

As shown in Figure 10-4, surface soil may provide exposures to Base workers (occupational exposures), hypothetical future construction workers, or hypothetical future trespassers (if the Base is closed in the future) via soil ingestion, dermal contact, and inhalation of air emissions (volatile and particulates). Subsurface soil may provide exposures to construction workers (i.e., during excavation) via soil ingestion, dermal contact, and inhalation of air emissions.

Groundwater is used for domestic purposes on and off Base. However, groundwater is probably an insignificant pathway at this SWMU because fate and transport modeling in the Phase I investigation showed that chemicals would not be transported to groundwater at concentrations of concern. In addition, only low levels of contamination were found in subsurface soils.

In summary, the potentially complete human exposure pathways at SWMU 77 are:

Occupational Workers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

Hypothetical Construction Workers

- Ingestion of and dermal contact with surface and subsurface soil
- Inhalation of volatile emissions and airborne particulate matter from surface and subsurface soil

Hypothetical Trespassers

- Ingestion of and dermal contact with surface soil
- Inhalation of volatile emissions and airborne particulate matter from surface soil

10.7.2 Comparison of Phase II Concentrations to Phase I Concentrations and RBCs

The objective of the Phase II risk evaluation was to verify whether the recommendation for no further action based on the Phase I Baseline Risk Assessment (W-C 1994) is appropriate for this SWMU. To meet this objective, maximum detected Phase II concentrations were compared to maximum detected Phase I concentrations. This comparison was made to evaluate whether the extent of contamination and potential risk had been adequately defined in Phase I and to assess whether the no further action recommendation was appropriate.

If Phase II concentrations exceeded Phase I concentrations, Phase II maximum concentrations for those chemicals which exceeded Phase I concentrations were compared to highly conservative EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994). This comparison was made to evaluate if chemicals detected in Phase II were at concentrations that could pose a significant human health risk (i.e., if the potential risk at the SWMU is higher than predicted in Phase I). EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from

accepted risk assessment methodology. Note that the RBCs are based on conservative residential exposure assumptions that significantly overestimate exposures that are likely to occur at this SWMU. Therefore, risks predicted from the RBC comparison significantly overestimate actual risks at the SWMU. A discussion of the methodology used to derive the RBCs is given in Section 3.4 and Appendix D.

High concentrations of PAHs (e.g., concentrations which exceed industrial soil RBCs) were detected in the surface sample of Boring 7707 which is located immediately beneath the asphalt in a parking area west of the C.E. Container Storage Area. TRPH was also detected in this sample at a concentration of 9,700 mg/kg. Boring logs indicate that this sample was taken within the top foot of soil and that it contained asphalt fragments. The deeper samples from this boring were virtually nondetect for organic analytes. This data suggests that the high PAH concentrations are likely due to the presence of asphalt within the sample and are not related to any release from SWMU 77. Therefore, this sample was not used to evaluate potential contamination from and risks associated with SWMU 77.

The presence of concentrations of PAHs, TRPH, and some nontarget compounds in sample 7707-0000 caused the reporting limits for pesticides/PCBs, SVOCs, and TRPH to be elevated as much as 50 times. As stated above, this sample contained asphalt fragments which likely caused the elevation of the reporting limits. Since most SVOCs were detected even at the elevated reporting limit, as was TRPH, the elevated reporting limits for these compounds did not limit the usability of the data set without this sample.

The elevated reporting limits for the pesticides/PCBs in sample 7707-0000 were above RBCs. The reporting limits were also high enough that estimated concentrations below the reporting limit would still exceed residential RBCs. Therefore, it is possible that pesticides/PCBs were present in the samples at significant concentrations even though they were reported as nondetect. In general, pesticides/PCBs were not detected consistently at this SWMU. The 5-foot sample from Boring 7707 was analyzed using normal reporting limits for all compounds, and the results showed that most VOCs, SVOCs, and pesticides/PCBs were nondetect. Since there is no reason to expect pesticide/PCB concentrations in sample 7707-0000 to be higher than those detected in other samples at this SWMU, the data set was considered to be complete without sample 7707-0000 and usable for purposes of risk calculation.

The contract lab that analyzed the samples reported concentrations (J-qualified) at one-fifth the reporting limit. The elevated reporting limits occurred only for one sample (7707-0000). The highest reporting limit for PCBs (including Aroclor-1260) was 1.7 mg/kg (1,700 μg/kg). One-fifth of the level is 0.34 mg/kg. This concentration exceeds the residential RBC for PCBs (0.083 mg/kg); however, it is below industrial RBC for PCBs (0.37 mg/kg). One sample (7710-0000) had a detection of PCBs (0.14 mg/kg) which is below the industrial RBC. All other samples were nondetect for PCBs at normal reporting limits. Since PCBs (if present) would have been reported at estimated concentrations below RBCs, and because PCBs were detected in only one of 26 samples (< 4% detection frequency), PCB contamination appears to be limited to the area near boring 7710 and at concentrations below the industrial RBC. Samples 7707-0000 and 7710-0000 are located across the SWMU from each other (approximately 410 feet apart). There are no other detections of PCBs across the entire SWMU, even at normal detection limits. Therefore, there is no reason to expect PCBs to be present at boring 7707 or to be a contaminant of concern at this SWMU.

Table 10-4 shows the comparison of the Phase II maximum concentrations (excluding data from the surface sample of Boring 7707 discussed above) with Phase I concentrations and with RBCs. As would be expected, the maximum detected concentrations of some chemicals from Phase II exceeded the Phase I concentrations, while the concentrations of other chemicals were lower in Phase II. Two chemicals (Aroclor-1260 and manganese) which exceeded the Phase I concentrations also exceeded the residential soil RBCs.

Aroclor-1260 was detected at a maximum concentration of 0.14 mg/kg which exceeded the residential soil RBC of 0.083 mg/kg. The estimated potential carcinogenic risk associated with this concentration based on assumed residential exposures is 2×10^{-6}. This is within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) for exposures to chemicals released from a hazardous waste site (EPA 1990 , 1990 , 1991 ,1992). This risk is overestimated because the C.E. Container Storage Area is located in an industrial area of the Base, and the area is likely to remain an industrial area in the future. The use of residential exposure assumptions is overly conservative because industrial exposures assumptions are more likely to occur at this SWMU. The maximum concentration of Aroclor-1260 did not exceed the industrial soil RBC of 0.37 mg/kg; therefore, no unacceptable human health risks are anticipated from the concentrations of Aroclor-1260 at SWMU 77.

Manganese was detected at a concentration (440 mg/kg), which slightly exceeded the residential soil RBC of 390 mg/kg; however, this concentration did not exceed the industrial soil RBC of 5,100 mg/kg. This concentration results in an estimated hazard quotient of 1.1 which slightly exceeds the recommended value of 1.0. A hazard index greater than one does not indicate that adverse health effects will occur but rather, that adverse effects are possible. Residential exposure assumptions are conservative and result in an overestimate of potential adverse health effects, because SWMU 77 is located in an industrial area, and it is likely to remain an industrial area in the future. In addition, if the area was zoned residential in the future, grading and construction associated with development would likely dilute or remove this small area containing this high concentration of manganese. Therefore, the exceedance due to manganese was considered to be insignificant and no unacceptable human health effects are expected from the concentrations of manganese detected at SWMU 77.

The potential cumulative risk at the SWMU was estimated by adding the incremental risk posed by Phase II concentrations to the risks calculated in the Phase I risk assessment. This is a very conservative approach that overestimates risk because it accounts for risk from the same chemical twice (i.e., in the Phase I risk assessment and in the Phase II risk evaluation. Chemicals for which the Phase II concentrations did not exceed Phase I concentrations were not included because higher concentrations were already evaluated in the Phase I risk assessment. Table 10-4a presents the incremental risk due to the Phase II concentrations, the Phase I risks, and the potential cumulative risks. Table 10-4a shows that the incremental effects of the Phase II concentrations do not significantly impact the results of the risk assessment. In addition, the potential cumulative cancer risk of 1×10^{-6} and the potential cumulative noncancer hazard of 0.2 are below or within EPA's target risk range.

TRPH is a complex mixture of hundreds of branched, straight-chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as PAHs, benzene, naphthalene, pyrene, and toluene) were analyzed for individually in the soil samples at the SWMU.

In the Phase II investigation at SWMU 77, TRPH was detected at a maximum concentration of 1,320 mg/kg (excluding the boring 7707 surface sample) which exceeds the State of New

Mexico TRPH action level of 100 mg/kg in soil. None of the potentially toxic constituents of TRPH were detected at concentrations which exceeded RBCs for residential soils. Since other constituents of TRPH which are not known to be toxic are unlikely to contribute significantly to risks at the SWMU, no unacceptable human health risks are expected due to the presence of TRPH at this SWMU.

10.7.3 Evaluation of the Groundwater Pathway

Fate and transport modeling done for the Phase I RFI indicated that chemicals detected at SWMU 77 would not be transported to groundwater at concentrations of potential concern.

The vertical distribution of the soil contaminants detected during the Phase II investigation was used to evaluate whether chemical releases pose a threat to groundwater. The chemicals of concern in Phase II were detected almost entirely within the first 5 feet of soil indicating that they are not infiltrating and are not being transported to the groundwater. In addition, most chemicals were detected at low concentrations (i.e., below residential soil RBCs). These concentrations would be further reduced by degradation and adsorption during transport to the groundwater (approximately 200 to 300 feet bgs). Therefore, groundwater is not likely to be impacted by contaminants detected during the Phase II investigation at SWMU 77.

10.7.4 Conclusions

No evidence exists to indicate that a significant release from SWMU 77 has occurred. The estimated potential risks associated with chemicals detected at SWMU 77 are within acceptable levels according to EPA guidance; therefore, no unacceptable human health risks are expected at this SWMU, and no further investigation is warranted.

10.8 SUMMARY AND RECOMMENDATIONS

Twenty-five soil samples were collected from five soil borings to 20 feet of depth during the Phase II RFI. Samples were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, and TRPH. Results of the Phase II chemical analyses were compared to Phase I results. If any Phase II concentrations exceeded Phase I concentrations, maximum detected concentrations were compared to background levels and RBCs.

The results of the Phase II investigation show that contamination is confined mainly to the top 5 feet of the soil at the SWMU. Eight metals exceeded background levels in the Phase II soil samples. Of these eight metals, six exceeded the Phase I concentrations. Nine organic compounds also exceeded Phase I concentrations. Of the analytes that exceeded Phase I concentrations, only one metal (manganese) and one organic compound (Aroclor-1260) exceeded residential RBCs.

The estimated risk (hazard quotient) for manganese was 1.1 Although this slightly exceeds the recommended hazard quotient of 1.0, the residential exposure assumptions are conservative, and there is likely no actual risk from this analyte. The estimated risk from Aroclor-1260 was 2×10^{-6}, which is within the EPA target risk range of 1×10^{-6} to 1×10^{-4}. The vertical extent of contamination appears to be defined, and potential impact to groundwater is considered low. Since there is no unacceptable health risk from any of the chemicals detected, it is recommended that no further investigation of this SWMU is necessary.

TABLE 10-1
SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
CIVIL ENGINEERING CONTAINER AREA (SWMU NO.77)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters						Sample Containers	
					VOCs	SVOCs	Metals	TRPH	Herbicides	Pest/PCBs	4 oz. jars	16 oz. jars
Boring 07707	0 - 2	CAN077-7707-0000		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7707-0005		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7707-7762	FD	Soil	X	X	X	X	X	X	1	1
	8 - 10	CAN077-7707-0010		Soil	X	X	X	X	X	X	1	1
	13 - 15	CAN077-7707-0015		Soil	X	X	X	X	X	X	1	1
	18 - 20	CAN077-7707-0020		Soil	X	X	X	X	X	X	1	1
Boring 07708	0 - 2	CAN077-7708-0000		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7708-0005		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7708-7702	MRD	Soil	X	X	X	X	X	X	1	1
	8 - 10	CAN077-7708-0010		Soil	X	X	X	X	X	X	1	1
	13 - 15	CAN077-7708-0015		Soil	X	X	X	X	X	X	1	1
	18 - 20	CAN077-7708-0020		Soil	X	X	X	X	X	X	1	1
Boring 07709	0 - 2	CAN077-7709-0000		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7709-0005		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7709-6605	MS/MSD	Soil	X	X	X	X	X	X	1	1
	8 - 10	CAN077-7709-0010		Soil	X	X	X	X	X	X	1	1
	13 - 15	CAN077-7709-0015		Soil	X	X	X	X	X	X	1	1
	18 - 20	CAN077-7709-0020		Soil	X	X	X	X	X	X	1	1

TABLE 10-1
SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
CIVIL ENGINEERING CONTAINER AREA (SWMU NO.77)
CANNON AFB, NEW MEXICO

Sample	Target Interval	Sample Identification	QA/QC	Sample	Analytical Parameters						Sample Containers	
Location	(ft-bgs)	Number	Type	Matrix	VOCs	SVOCs	Metals	TRPH	Herbicides	Pest/PCBs	4 oz. jars	16 oz. jars
Boring 07710	0 - 2	CAN077-7710-0000		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7710-0005		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7710-0005	FD	Soil	X	X	X	X	X	X	1	1
	8 - 10	CAN077-7710-0010		Soil	X	X	X	X	X	X	1	1
	13 - 15	CAN077-7710-0015		Soil	X	X	X	X	X	X	1	1
	18 - 20	CAN077-7710-0020		Soil	X	X	X	X	X	X	1	1
Boring 07711	0 - 2	CAN077-7711-0000		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7711-0005		Soil	X	X	X	X	X	X	1	1
	3 - 5	CAN077-7711-7701	MRD	Soil	X	X	X	X	X	X	1	1
	8 - 10	CAN077-7711-0010		Soil	X	X	X	X	X	X	1	1
	13 - 15	CAN077-7711-0015		Soil	X	X	X	X	X	X	1	1
	18 - 20	CAN077-7711-0020		Soil	X	X	X	X	X	X	1	1

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 10-2 for locations of the borings.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7707-0000			CAN077-7707-0005			CAN077-7707-7762[1]			CAN077-7707-0010			CAN077-7707-0014			CAN077-7707-0020		
LAB SAMPLE NUMBER	0396860012SA			0396860013SA			0396860017SA			0396860014SA			0396860015SA			0396860016SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	15	UJ	<	12	U	<	14	U	<	13	U	<	11	U	<	11	U
1,2-Dichloropropane	2	5.2	J	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.5	U
Methylene chloride	<	5.2	UJ	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.5	U
Toluene	28	5.2	J	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	980	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Anthracene	4600	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Benzo(a)anthracene	20000	6900		<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Benzo(a)pyrene	21000	6900		<	370	U	<	370	U	<	360	U	<	360	UJ	<	370	U
Benzo(b)fluoranthene	21000	6900		<	370	U	<	370	U	<	360	U	<	360	UJ	<	370	U
Benzo(g,h,i)perylene	11000	6900		<	370	U	<	370	U	<	360	U	<	360	UJ	<	370	U
Benzo(k)fluoranthene	27000	6900		<	370	U	<	370	U	<	360	U	<	360	UJ	<	370	U
bis(2-Ethylhexyl)phthalate	<	6900	U	<	370	U	<	370	U	180	360	J	200	360	J	<	370	U
Carbazole	7200	6900		<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Chrysene	2400	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Di-n-butyl phthalate	<	6900	U	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Dibenz(a,h)anthracene	5100	6900	J	<	370	U	<	370	U	<	360	U	<	360	UJ	<	370	U
Dibenzofuran	1200	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Fluoranthene	64000	6900		74	370	J	61	370	J	<	360	U	<	360	U	<	370	U
Fluorene	1200	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Indeno(1,2,3-cd)pyrene	11000	6900		<	370	U	<	370	U	<	360	U	<	360	UJ	<	370	U
2-Methylnaphthalene	3200	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U
Naphthalene	1500	6900	J	<	370	U	<	370	U	<	360	U	<	360	U	<	370	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7707-0000			CAN077-7707-0005			CAN077-7707-7762[1]			CAN077-7707-0010			CAN077-7707-0014			CAN077-7707-0020		
LAB SAMPLE NUMBER	0396860012SA			0396860013SA			0396860017SA			0396860014SA			0396860015SA			0396860016SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Phenanthrene	41000	6900		<	370	U	42	370	J	<	360	U	<	360	U	<	370	U
Pyrene	45000	6900		49	370	J	45	370	J	<	360	U	<	360	U	<	370	U
Pesticides/PCB's (µg/kg)																		
Aroclor 1260	<	1700	U	<	37	U	<	37	U	<	36	U	<	36	U	<	37	U
4,4'-DDE	<	170	U	<	3.7	U	<	3.7	U	<	3.6	U	<	3.6	U	<	3.7	U
4,4'-DDT	<	170	U	<	3.7	U	<	3.7	U	<	3.6	U	<	3.6	U	<	3.7	U
Endrin ketone	120	170	J	<	3.7	U	<	3.7	U	<	3.6	U	<	3.6	U	<	3.7	U
Metals (mg/kg)																		
Aluminum	3500	10.4		9920	11.2		10500	11.1		7520	10.9		3120	54.7		4420	22.1	
Arsenic	3.6	0.52	J	1.8	0.56	J	1.9	0.56	J	2.3	0.55	J	2.1	0.55	J	1.2	0.55	J
Barium	538	1	J	81.1	1.1	J	78.4	1.1	J	483	1.1	J	982	5.5	J	1680	2.2	J
Beryllium	0.22	0.21		0.57	0.22		0.58	0.22		0.44	0.22		<	1.1	U	<	0.44	U
Cadmium	<	0.52	U	<	0.56	U	<	0.56	U	0.38	0.55	J	<	2.7	U	<	1.1	U
Calcium	59400	20.8		28500	22.4		39500	22.3		107000	21.9		294000	109		177000	44.3	
Chromium	9.2	1	J	9.6	1.1	J	9.5	1.1	J	6.8	1.1	J	<	5.5	UJ	4.1	2.2	J
Cobalt	3.2	1		4.6	1.1		4.4	1.1		3	1.1		<	5.5	U	<	2.2	U
Copper	5	2.1		8	2.2		7.8	2.2		4.9	2.2		3.1	10.9	J	1.6	4.4	J
Iron	5640	10.4		9580	11.2		9520	11.1		6220	10.9		1760	54.7		2680	22.1	
Lead	26.2	5.2		4.4	1.1		5.2	2.8		5.1	2.7		0.85	0.55		1.3	0.55	
Magnesium	2440	20.8	J	2290	22.4	J	2500	22.3	J	3520	21.9	J	9840	109	J	8840	44.3	J
Manganese	357	1		206	1.1		186	1.1		107	1.1		13.6	5.5		23.4	2.2	
Nickel	6.7	4.2		10.8	4.5		9.1	4.5		6.5	4.4		<	21.9	U	5.2	8.9	J
Potassium	516	521	J	1780	560		1860	557		1330	547		516	2730	J	676	1110	J
Thallium	<	1	UJ	0.12	0.56	J	0.14	0.56	J	0.13	0.55	J	<	1.1	UJ	<	1.1	UJ

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7707-0000			CAN077-7707-0005			CAN077-7707-7762[1]			CAN077-7707-0010			CAN077-7707-0014			CAN077-7707-0020		
LAB SAMPLE NUMBER	0396860012SA			0396860013SA			0396860017SA			0396860014SA			0396860015SA			0396860016SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Vanadium	16	1		17.1	1.1		16.8	1.1		19.7	1.1		14.2	5.5		12.5	2.2	
Zinc	17.4	2.1		23.3	2.2		23.7	2.2		16.1	2.2		4.4	10.9	J	6.9	4.4	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	9700	834		63.6	44.8		<	44.6	U	<	43.8	U	<	43.7	U	<	44.3	U

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R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7708-0000			CAN077-7708-0005			CAN077-7708-0010			CAN077-7708-0015			CAN077-7708-0020			CAN077-7709-0000		
LAB SAMPLE NUMBER	0396880001SA			0396880002SA			0396880003SA			0396880004SA			0396880005SA			0396910001SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
1,2-Dichloropropane	<	5.6	U	<	5.6	U	<	5.5	U	<	5.3	U	<	5.6	U	<	5.4	U
Methylene chloride	2.2	5.6	J	2.5	5.6	J	2.1	5.5	J	1.5	5.3	J	2	5.6	J	<	5.4	U
Toluene	<	5.6	U	<	5.6	U	<	5.5	U	<	5.3	U	<	5.6	U	2.4	5.4	J
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Anthracene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Benzo(a)anthracene	37	370	J	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Benzo(a)pyrene	50	370	J	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Benzo(b)fluoranthene	100	370	J	<	370	U	<	360	U	<	350	U	<	370	U	41	350	J
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Benzo(k)fluoranthene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
bis(2-Ethylhexyl)phthalate	770	370		660	370		540	360		740	350		350	370	J	<	350	U
Carbazole	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Chrysene	76	370	J	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Dibenzofuran	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Fluoranthene	100	370	J	<	370	U	<	360	U	<	350	U	<	370	U	39	350	J
Fluorene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
2-Methylnaphthalene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Naphthalene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
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J = Estimated value.
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(1) Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7708-0000			CAN077-7708-0005			CAN077-7708-0010			CAN077-7708-0015			CAN077-7708-0020			CAN077-7709-0000		
LAB SAMPLE NUMBER	0396880001SA			0396880002SA			0396880003SA			0396880004SA			0396880005SA			0396910001SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Phenanthrene	<	370	U	<	370	U	<	360	U	<	350	U	<	370	U	<	350	U
Pyrene	100	370	J	<	370	U	<	360	U	<	350	U	<	370	U	40	350	J
Pesticides/PCB's (µg/kg)																		
Aroclor 1260	<	37	U	<	37	U	<	36	U	<	35	U	<	37	U	<	35	U
4,4'-DDE	<	3.7	U	<	3.7	U	<	3.6	U	<	3.5	U	<	3.7	U	3.7	3.5	
4,4'-DDT	<	3.7	U	<	3.7	U	<	3.6	U	<	3.5	U	<	3.7	U	6.8	3.5	
Endrin ketone	<	3.7	U	<	3.7	U	<	3.6	U	<	3.5	U	<	3.7	U	<	3.5	U
Metals (mg/kg)																		
Aluminum	2420	11.3		5370	22.3		6760	11		5350	21.3		5880	22.4		5220	10.7	
Arsenic	2.8	0.56	J	2.2	0.56	J	2	0.55	J	1.5	0.53	J	1.2	0.56	J	2.6	0.54	
Barium	691	1.1	J	578	2.2	J	327	1.1	J	1820	2.1	J	87.3	2.2	J	248	1.1	J
Beryllium	0.15	0.23	J	0.23	0.45	J	0.48	0.22		0.27	0.43	J	0.26	0.45	J	0.25	0.21	
Cadmium	0.36	0.56	J	<	1.1	U	<	0.55	U	<	1.1	U	<	1.1	U	0.57	0.54	
Calcium	99300	22.5		185000	44.6		46000	21.9		160000	42.5		144000	44.9		46100	21.5	
Chromium	3.7	1.1		4	2.2		6.1	1.1		4.5	2.1		25.4	2.2		5.6	1.1	
Cobalt	1.1	1.1		<	2.2	U	2.7	1.1		2.6	2.1		2.1	2.2	J	2.2	1.1	
Copper	5.5	2.3		3.1	4.5	J	3.8	2.2		3.1	4.3	J	14.5	4.5		8.4	2.1	
Iron	5170	11.3		4210	22.3		6210	11		4020	21.3		9250	22.4		6400	10.7	
Lead	<		R	<		R	<		R	<		R	<		R	48.5	10.7	
Magnesium	1410	22.5		2530	44.6		2660	21.9		3620	42.5		7240	44.9		1400	21.5	
Manganese	440	1.1		42.4	2.2		114	1.1		87.7	2.1		90.3	2.2		409	1.1	J
Nickel	4	4.5	J	5.1	8.9	J	5.4	4.4		5.3	8.5	J	13.9	9		5.8	4.3	
Potassium	464	563	J	836	1110	J	1230	549		1210	1060		1020	1120	J	1030	537	
Thallium	<	0.56	U	<	0.56	U	<	0.55	U	<	1.1	U	<	1.1	U	0.12	0.54	J

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(1) Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7708-0000			CAN077-7708-0005			CAN077-7708-0010			CAN077-7708-0015			CAN077-7708-0020			CAN077-7709-0000		
LAB SAMPLE NUMBER	0396880001SA			0396880002SA			0396880003SA			0396880004SA			0396880005SA			0396910001SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Vanadium	19.1	1.1		14.4	2.2		21.5	1.1		9.6	2.1		10.5	2.2		16.3	1.1	
Zinc	17.9	2.3		10.4	4.5		14.5	2.2		11.3	4.3		14.6	4.5		26	2.1	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	84.3	45		<	44.6	U	<	43.9	U	<	42.5	U	<	44.9	U	1320	172	

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TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7709-0005			CAN077-7709-0010			CAN077-7709-0015			CAN077-7709-0020			CAN077-7710-0000			CAN077-7710-0005		
LAB SAMPLE NUMBER	0396910002SA			0396910003SA			0396910004SA			0396910005SA			0396910007SA			0396910008SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	6.5	12	J	10	11	J	7.7	11	J	9.2	11	J	<	11	U	<	11	U
1,2-Dichloropropane	<	5.9	U	<	5.7	U	<	5.5	U	<	5.6	U	<	5.3	U	<	5.5	U
Methylene chloride	2.2	5.9	J	1.6	5.7	J	2	5.5	J	1.9	5.6	J	1.7	5.3	J	3.1	5.5	J
Toluene	<	5.9	U	<	5.7	U	<	5.5	U	<	5.6	U	<	5.3	U	<	5.5	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Anthracene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Benzo(a)anthracene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Benzo(a)pyrene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Benzo(b)fluoranthene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Benzo(g,h,i)perylene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Benzo(k)fluoranthene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	390	U	<	380	U	<	370	U	<	370	U	73	350	J	<	360	U
Carbazole	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Chrysene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Di-n-butyl phthalate	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Dibenz(a,h)anthracene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Dibenzofuran	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Fluoranthene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Fluorene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
2-Methylnaphthalene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Naphthalene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U

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(1) Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7709-0005			CAN077-7709-0010			CAN077-7709-0015			CAN077-7709-0020			CAN077-7710-0000			CAN077-7710-0005		
LAB SAMPLE NUMBER	0396910002SA			0396910003SA			0396910004SA			0396910005SA			0396910007SA			0396910008SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Phenanthrene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Pyrene	<	390	U	<	380	U	<	370	U	<	370	U	<	350	U	<	360	U
Pesticides/PCB's (µg/kg)																		
Aroclor 1260	<	39	U	<	38	U	<	37	U	<	37	U	140	70		<	36	U
4,4'-DDE	<	3.9	U	<	3.8	U	<	3.7	U	<	3.7	U	<	7	U	<	3.6	U
4,4'-DDT	<	3.9	U	<	3.8	U	<	3.7	U	<	3.7	U	<	7	U	<	3.6	U
Endrin ketone	<	3.9	U	<	3.8	U	<	3.7	U	<	3.7	U	<	7	U	<	3.6	U
Metals (mg/kg)																		
Aluminum	4530	59.4		6680	22.9		4980	22.2		6910	22.4		2810	10.5		9330	10.9	
Arsenic	2.1	0.59		2.3	0.57		1.2	0.55		0.93	0.56		2.1	0.53		2.2	0.55	
Barium	219	5.9	J	202	2.3	J	674	2.2		91	2.2		255	1.1	J	109	1.1	J
Beryllium	<	1.2	U	0.49	0.46		0.36	0.44	J	0.42	0.45	J	0.13	0.21	J	0.51	0.22	
Cadmium	<	3	U	<	1.1	U	<	1.1	U	<	1.1	U	<	0.53	U	<	0.55	U
Calcium	232000	119		178000	45.8		217000	44.4		148000	44.9		27000	21.1		61300	21.9	
Chromium	<	5.9	U	4.4	2.3		4.2	2.2		5.5	2.2		3.8	1.1		8.5	1.1	
Cobalt	<	5.9	U	2.7	2.3		1.6	2.2	J	1.4	2.2	J	1.7	1.1		3.7	1.1	
Copper	<	11.9	U	2.6	4.6	J	2.5	4.4	J	2.7	4.5	J	6.1	2.1		7.5	2.2	
Iron	3740	59.4		5380	22.9		3790	22.2		4720	22.4		7400	10.5		8670	10.9	
Lead	3.1	0.59	J	4.4	0.57		4.7	0.55		3.5	0.56		7.6	0.53	J	6.6	0.55	J
Magnesium	2910	119		4220	45.8		3530	44.4		8550	44.9		1430	21.1		2600	21.9	
Manganese	38.6	5.9	J	56.5	2.3	J	48.7	2.2		49.5	2.2		223	1.1	J	157	1.1	J
Nickel	<	23.7	U	10.5	9.2		2.5	8.9	J	7.2	9	J	6.1	4.2		9.5	4.4	
Potassium	470	2970	J	989	1140	J	1000	1110	J	1180	1120		512	527	J	1740	547	
Thallium	<	1.2	UJ	<	0.57	U	<	0.55	U	<	1.1	U	<	0.53	U	<	0.55	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7709-0005			CAN077-7709-0010			CAN077-7709-0015			CAN077-7709-0020			CAN077-7710-0000			CAN077-7710-0005		
LAB SAMPLE NUMBER	0396910002SA			0396910003SA			0396910004SA			0396910005SA			0396910007SA			0396910008SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Vanadium	10	5.9		16.3	2.3		9.5	2.2		20.4	2.2		11.9	1.1		15.9	1.1	
Zinc	8.8	11.9	J	12.1	4.6	J	10.4	4.4		11.7	4.5		24.7	2.1	J	20.3	2.2	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	47.5	U	<	45.8	U	<	44.4	U	<	44.9	U	105	42.2		<	43.7	U

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A complete summary of chemical results are presented in Appendix A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7710-7761[1]			CAN077-7710-0010			CAN077-7710-0015			CAN077-7710-0020			CAN077-7711-0000			CAN077-7711-0005		
LAB SAMPLE NUMBER	0396910006SA			0396910009SA			0396910010SA			0396910011SA			0396910012SA			0396910013SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																		
Acetone	16	11		21	11		<	11	U	<	11	U	<	11	U	19	11	
1,2-Dichloropropane	<	5.6	U	<	5.5	U	<	5.4	U	<	5.5	U	<	5.4	U	<	5.3	U
Methylene chloride	1.9	5.6	J	3	5.5	J	2.9	5.4	J	2.1	5.5	J	2.4	5.4	J	1.7	5.3	J
Toluene	1.2	5.6	J	<	5.5	U	<	5.4	U	<	5.5	U	3.5	5.4	J	2.2	5.3	J
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Anthracene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Benzo(a)anthracene	<	370	U	<	360	U	<	360	U	<	360	U	54	350	J	<	350	U
Benzo(a)pyrene	<	370	U	<	360	U	<	360	U	<	360	U	56	350	J	<	350	U
Benzo(b)fluoranthene	<	370	U	<	360	U	<	360	U	<	360	U	110	350	J	<	350	U
Benzo(g,h,i)perylene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Benzo(k)fluoranthene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
bis(2-Ethylhexyl)phthalate	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Carbazole	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Chrysene	<	370	U	<	360	U	<	360	U	<	360	U	50	350	J	<	350	U
Di-n-butyl phthalate	<	370	U	<	360	U	<	360	U	<	360	U	910	350		<	350	U
Dibenz(a,h)anthracene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Dibenzofuran	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Fluoranthene	<	370	U	<	360	U	<	360	U	<	360	U	89	350	J	<	350	U
Fluorene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
2-Methylnaphthalene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U
Naphthalene	<	370	U	<	360	U	<	360	U	<	360	U	<	350	U	<	350	U

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
[1] Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7710-7761[1]			CAN077-7710-0010			CAN077-7710-0015			CAN077-7710-0020			CAN077-7711-0000			CAN077-7711-0005		
LAB SAMPLE NUMBER	0396910006SA			0396910009SA			0396910010SA			0396910011SA			0396910012SA			0396910013SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Phenanthrene	<	370	U	<	360	U	<	360	U	<	360	U	58	350	J	<	350	U
Pyrene	<	370	U	<	360	U	<	360	U	<	360	U	96	350	J	<	350	U
Pesticides/PCB's (µg/kg)																		
Aroclor 1260	<	37	U	<	36	U	<	36	U	<	36	U	<	35	U	<	35	U
4,4'-DDE	<	3.7	U	<	3.6	U	<	3.6	U	<	3.6	U	14	3.5		4.1	3.5	
4,4'-DDT	<	3.7	U	<	3.6	U	<	3.6	U	<	3.6	U	10	3.5		2.1	3.5	J
Endrin ketone	<	3.7	U	<	3.6	U	<	3.6	U	<	3.6	U	<	3.5	U	<	3.5	U
Metals (mg/kg)																		
Aluminum	12500	11.2		7530	22.1		8210	10.8		11600	11		5590	10.7		8780	21.3	
Arsenic	1.8	0.56		1.8	0.55		1.3	0.54		1.5	0.55		2.7	0.54		2.2	0.53	
Barium	203	1.1	J	2840	2.2	J	542	1.1	J	486	1.1	J	336	1.1	J	459	2.1	J
Beryllium	0.6	0.22		0.59	0.44		0.39	0.22		0.48	0.22		0.3	0.21		0.57	0.43	
Cadmium	<	0.56	U	<	1.1	U	<	0.54	U	<	0.55	U	0.45	0.54	J	<	1.1	U
Calcium	82000	22.4		136000	44.1		76400	21.7		79000	22.1		18300	21.5		129000	42.6	
Chromium	10.7	1.1		5.1	2.2		6.3	1.1		7.9	1.1		8.4	1.1		7.6	2.1	
Cobalt	4.3	1.1		2.8	2.2		2.5	1.1		2.5	1.1		3.1	1.1		2.8	2.1	
Copper	7.8	2.2		3	4.4	J	2.9	2.2		3.1	2.2		13.4	2.1		6.6	4.3	
Iron	10300	11.2		5510	22.1		6430	10.8		7380	11		9020	10.7		7930	21.3	
Lead	6.7	0.56		4.9	0.55	J	4.7	0.54	J	4.4	1.1	J	27	5.4	J	7.3	0.53	J
Magnesium	3310	22.4		4320	44.1		3770	21.7		8330	22.1		1380	21.5		2920	42.6	
Manganese	161	1.1	J	96.9	2.2	J	78.8	1.1	J	74.5	1.1	J	190	1.1	J	140	2.1	J
Nickel	10.8	4.5		6.2	8.8	J	5.7	4.3		7.7	4.4		7.7	4.3		7.8	8.5	J
Potassium	2200	560		1460	1100		1960	541		2500	552		1380	536		1330	1060	
Thallium	<	0.56	U	<	1.1	UJ	0.25	0.54	J	<	0.55	U	<	0.54	U	<	0.53	U

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A complete summary of chemical results are presented in Appendix A.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

[1] Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7710-7761[1]			CAN077-7710-0010			CAN077-7710-0015			CAN077-7710-0020			CAN077-7711-0000			CAN077-7711-0005		
LAB SAMPLE NUMBER	0396910006SA			0396910009SA			0396910010SA			0396910011SA			0396910012SA			0396910013SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94			12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Vanadium	19	1.1		14.4	2.2		15.6	1.1		27.5	1.1		16	1.1		18.4	2.1	
Zinc	24.3	2.2	J	14.7	4.4	J	16.1	2.2	J	18.9	2.2	J	64.8	2.1	J	24.5	4.3	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.8	U	<	44.1	U	<	43.3	U	<	44.2	U	113	42.9		<	42.6	U

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7711-0010			CAN077-7711-0015			CAN077-7711-0020		
LAB SAMPLE NUMBER	0396910014SA			0396910015SA			0396910016SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)									
Acetone	18	11		19	11		<	10	U
1,2-Dichloropropane	<	5.5	U	<	5.6	U	<	5.2	U
Methylene chloride	1.9	5.5	J	2	5.6	J	<	5.2	U
Toluene	2.2	5.5	J	<	5.6	U	<	5.2	U
Semivolatile Organics (µg/kg)									
Acenaphthene	<	360	U	<	370	U	<	350	U
Anthracene	<	360	U	<	370	U	<	350	U
Benzo(a)anthracene	<	360	U	<	370	U	<	350	U
Benzo(a)pyrene	<	360	U	<	370	U	<	350	U
Benzo(b)fluoranthene	<	360	U	<	370	U	<	350	U
Benzo(g,h,i)perylene	<	360	U	<	370	U	<	350	U
Benzo(k)fluoranthene	<	360	U	<	370	U	<	350	U
bis(2-Ethylhexyl)phthalate	<	360	U	<	370	U	<	350	U
Carbazole	<	360	U	<	370	U	<	350	U
Chrysene	<	360	U	<	370	U	<	350	U
Di-n-butyl phthalate	<	360	U	<	370	U	<	350	U
Dibenz(a,h)anthracene	<	360	U	<	370	U	<	350	U
Dibenzofuran	<	360	U	<	370	U	<	350	U
Fluoranthene	<	360	U	<	370	U	<	350	U
Fluorene	<	360	U	<	370	U	<	350	U
Indeno(1,2,3-cd)pyrene	<	360	U	<	370	U	<	350	U
2-Methylnaphthalene	<	360	U	<	370	U	<	350	U
Naphthalene	<	360	U	<	370	U	<	350	U

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7711-0010			CAN077-7711-0015			CAN077-7711-0020		
LAB SAMPLE NUMBER	0396910014SA			0396910015SA			0396910016SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Phenanthrene	<	360	U	<	370	U	<	350	U
Pyrene	<	360	U	<	370	U	<	350	U
Pesticides/PCB's (µg/kg)									
Aroclor 1260	<	36	U	<	37	U	<	35	U
4,4'-DDE	<	3.6	U	<	3.7	U	<	3.5	U
4,4'-DDT	<	3.6	U	<	3.7	U	<	3.5	U
Endrin ketone	<	3.6	U	<	3.7	U	<	3.5	U
Metals (mg/kg)									
Aluminum	7460	22.1		9100	11.1		9750	10.5	
Arsenic	1.4	0.55		1.3	0.56		1.5	0.52	
Barium	133	2.2	J	105	1.1	J	156	1	J
Beryllium	0.69	0.44		0.47	0.22		0.41	0.21	
Cadmium	<	1.1	U	<	0.56	U	<	0.52	U
Calcium	141000	44.2		104000	22.3		67400	21	
Chromium	3.7	2.2		6.9	1.1		6.6	1	
Cobalt	2.3	2.2		3.7	1.1		3.4	1	
Copper	3.5	4.4	J	3.8	2.2		3.7	2.1	
Iron	4960	22.1		6940	11.1		7080	10.5	
Lead	4.4	0.55	J	5	0.56	J	4.8	0.52	J
Magnesium	4210	44.2		4440	22.3		6700	21	
Manganese	61.3	2.2	J	88.5	1.1	J	120	1	J
Nickel	5	8.8	J	8	4.5		7	4.2	
Potassium	1170	1100		2100	557		2250	524	
Thallium	<	0.55	U	<	0.56	U	<	0.52	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.
(1) Duplicate for preceding sample number.

TABLE 10-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 077
CANNON AFB

LOCATOR	CAN077-7711-0010			CAN077-7711-0015			CAN077-7711-0020		
LAB SAMPLE NUMBER	0396910014SA			0396910015SA			0396910016SA		
COLLECT DATE	12/07/94			12/07/94			12/07/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Vanadium	12.5	2.2		17.9	1.1		20.3	1	
Zinc	12.6	4.4	J	17.4	2.2	J	19.4	2.1	J
TRPH (mg/kg)									
Total Recoverable Petroleum Hydrocarbons	<	44.2	U	<	44.5	U	<	41.9	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Appendix A.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 10-3
COMPARISON OF PHASE II MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1)
SWMU 77, CANNON AFB
Civil Engineering Container Area

Sample ID	Metal	Maximum detected concentration	Range of Background concentrations (2)	Upper tolerance limit (UTL) background concentration(3)	Reported Level in Clovis, NM Region (4)	Does maximum detected exceed background
CAN077-7710-0020	Aluminum	11,600	1,410 - 11,000	10,540	50,000	NO**
CAN077-7707-0000	Arsenic	3.6	0.67 - 28	15.5	6.5	NO
CAN077-7710-0010	Barium	2840	14.5 - 1200	642	500	YES
CAN077-7711-0010	Beryllium	0.69	0.17 - 0.77	0.73	1-2	NO
CAN077-7709-0000	Cadmium	0.57	<0.51 - 4.2	*	----	YES
CAN077-7708-0020	Chromium	25.4	4 - 15.4	12.5	30	YES
CAN077-7707-0005	Cobalt	4.6	0.85 - 5.3	4.5	3-7	NO**
CAN077-7708-0020	Copper	14.5	<2 - 18.4	*	20	NO**
CAN077-7709-0000	Lead	48.5	1.1 - 46	25.8	15	YES
CAN077-7708-0000	Manganese	440	22.4 - 216	164	500	YES
CAN077-7708-0020	Nickel	13.9	1.3 - 9.8	9	15	YES
CAN077-7710-0015	Thallium	0.25	0.14 - 0.22	*	----	YES
CAN077-7710-0020	Vanadium	27.5	5.2 - 28.3	25.3	30-70	NO**
CAN077-7711-0000	Zinc	64.8	<4.3 - 27.5	21.9	45	YES

(1) All units in mg/kg.

(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1993) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).

Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1993).

(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.

(4) USGS 1984.

*Data insufficient to calculate UTL of background concentration.

** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 10-4

COMPARISON OF PHASE II SOIL CONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCs
SWMU 77, CANNON AFB
Civil Engineering Container Area

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Phase II concentration greater than Phase I Concentration	Estimated Risk(3)	Risk Type	Phase II Industrial Soil Risk-based Concentration(2) (mg/kg)	Exceeds RBC?
Acetone	ND	0.021	7,800	NO	YES				
1,2-Dichloropropane	ND	0.002	9.4	NO	YES				
Methylene Chloride	ND	0.0036	85	NO	YES				
Tetrachloroethene	0.0013	ND	12	NO	NO				
Toluene	0.0075	0.0035	16,000	NO	NO				
Xylenes	0.0068	ND	160,000	NO	NO				
Anthracene	0.15	ND	23,000	NO	NO				
Aroclor-1260	ND	0.14	0.083	YES	YES	2 X 10-6	carcinogenic	0.37	NO
Benzo(a)anthracene	0.37	0.054	0.88	NO	NO				
Benzo(a)pyrene	0.35	0.056	0.088	NO	NO				
Benzo(b)fluoranthene	0.63	0.11	0.88	NO	NO				
Benzo(g,h,i)perylene	0.16	ND	NA(a)	NA	NO				
Bis(2-ethylhexyl) phthalate	ND	0.77	46	NO	YES				
Butyl Benzyl Phthalate	0.083	ND	16,000	NO	NO				
Carbazole	0.043	7.2	32	NO	YES				
Chlordane (total)	0.0178	ND	0.49	NO	NO				
Chrysene	0.5	0.076	88	NO	NO				
4,4'-DDE	0.0038	0.014	1.9	NO	YES				
4,4'-DDT	0.03	0.01	1.9	NO	NO				
Dibenzo(a,h)anthracene	0.073	ND	0.088	NO	NO				
Dibenzofuran	ND	1.2	310	NO	YES				
Di-n-Butyl phthalate	ND	0.91	7,800	NO	YES				
Di-n-octyl phthalate	0.16	ND	1,600	NO	NO				
Endrin Ketone	N/A	0.12	NA	NA	NA				
Fluoranthene	1.1	0.1	3,100	NO	NO				
Indeno(1,2,3-cd)pyrene	0.15	ND	0.88	NO	NO				
4-Nitrophenol	0.058	ND	NA(a)	NA	NO				
Pentachlorophenol	0.063	ND	5.3	NO	NO				
Phenanthrene	0.8	ND	NA(a)	NA	NO				

TABLE 10-4

COMPARISON OF PHASE II SOIL CONCENTRATIONS TO PHASE I SOIL CONCENTRATIONS AND RBCs
SWMU 77, CANNON AFB
Civil Engineering Container Area

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Phase II concentration greater than Phase I Concentration	Estimated Risk(3)	Risk Type	Phase II Industrial Soil Risk-based Concentration(2) (mg/kg)	Exceeds RBC?
Pyrene	0.9	0.1	2,300	NO	NO				
TRPH	10,000	1,320	NA(a)	NA	NO				
Antimony	5.9	ND	31	NO	NO				
Barium	503	2840	5,500	NO	YES				
Cadmium	3	0.57	39	NO	NO				
Chromium	8.6	25.4	390	NO	YES				
Cobalt	4.8	4.6	4700	NO	NO				
Copper	11	14.5	2900	NO	YES				
Lead	41	48.5	NA(a)	NA	YES				
Manganese	410	440	390	YES	YES	1.1	noncarcinogenic	5100	NO
Nickel	8.6	13.9	1600	NO	YES				
Silver	2	ND	390	NO	NO				
Thallium	NA	0.25	6.3	NO	NA				
Zinc	73.8	64.8	23000	NO	NO				

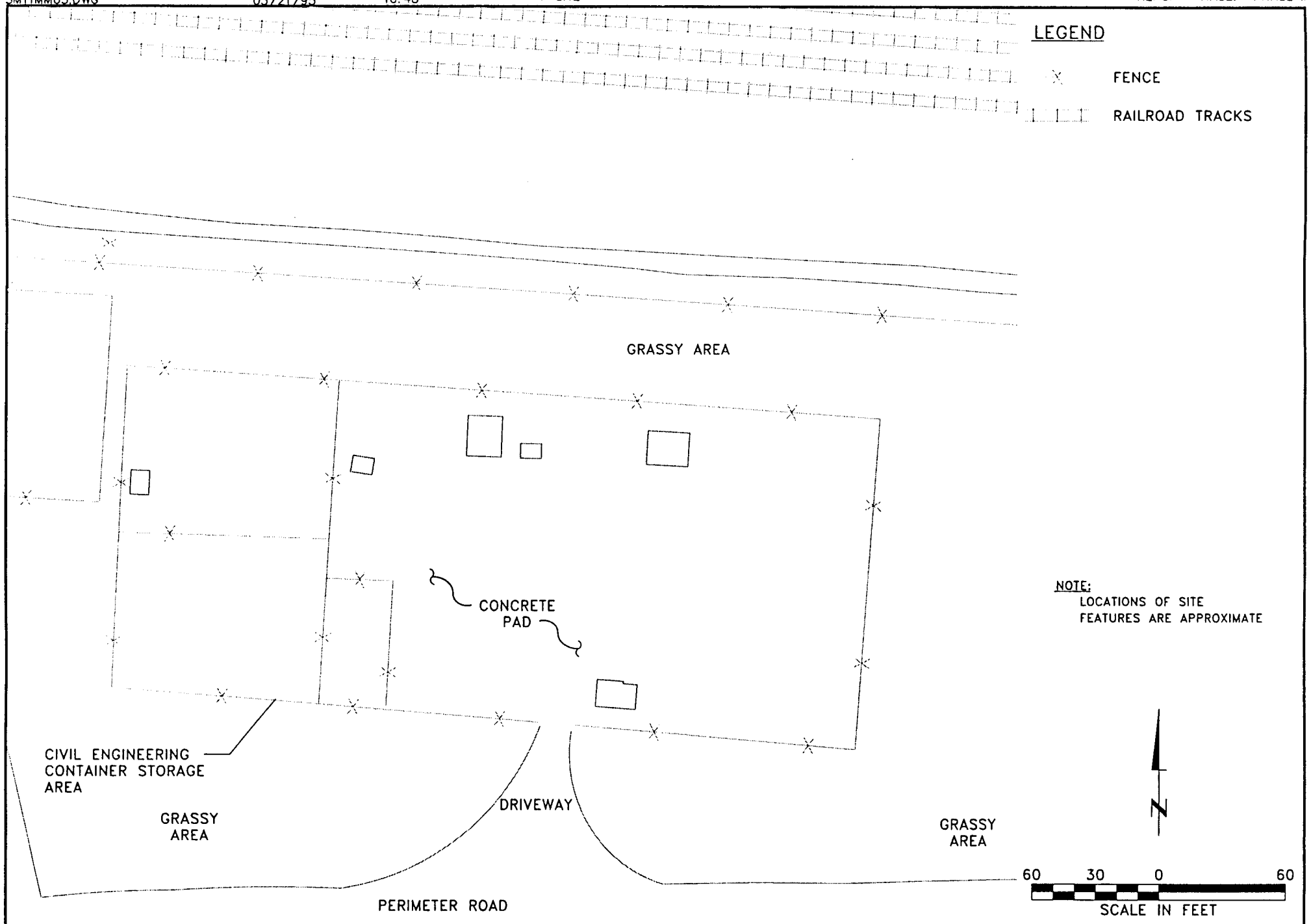
(1) EPA Region III Risk-Based Concentrations for residential soil (EPA 1994).
(2) EPA Region III Risk-Based Concentrations for industrial soil (EPA 1994).
(3) Estimated risk based on maximum Phase II concentrations that exceeded previously evaluated Phase I levels.
Estimated risk = 1×10^{-6} * concentrations/RBC for carcinogens; Estimated risk = concentration/RBC for noncarcinogens.
(a) EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.
* No RBC has been calculated for lead. EPA recommends an interim residential soil lead concentration of 400 mg/kg (EPA 1994).
NA = Not Applicable
ND = Not Detected
N/A = Not Analyzed For

TABLE 10-4a

POTENTIAL CUMULATIVE RISK AT SWMU 77
CANNON AFB, NEW MEXICO

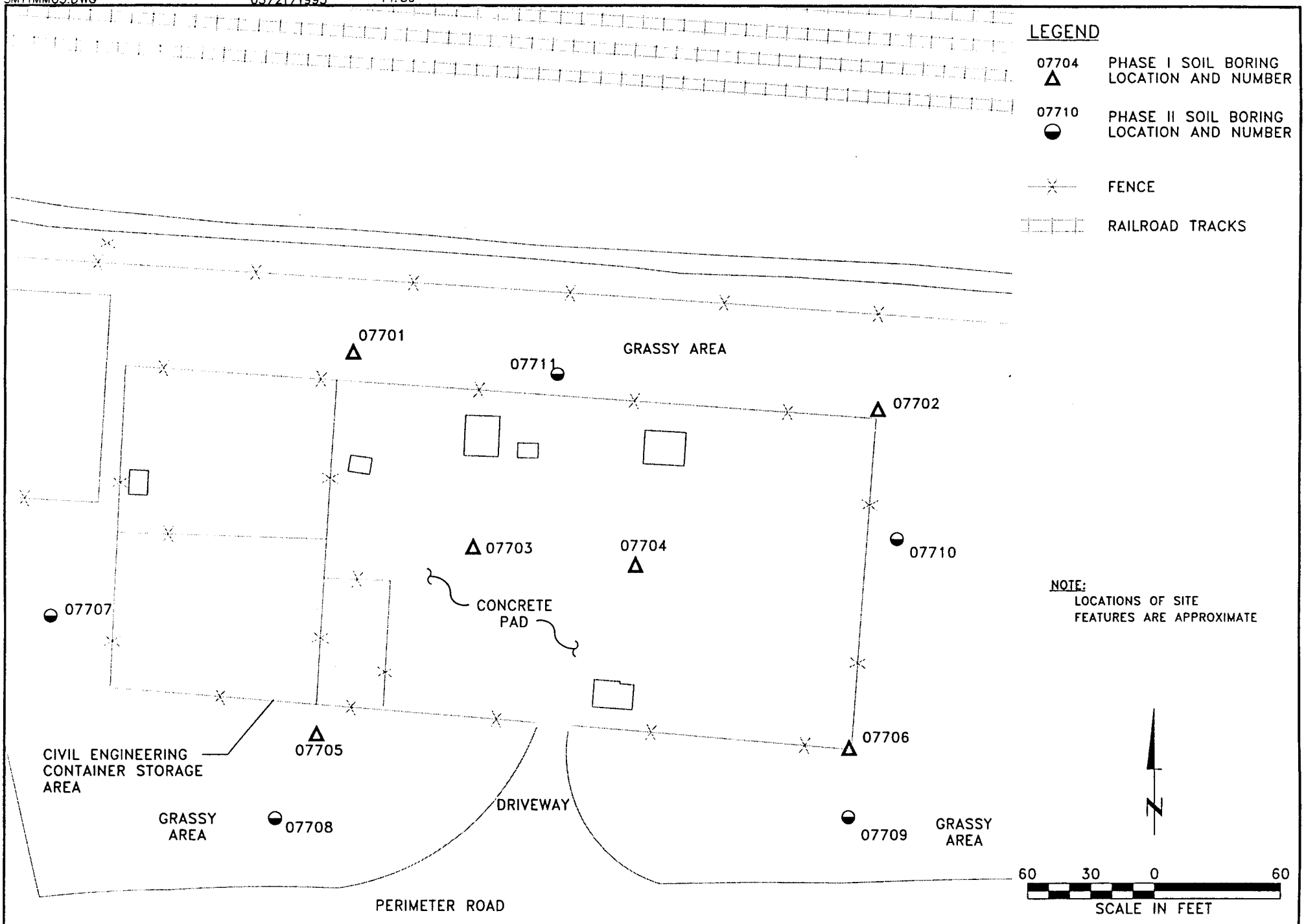
Chemical[1]	Carcinogen?	Phase II Concentration (mg/kg)	Residential RBC (mg/kg)	Industrial RBC (mg/kg)	Risk Residential[2]	Hazard Residential[3]	Risk Industrial[2]	Hazard Industrial[3]
Acetone	No	0.021	7,800	100,000		0.000003		0.0000002
1,2-Dichloropropane	Yes	0.002	9.4	42	2.13E-10		4.76E-11	
Methylene chloride	Yes	0.0036	85	380	4.24E-11		9.47E-12	
Aroclor-1260	Yes	0.14	0.083	0.37	1.69E-06		3.78E-07	
Bis(2-ethylhexyl) phthalat	Yes	0.77	46	200	1.67E-08		3.85E-09	
Carbazole		7.2	NA	NA		NA		NA
4,4-DDE	Yes	0.014	1.9	8.4	7.37E-09		1.67E-09	
Dibenzofuran	No	1.2	310	4,100		0.004		0.0003
Di-n-butyl phthalate	No	0.91	7,800	100,000		0.0001		0.000009
Endrin ketone	No	0.12	23	310		0.01		0.0004
Barium	No	2,840	5,500	72,000		0.5		0.04
Chromium	No	25.4	390	5,100		0.07		0.005
Copper	No	2,900	2,900	38,000		1		0.08
Lead	No	48.5	400*	NA*		NA*		NA*
Manganese	No	440	390	5,100		1		0.09
Nickel	No	13.9	1,600	20,000		0.01		0.0007
Thallium	No	0.25	6.3	92		0.04		0.003
Totals					2E-06	3	4E-07	0.2
Phase I Risk[4]					NA	NA	6E-07	0.002
Cumulative Risk[5]					NA	NA	1E-06	0.2

[1] Chemicals with maximum Phase II concentration exceeding Phase I concentrations
[2] Risk = 1E-06 x concentration/RBC
[3] Hazard = concentration/RBC
[4] Highest calculated risk and hazard for all receptors evaluated in risk assessment (W-C 1994d)
[5] Sum of Phase I risk and incremental risk from Phase II concentrations (i.e., that exceeded Phase I levels)
* No RBC is available for lead; 400 is residential level generally acceptable based on EPA lead uptake model.



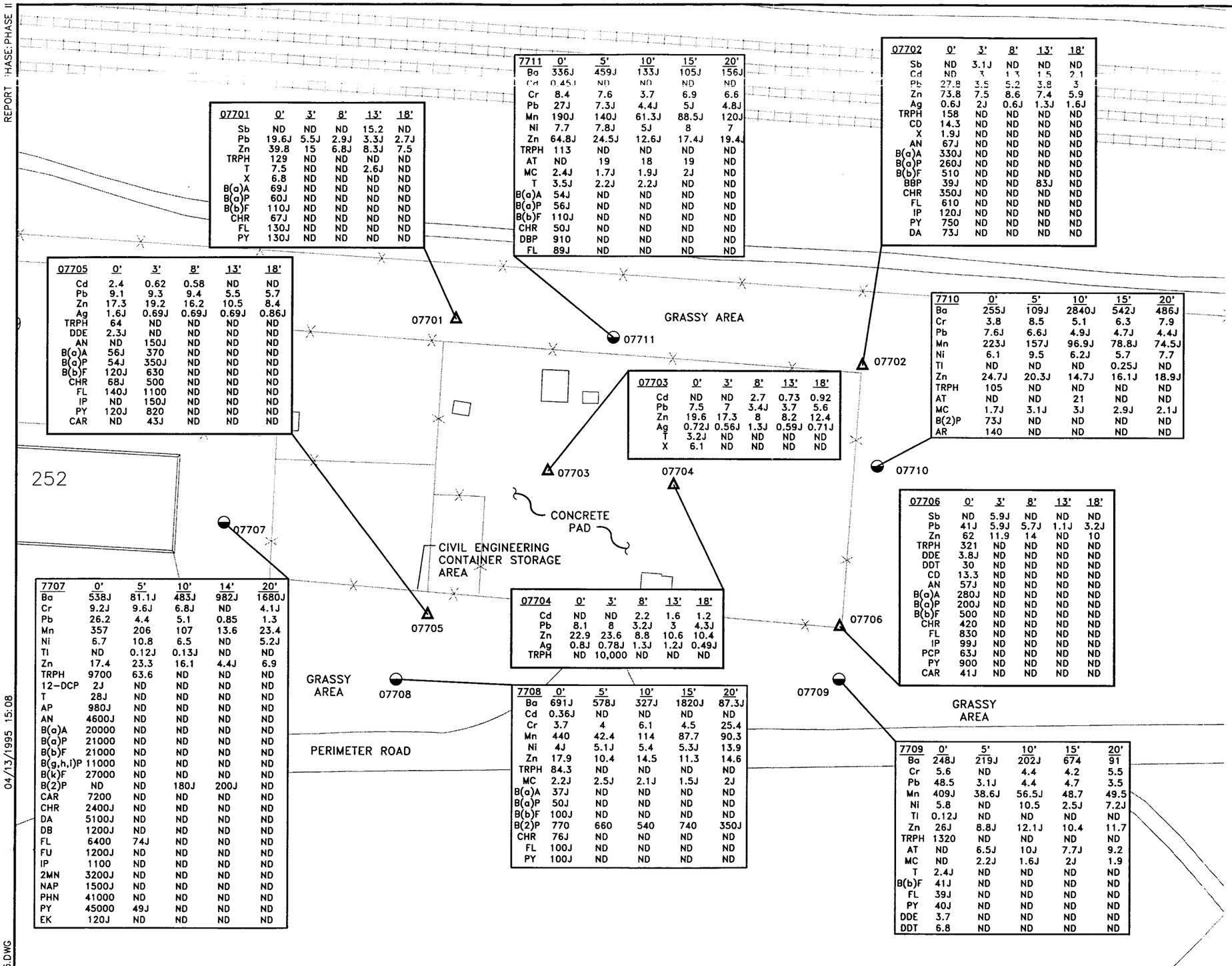
SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	CIVIL ENGINEERING CONTAINER STORAGE AREA – SWMU 77 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 10-1



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	CIVIL ENGINEERING CONTAINER STORAGE AREA – SWMU 77 SITE PLAN WITH BORING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY: .	REVISION: 0		C3M11MM	10-2



07701	0'	3'	8'	13'	18'
Sb	ND	ND	ND	15.2	ND
Pb	19.6J	5.5J	2.9J	3.3J	2.7J
Zn	39.8	15	6.8J	8.3J	7.5
TRPH	129	ND	ND	ND	ND
T	7.5	ND	ND	2.6J	ND
X	6.8	ND	ND	ND	ND
B(a)A	69J	ND	ND	ND	ND
B(a)P	60J	ND	ND	ND	ND
B(b)F	110J	ND	ND	ND	ND
CHR	67J	ND	ND	ND	ND
FL	130J	ND	ND	ND	ND
PY	130J	ND	ND	ND	ND

7711	0'	5'	10'	15'	20'
Ba	336J	459J	133J	105J	156J
Cd	0.45J	ND	ND	ND	ND
Cr	8.4	7.6	3.7	6.9	6.6
Pb	27J	7.3J	4.4J	5J	4.8J
Mn	190J	140J	61.3J	88.5J	120J
Ni	7.7	7.8J	5J	8	7
Zn	64.8J	24.5J	12.6J	17.4J	19.4J
TRPH	113	ND	ND	ND	ND
AT	ND	19	18	19	ND
MC	2.4J	1.7J	1.9J	2J	ND
T	3.5J	2.2J	2.2J	ND	ND
B(a)A	54J	ND	ND	ND	ND
B(a)P	56J	ND	ND	ND	ND
B(b)F	110J	ND	ND	ND	ND
CHR	50J	ND	ND	ND	ND
DBP	910	ND	ND	ND	ND
FL	89J	ND	ND	ND	ND

07702	0'	3'	8'	13'	18'
Sb	ND	3.1J	ND	ND	ND
Cd	ND	3	1.3	1.5	2.1
Pb	27.8	3.5	5.2	3.8	3
Zn	73.8	7.5	8.6	7.4	5.9
Ag	0.6J	2J	0.6J	1.3J	1.6J
TRPH	158	ND	ND	ND	ND
CD	14.3	ND	ND	ND	ND
X	1.9J	ND	ND	ND	ND
AN	67J	ND	ND	ND	ND
B(a)A	330J	ND	ND	ND	ND
B(a)P	260J	ND	ND	ND	ND
B(b)F	510	ND	ND	ND	ND
BBP	39J	ND	ND	83J	ND
CHR	350J	ND	ND	ND	ND
FL	610	ND	ND	ND	ND
IP	120J	ND	ND	ND	ND
PY	750	ND	ND	ND	ND
DA	73J	ND	ND	ND	ND

07705	0'	3'	8'	13'	18'
Cd	2.4	0.62	0.58	ND	ND
Pb	9.1	9.3	9.4	5.5	5.7
Zn	17.3	19.2	16.2	10.5	8.4
Ag	1.6J	0.69J	0.69J	0.69J	0.86J
TRPH	64	ND	ND	ND	ND
DDE	2.3J	ND	ND	ND	ND
AN	ND	150J	ND	ND	ND
B(a)A	56J	370	ND	ND	ND
B(a)P	54J	350J	ND	ND	ND
B(b)F	120J	630	ND	ND	ND
CHR	68J	500	ND	ND	ND
FL	140J	1100	ND	ND	ND
IP	ND	150J	ND	ND	ND
PY	120J	820	ND	ND	ND
CAR	ND	43J	ND	ND	ND

7710	0'	5'	10'	15'	20'
Ba	255J	109J	2840J	542J	486J
Cr	3.8	8.5	5.1	6.3	7.9
Pb	7.6J	6.6J	4.9J	4.7J	4.4J
Mn	223J	157J	96.9J	78.8J	74.5J
Ni	6.1	9.5	6.2J	5.7	7.7
Tl	ND	ND	ND	0.25J	ND
Zn	24.7J	20.3J	14.7J	16.1J	18.9J
TRPH	105	ND	ND	ND	ND
AT	ND	ND	21	ND	ND
MC	1.7J	3.1J	3J	2.9J	2.1J
B(2)P	73J	ND	ND	ND	ND
AR	140	ND	ND	ND	ND

07703	0'	3'	8'	13'	18'
Cd	ND	ND	2.7	0.73	0.92
Pb	7.5	7	3.4J	3.7	5.6
Zn	19.6	17.3	8	8.2	12.4
Ag	0.72J	0.56J	1.3J	0.59J	0.71J
T	3.2J	ND	ND	ND	ND
X	6.1	ND	ND	ND	ND

07706	0'	3'	8'	13'	18'
Sb	ND	5.9J	ND	ND	ND
Pb	41J	5.9J	5.7J	1.1J	3.2J
Zn	62	11.9	14	ND	10
TRPH	321	ND	ND	ND	ND
DDE	3.8J	ND	ND	ND	ND
DDT	30	ND	ND	ND	ND
CD	13.3	ND	ND	ND	ND
AN	57J	ND	ND	ND	ND
B(a)A	280J	ND	ND	ND	ND
B(a)P	200J	ND	ND	ND	ND
B(b)F	500	ND	ND	ND	ND
CHR	420	ND	ND	ND	ND
FL	830	ND	ND	ND	ND
IP	99J	ND	ND	ND	ND
PCP	63J	ND	ND	ND	ND
PY	900	ND	ND	ND	ND
CAR	41J	ND	ND	ND	ND

7707	0'	5'	10'	14'	20'
Ba	538J	81.1J	483J	982J	1680J
Cr	9.2J	9.6J	6.8J	ND	4.1J
Pb	26.2	4.4	5.1	0.85	1.3
Mn	357	206	107	13.6	23.4
Ni	6.7	10.8	6.5	ND	5.2J
Tl	ND	0.12J	0.13J	ND	ND
Zn	17.4	23.3	16.1	4.4J	6.9
TRPH	9700	63.6	ND	ND	ND
12-DCP	2J	ND	ND	ND	ND
T	28J	ND	ND	ND	ND
AP	980J	ND	ND	ND	ND
AN	4600J	ND	ND	ND	ND
B(a)A	20000	ND	ND	ND	ND
B(a)P	21000	ND	ND	ND	ND
B(b)F	21000	ND	ND	ND	ND
B(g,h,i)P	11000	ND	ND	ND	ND
B(k)F	27000	ND	ND	ND	ND
B(2)P	ND	ND	180J	200J	ND
CAR	7200	ND	ND	ND	ND
CHR	2400J	ND	ND	ND	ND
DA	5100J	ND	ND	ND	ND
DB	1200J	ND	ND	ND	ND
FL	6400	74J	ND	ND	ND
FU	1200J	ND	ND	ND	ND
IP	1100	ND	ND	ND	ND
2MN	3200J	ND	ND	ND	ND
NAP	1500J	ND	ND	ND	ND
PHN	41000	ND	ND	ND	ND
PY	45000	49J	ND	ND	ND
EK	120J	ND	ND	ND	ND

07704	0'	3'	8'	13'	18'
Cd	ND	ND	2.2	1.6	1.2
Pb	8.1	8	3.2J	3	4.3J
Zn	22.9	23.6	8.8	10.6	10.4
Ag	0.8J	0.78J	1.3J	1.2J	0.49J
TRPH	ND	10,000	ND	ND	ND

7708	0'	5'	10'	15'	20'
Ba	691J	578J	327J	1820J	87.3J
Cd	0.36J	ND	ND	ND	ND
Cr	3.7	4	6.1	4.5	25.4
Mn	440	42.4	114	87.7	90.3
Ni	4J	5.1J	5.4	5.3J	13.9
Zn	17.9	10.4	14.5	11.3	14.6
TRPH	84.3	ND	ND	ND	ND
MC	2.2J	2.5J	2.1J	1.5J	2J
B(a)A	37J	ND	ND	ND	ND
B(a)P	50J	ND	ND	ND	ND
B(b)F	100J	ND	ND	ND	ND
B(2)P	770	660	540	740	350J
CHR	76J	ND	ND	ND	ND
FL	100J	ND	ND	ND	ND
PY	100J	ND	ND	ND	ND

7709	0'	5'	10'	15'	20'
Ba	248J	219J	202J	674	91
Cr	5.6	ND	4.4	4.2	5.5
Pb	48.5	3.1J	4.4	4.7	3.5
Mn	409J	38.6J	56.5J	48.7	49.5
Ni	5.8	ND	10.5	2.5J	7.2J
Tl	0.12J	ND	ND	ND	ND
Zn	26J	8.8J	12.1J	10.4	11.7
TRPH	1320	ND	ND	ND	ND
AT	ND	6.5J	10J	7.7J	9.2
MC	ND	2.2J	1.6J	2J	1.9
T	2.4J	ND	ND	ND	ND
B(b)F	41J	ND	ND	ND	ND
FL	39J	ND	ND	ND	ND
PY	40J	ND	ND	ND	ND
DDE	3.7	ND	ND	ND	ND
DDT	6.8	ND	ND	ND	ND

LEGEND

07702 △ PHASE I BORING LOCATION WITH NUMBER

07710 ◒ PHASE II BORING LOCATION WITH NUMBER

FENCE

RAILROAD TRACKS

Sb = ANTIMONY (mg/kg)
Cd = CADMIUM (mg/kg)
Pb = LEAD (mg/kg)
Zn = ZINC (mg/kg)
Ba = BARIUM (mg/kg)
Cr = CHROMIUM (mg/kg)
Mn = MAGNESIUM (mg/kg)
Ni = NICKEL (mg/kg)
Tl = THALLIUM (mg/kg)
AP = ACENAPTHENE
AN = ANTHRACENE
AT = ACETONE
AR = AROCLOR-1260
DA = DIBENZ(a,h)ANTHRACENE
DB = DIBENZOFURAN
FU = FLUORENE
MC = METHYLENE CHLORIDE
EK = ENDRIN KETONE
Ag = SILVER (mg/kg)
TRPH = TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (mg/kg)
CD = CHLORDANE
FL = FLUORANTHENE
IP = INDENO(1,2,3-CD)PYRENE
PY = PYRENE
DA = DIBENZO(a,h)ANTHRACENE
B(a)A = BENZO(A)ANTHRACENE
B(a)P = BENZO(A)PYRENE
B(b)F = BENZO(B)FLURANTHENE
BBP = BENZYL BUTYL PHTHALATE
CHR = CHRYSENE
DDE = 4,4'-DDE
DDT = 4,4'-DDT
DDD = 4,4'-DDD
12-DCP = 1,2-DICHLOROPROPANE
2MN = 2-METHYLNAPHTHALENE
NAP = NAPHTHALENE
PHN = PHENANTHRENE
B(g,h,i)P = BENZO(g,h,i)PERYLE
B(k)F = BENZO(k)FLUORANTHENE
B(2)P = BIS(2-Ethylhexyl)PHTHA
CAR = CARBAZOLE
BBP = BUTYL BENZYLPHTHALATE
PCP = PENTACHLOROPHENOL
CAR = CARBAZOLE
X = XYLENES
T = TOLUENE

CONCENTRATIONS ARE µg/kg EXCEPT WHERE NOTED

ND= CHEMICALS ANALYZED FOR WERE NOT DETECTED

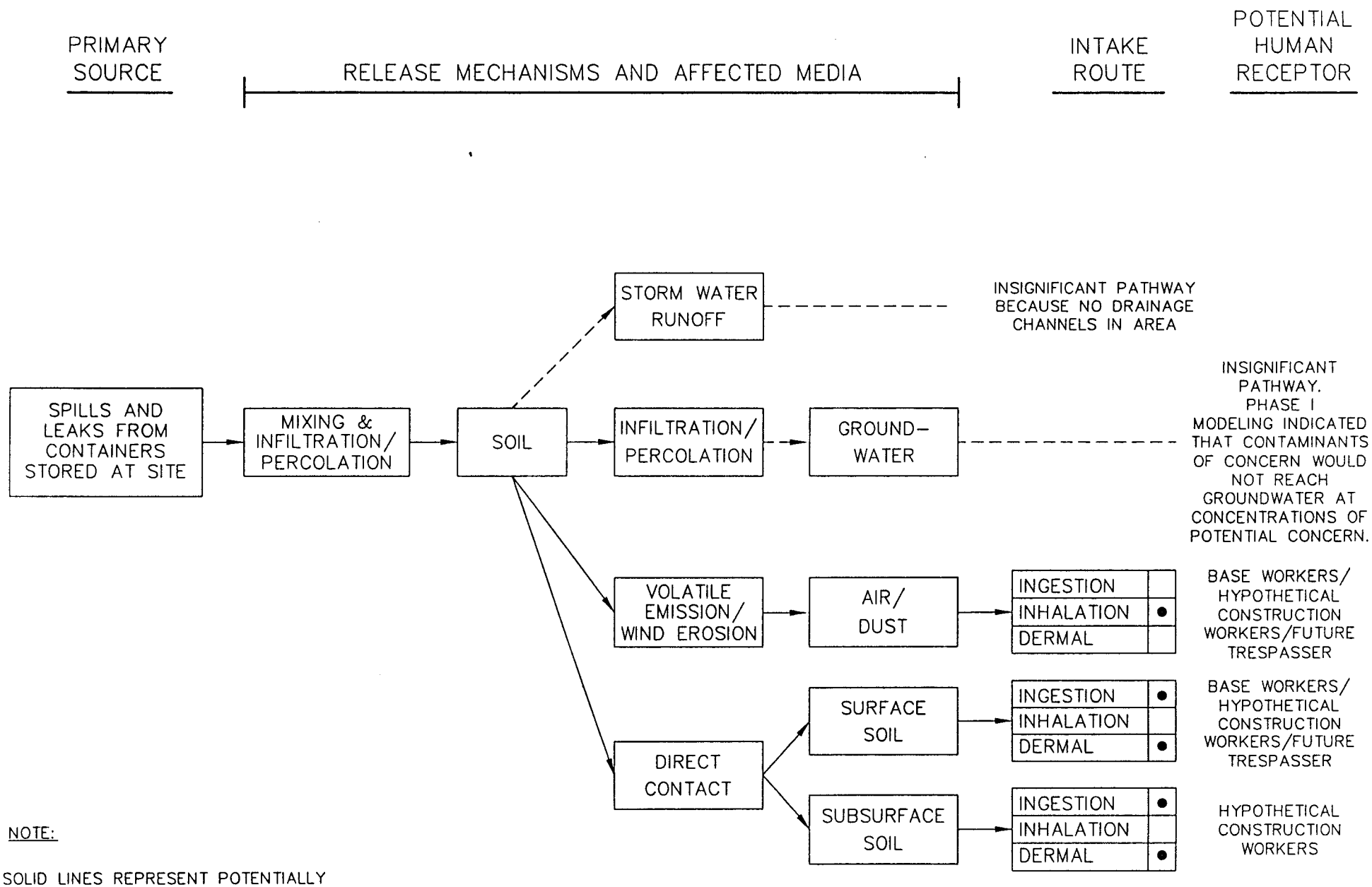
NOTE:
LOCATIONS OF SITE FEATURES ARE APPROXIMATE

60 30 0 60
SCALE IN FEET

N

SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY TBS	DATE 01/18/95	CIVIL ENGINEERING CONTAINER STORAGE AREA - SWMU 77 CONCENTRATION OF CHEMICALS DETECTED IN SOIL CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 10-3
CHK'D BY	REVISION 0			



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

ONLY FUTURE USE EXPOSURES WILL BE CONSIDERED FOR SOILS PRESENTLY COVERED BY PAVEMENT

DRN BY JWB	DATE 08/19/93	SITE CONCEPTUAL EXPOSURE MODEL CIVIL ENGINEERING CONTAINER STORAGE AREA SWMU – 77 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.
CHK'D BY .	REVISIONS: 0		C3M11MM

FIG. NO. 10-4

11.1 SITE BACKGROUND

11.1.1 Site Description

The Playa Lake occupies approximately 13 acres within Cannon AFB near the east-central edge of the Base (Figure 11-1). This shallow pond is maintained at approximately two-thirds total capacity by inflow from the wastewater treatment lagoons located to the west.

11.1.2 Site History

The Playa Lake received all of the Base sanitary and industrial wastewater from 1943 to 1966; a portion of the wastewater was treated with an Imhoff unit prior to discharge to the Playa Lake. The lake has received sanitary and industrial wastewater effluent from the wastewater treatment lagoons from 1966 to the present.

11.1.3 Current Use

The Playa Lake continues to receive effluent from the wastewater lagoons. Discharge occurs from the Playa Lake in the form of irrigation water which is mechanically pumped from the lake by a local farmer.

11.1.4 Potential Contaminants

Contaminants of concern include organics, PCBs, pesticides, and metals.

11.1.5 Previous Investigations

Sediment samples from four locations and surface water samples from three locations were collected from the Playa Lake in 1993 to determine whether a release of SWMU-related chemicals had occurred as a result of the wastewater treatment operations. The previous

sample locations are shown in Figure 11-2. Target analyses for the sediment samples collected included VOCs, SVOCs, metals, TRPH, PCBs, pesticides, and herbicides. Surface water samples collected were analyzed for the Appendix IX list of chemicals. Benzene was detected in sediment samples 10302 through 10304. 2-Butanone was detected in sediment samples 10303 and 10304. Chloromethane was detected in sediment sample 10301. Petroleum hydrocarbons were detected in all of the sediment samples. Aluminum, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, potassium, nickel, selenium, silver, sodium, vanadium, and zinc were detected above background in one or more of the sediment samples.

BRA Summary

Beryllium, silver, vanadium, and petroleum hydrocarbons exceeded the risk screening criteria. Based on the results of the Phase I investigation, a BRA was completed for this SWMU. Potential receptors at SWMU 103 for human health risk included occupational workers, hypothetical future construction workers, hypothetical future trespassers, and farmers. These receptors were assumed to be exposed to sediment via ingestion, dermal contact, and inhalation pathways. Potential human health risks from groundwater were not evaluated at this SWMU, because chemical concentrations beneath the lake were not determined.

The maximum potential excess human health risk at SWMU 103 was 9×10^{-8} for occupational workers. This is below the EPA's target risk range of 1×10^{-6} to 1×10^{-4} for risk from releases at hazardous waste sites indicating that no unacceptable risk is expected. The primary contributor to the risk was dermal contact with bis(2-ethylhexyl)phthalate in surface soils.

Results of the ecological risk assessment showed that there could be a potential for ecological risks to predatory birds (i.e., herons) due to chemical releases at the SWMU. However, due to significant uncertainties associated with bioaccumulation assumptions used in this assessment as well as the exclusion of factors that would decrease the risk to herons (i.e., seasonal use of the Lake by the heron or other food sources), the actual level of risk, if any, is unknown.

Since the groundwater pathway had not been completely characterized, the assessment of risks could not be completed for this SWMU in the Phase I investigation. Therefore, it was recommended that additional data be collected so that the groundwater pathway could be fully characterized.

11.1.6 Phase II Sampling Objectives

The overall objective of sampling at the Playa Lake was to evaluate whether or not a release of SWMU-related chemicals had occurred as a result of the wastewater treatment operations which could pose a significant risk to human health or the environment. The analytical data collected from this investigation was used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU were to:

- Characterize the concentrations of SWMU-related chemicals in sediment and shallow soils underlying the sediment within the Playa Lake and in surface and subsurface soils around the perimeter of the lake.

- Characterize the vertical distribution of SWMU-related chemicals and evaluate the potential for any chemicals of concern found in the soils to impact the groundwater.

11.2 FIELD INVESTIGATION AND DATA COLLECTION

11.2.1 Soils Sampling

Six soil borings were drilled and soil samples collected at locations surrounding the playa lake. In addition, five sediment hand auger borings were drilled and sampled at various locations within the playa lake. The borings were drilled to a total depth of 20 feet at various locations along the shore of the playa lake. The sediment sample borings were drilled to a depth of 5 feet below the bottom of the lake. The soil and sediment boring locations were chosen to assess the lateral and vertical presence and extent of site related contaminants to the 20-foot depth in soils and the 5-foot depth in sediments. Phase II RFI boring numbers and sample descriptions are shown in Table 12-1 and on Figure 12-2.

Surface soil samples from all soil borings were collected from 0 to 2 feet. All borings were also sampled at intervals of 3 to 5 feet, 8 to 10 feet, 13 to 15 feet, and 18 to 20 feet as specified in the field sampling plan and the sample summary tables. The sediment borings were sampled at intervals of 2 to 3 feet and 4 to 5 feet. The samples were collected in accordance with QAPP SOP No. 5 - Sediment Sampling, QAPP SOP No. 6 - Surface Soil Sampling and QAPP SOP No. 7 - Subsurface Drilling and Sampling. Target analytes included:

- Volatile Organic Compounds (VOCs) by EPA Method 8240
- Semivolatile organics (SVOCs) by EPA Method 8270
- Total TAL Metals by EPA Methods 6010 and 7000
- TRPH by EPA Method 9071/418.1
- Chlorinated Herbicides by EPA Method 8150 (Appendix IX)
- Pesticides and PCBs by EPA Method 8080

11.2.2 Geologic Summary of Boring Logs

Logs from the six Phase II RFI borings show a subsurface lithology consisting mainly of fine-grained fill material and Ogallala Formation sediments. Boring 1316 encountered a 2-foot layer of silty clay (USCS symbol CL) fill at the surface. This fill is described as reddish-brown, dry, stiff, and low plastic with some asphalt and gravel. Below this fill, and to a depth of 6.5 feet, is a sand fill (USCS symbol SP) described as light brown, dry, loose to medium dense, and fine-grained. Boring 1317 encountered 0.5 feet of clayey silt fill (USCS symbol ML) at the surface followed by the same sand fill found in boring 1316 to a depth of 4.9 feet. Boring 1318 also had the silty clay fill material from the surface to a depth of 4.2 feet. Below the fill, and from the surface in borings 1313 through 1315, all borings contained clayey silt to the completion depths of the borings. The clayey silt is described as light reddish-brown, dry, and loose to hard with some caliche.

No field screening (headspace) or visual indications of contamination, with the exception of very low headspace readings in boring 1313 (high of 0.3 ppm), were observed while drilling and sampling the Phase II soil borings. No odors were noted during drilling or sampling activities.

11.2.3 Site Topography

The site is located in a level grassy area immediately southeast of the ordnance area. The fence surrounding the ordnance area bounds the site on the northwest. A dirt access road is located between the fence and the shore of the playa lake. The ground surface slopes downward to the water surface for a vertical distance of about 4 to 5 feet along the shoreline of the lake.

The Playa Lake is in a large playa near the ordnance area. The lake is an estimated 1,000 feet across the widest part and an estimated 5 feet deep at the deepest area with a gradually sloping bottom.

11.3 CHEMICAL INVESTIGATION RESULTS

11.3.1 General

Soil samples were collected from five drill rig soil borings (10313, 10314, 10315, 10316, and 10317) and five shallow lake sediment hand-augered borings (10308, 10309, 10310, 10311, and 10312). Sampling and analyses performed are summarized in Table 11-1. A summary of the analytical results for these soil samples are provided in Table 11-2. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical results are provided in Appendix A.

11.3.2 Organic Results for Near-Surface Soil Boring Samples

The near-surface soil samples collected at this SWMU (CAN103-1313-0000, CAN103-1314-0000, CAN103-1315-0000, CAN103-1316-0000, CAN103-1317-0000, and CAN103-1318-0000) were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, TRPH, and TRPH as indicated in Table 11-1. Except for acetone and methylene chloride, which were qualified as nondetect after they were found to be laboratory contaminants, the only VOC reported for any of the surface soil samples was toluene in sample CAN103-1318-0000 at an estimated concentration of 1.1 μg/kg. Several VOCs, in the form of PAHs, were reported in the surface sample from borings 10315 and 10318 (CAN103-1315-0000 and CAN103-1318-

0000, respectively). The total PAH concentration in sample CAN103-1315-0000 was 416 μg/kg. Only fluoranthene, also a PAH, was detected in sample CAN103-1318-0000 at an estimated concentration of 44 μg/kg. No other SVOCs were reported for any of the surface samples. The PCB Aroclor-1248 was reported in sample CAN103-1315-0000 at a concentration of 750 μg/kg. The pesticides 4,4'-DDE and 4,4'-DDT were reported in sample CAN103-1318-0000 at concentrations of 2.4 μg/kg (estimated) and 3.7 μg/kg, respectively. No herbicides were reported in any of the surface samples. Petroleum hydrocarbons were detected in samples CAN103-1315-0000 and CAN103-1318-0000 at concentrations of 734 mg/kg (estimated) and 132 mg/kg, respectively.

11.3.3 Organic Results for Subsurface Soil Boring Samples

The subsurface samples collected at this SWMU (CAN103-1313-0005, CAN103-1313-0000, CAN103-1313-0015, and CAN103-1313-0020 for boring 10313; CAN103-1314-0005, CAN103-1314-0010, CAN103-1314-0015, and CAN103-1314-0020 for boring 10314; CAN103-1315-0005, CAN103-1315-0010, CAN103-1315-0015, and CAN103-1315-0020 for boring 10315; CAN103-1316-0005, CAN103-1316-0010, CAN103-1316-0015, and CAN103-1316-0020 for boring 10316; CAN127-2710-0005 and CAN127-2710-0010 for boring 02710; CAN103-1217-0005, CAN103-1317-0010, CAN103-1317-0015, and CAN103-1317-0020 for boring 10317; CAN103-1318-0005, CAN103-1318-0010, CAN103-1318-0015, and CAN103-1318-0020 for boring 10318) were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, TRPH, and TRPH as indicated in Table 11-1.

Other than acetone and methylene chloride, which were qualified nondetect after they were determined to be laboratory contaminants, the only VOC reported was toluene. Toluene was reported in samples CAN103-1317-0005 and CAN103-1318-0020 at concentrations of 2 μg/kg (estimated) and 1.9 μg/kg (estimated), respectively. Two SVOCs, bis(2-ethylhexyl)phthalate and di-n-octyl phthalate were reported in sample CAN103-1315-0020 at concentrations of 5,800 μg/kg and 430 μg/kg, respectively. No pesticides were reported for any of the subsurface samples; however, the PCB Aroclor-1248 was reported in sample CAN103-1315-0005 at a concentration of 48 μg/kg. Petroleum hydrocarbons were reported for samples CAN103-1316-0010 and CAN103-1317-0005 at concentrations of 58.5 mg/kg and 64.4 mg/kg, respectively.

11.3.4 Organic Results for Sediment Boring Samples

The sediment samples collected at this SWMU (CAN103-13-8-0003 and CAN103-1308-0005 for boring 10308; CAN103-1309-0003 and CAN103-1309-0005 for boring 10309; CAN103-1310-0003 and CAN103-1310-0005 for boring 10310; CAN103-1311-003 and CAN103-1311-0005 for boring 10311; and CAN103-1312-0003 and CAN103-1312-0005 for boring 10312 were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, TRPH, and TRPH as indicated in Table 11-1.

Other than acetone and methylene chloride, which were qualified nondetect after they were determined to be laboratory contaminants, the only VOCs reported were toluene, 2-butanone, and carbon disulfide. Toluene was reported in samples CAN103-1038-003, CAN103-1038-0005, CAN103-1039-0003, CAN103-1039-0005, and CAN103-10311-0005 at estimated concentrations of 1.6 μg/kg, 3.6 μg/kg, 1.4 μg/kg, 2.7 μg/kg, and 2.7 μg/kg, respectively. Carbon disulfide was reported in samples CAN103-1039-003 and CAN103-10311-0005 at concentrations of 13 μg/kg and 7.1 μg/kg, respectively. 2-Butanone was reported in samples CAN103-1038-003, CAN103-1038-005, CAN103-1039-005, and CAN103-1312-0005 at concentrations of 21 μg/kg, 16 μg/kg, 14 μg/kg, and 12 μg/kg. Only one SVOC, butyl benzyl phthalate, was reported in sample CAN103-10310-003 at an estimated concentration of 71 μg/kg. Several pesticides were reported in low concentrations. 4,4′-DDE was reported in sample CAN103-10310-0003 at an estimated concentration of 3.6 μg/kg. 4,4′-DDT, dieldrin, and endrin were reported for sample CAN103-1038-0003 at estimated concentrations of 2.4 μg/kg, 2.4 μg/kg, and 2.6 μg/kg, respectively. Gamma-chlordane was reported for samples CAN103-1039-005, CAN103-10310-003, and CAN103-10310-005 at concentrations of 1.1 μg/kg (estimated), 2.4 μg/kg, and 1.2 μg/kg (estimated), respectively. No herbicides or TRPH were reported for any of the sediment samples.

11.3.5 Inorganic Results

Metals analyses were performed on samples collected from this SWMU as indicated in Table 11-1. The range of results for metals reported in these soil samples, combining Phase I and Phase II data, are summarized in Table 11-A.

TABLE 11-A

Analyte	Frequency Reported	Lowest Detection	Sample Location	Highest Detection	Sample Location
Aluminum	44/44	2410	1031-500	24,700	1039-005
Antimony	2/47	3.3J	10311-0003	4.9J	1317-0000
Barium	47/47	0.066	1037-3000	1300J	1315-0005
Beryllium	28/47	.15	1313-0020	1.6	1039-0005
Cadmium	4/47	.66	10310-0005	2.6	1034-5001
Chromium	40/47	1.4	1316-0000	35.5	1032-5001
Calcium	44/44	1290	10311-0003	329,000	1313-0005
Cobalt	36/47	.87	1315-0020	11.3	1039-0005
Copper	46/47	.0051	1036-3000	102	1032-5001
Iron	44/44	1530	1313-0005	21,700	1039-0005
Magnesium	44/44	1160	1316-0005	9,160	1317-0010
Manganese	44/44	15J	1313-0005	902	1039-0005
Nickel	39/47	2.5J	1313-0020	27.7	1032-5001
Potassium	43/44	968	1031-5001	4,750	1039-0005
Silver	9/47	.0052	1037-3000	33.7	1032-5001
Sodium	15/44	99.1J	1031-5001	18,900	1032-5001
Tin		--	--	--	--
Vanadium	47/47	0.0048	1036-3000	130	1032-5001
Zinc	47/47	0.014	1036-3007	275	1032-5001
Arsenic	47/47	0.0031	1035-3000	10.8	1032-5001
Lead	47/47	0.006	1036-3000	39.3	1032-5001
Mercury	5/47	.14	1316-0005	0.51	1034-5001
Selenium	6/40	.13J	10310-0003	13.2	1032-5001
Thallium	10/47	.12	--	.34J	1038-0003

Note: See Table 11-3 for background comparison.

11.4 DATA ASSESSMENT

An assessment of the Playa Lake (SWMU 103) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

11.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicates that there were no sampling issues that would significantly impact data usability.

11.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the sediment and soil samples were specified in the Cannon AFB RFI QAPP Addendum (W-C, 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA, 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988). A detailed review of SWMU 103 data is provided in the QCSR.

For the organic analyses, qualification of data was required based on surrogates, holding times, MS/MSD recoveries, and blank contamination. The holding time for the herbicide analysis of CAN103-1313-0005 did not meet criteria. Herbicide data for sample CAN103-1313-0005 were qualified estimated nondetect **UJ**. For sample CAN103-1313-0000 herbicide analysis, the surrogate recovery was below evaluation criteria. Associated herbicide data were qualified as estimated nondetect **UJ** to indicate a potential low bias. Acetone, methylene chloride, and bis(2-ethylhexyl)phthalate data were qualified as nondetect **U** for the several samples based on blank contamination. For one set of MS/MSD samples, TRPH was reported to have negative recoveries. For samples CAN103-1315-0000, CAN103-1315-0005, CAN103-1415-0010, CAN103-1315-1362, CAN103-1315-0015, and CAN103-1315-0020, detected TRPH data were qualified as estimated **J**, and nondetect TRPH data were rejected **R** based on the MS/MSD recoveries.

The MS recoveries for antimony, barium, cadmium, calcium, lead, selenium, silver, and thallium were reported below evaluation criteria, and the MS recoveries for manganese, barium, and nickel were above the evaluation criteria. Antimony and selenium data were qualified for all SWMU 103 samples as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias. The following data was also qualified to indicate a potential low bias based on the MS recoveries:

- Thallium data for borings 1314, 1313, and 1316 samples and samples CAN103-1312-0003 and CAN103-1312-0005

- Silver data for borings 1314 and 1313 samples and samples CAN103-1316-0010 and CAN103-1316-0020

- Lead data for samples CAN103-1316-0000 and CAN103-1316-0005

- Barium data for sediment samples CAN103-1312-0003 and CAN103-1312-0005

- Calcium data for boring 1315 samples

- Cadmium and lead data for sediment samples CAN103-1038-003, CAN103-1038-005, CAN103-1039-003, CAN103-1039-005, CAN103-10310-003, CAN103-10310-005, CAN103-10311-003, CAN103-10311-005, and CAN103-10310-603

Detected barium and nickel data were qualified as estimated **J** to indicate a potential high bias for boring 1314 and 1313 samples and samples CAN103-B16-0010 and CAN103-1316-0020. Detected manganese data for borings 1317, 1318, 1314, and 1313 samples and samples CAN103-1316-0010 and CAN103-1316-0020 were qualified as estimated **J** to indicate a potential high bias.

Precision parameters met the evaluation criteria for the organic analyses. For the field duplicate samples CAN103-1316-0010 and CAN103-1316-1364, aluminum, barium, calcium, chromium, iron, vanadium, and zinc data qualified as estimated **J** (detects) or **UJ** (nondetects) based on outlying precision parameters. RPDs for aluminum, barium, lead, and vanadium were outlying the evaluation criteria for the matrix duplicate samples. Aluminum data for borings 1314 and 1313 samples and samples CAN103-1316-0010, CAN103-1316-0020, CAN103-1312-0003, and CAN103-1312-0005 were qualified as estimated **J** (detects) or **UJ** (nondetects) based on the outlying precision parameter. Associate barium data were qualified based on a low MS recovery. Vanadium data for CAN103-1312-0003 and CAN103-1312-0005 and lead data for the sediment samples and boring 1315 samples were qualified also on the basis of the outlying precision parameter as estimated **J** (detects) or **UJ** (nondetects).

11.4.3 Reporting Limits

Reporting limits were raised for the selenium, thallium, arsenic, lead, and pesticide/PCB analyses by more than 10 times the nominal RL. Selenium and thallium analyses for several samples required dilutions due to either matrix interferences or dilutions. Selenium and thallium data, which had elevated reporting limits due to matrix interferences, were qualified as estimated **J** (detects) or **UJ** (nondetects). Lead analyses required dilutions due to matrix interferences or lead concentrations above the calibration range. Method 6010 analyses required dilutions due to calcium concentrations above the calibration range, and arsenic analyses required dilutions due to matrix interferences. For samples CAN103-1317-0005 and CAN103-1315-0000, pesticide/PCB analyses required dilutions to concentrations of 4.4′-DDE, 4,4′-DDT and/or Aroclor-1248 above the calibration range.

11.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 103 were determined to meet quality criteria except the TRPH data which was rejected for samples CAN103-1315-0000, CAN103-1315-0005, CAN103-1415-0010, CAN103-1315-1362, CAN103-1315-0015, and CAN103-1315-0020. The elevated reporting limits were not judged to limit the use of the data. The elevated RLs were compared to the RBCs for the metal analyses and were judged not to be a limitation for the use of the data for the human health risk screening. The elevated RLs were either below the RBCs or the laboratory would report estimated concentrations below the RBCs. Additionally, for arsenic and lead, these analytes were detected in the samples. In conjunction with other information, including field observations, data were judged to be acceptable.

11.5 NATURE AND EXTENT OF CONTAMINATION

SWMU 103 is a playa lake that has collected natural drainage and industrial and sanitary wastewater since the Base was established in 1942. Samples of the water from the lake and the sludge/sediment from the bottom of the lake were collected during the Phase I investigation for chemical testing. The water showed no visible evidence of contamination other than having a high algae content. The sludge samples were putrid smelling, and the chemical test results revealed that they contained elevated levels of beryllium, silver, vanadium, and TRPH.

Relatively low concentrations of some VOCs, SVOCs, and pesticides were also detected in the sediment samples. Sediment samples collected at depths of 3 feet and 5 feet below the lake bottom during the Phase II investigation confirmed that low levels of VOCs, SVOCs, and pesticides are present in lake bottom sediments.

A series of soil borings to a depth of 20 feet, surrounding the Playa Lake indicated that very low levels of VOCs, SVOCs, pesticides and one PCB (Aroclor-1248) are present mainly in surface and shallow subsurface soils surrounding the Playa Lake. High detections of these compounds were not indicated at depth in these borings, except for a relatively high level of bis(2-ethylhexyl)phthalate that was reported at 20 feet in boring 10315. Petroleum hydrocarbons were detected only in the surface soils from the borings.

11.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, SWMU concentrations of metals in soil were evaluated to assess whether they exceeded background levels. Metals that occur in concentrations within background levels were not considered SWMU-related chemicals of concern and were not evaluated further.

Background levels were defined by the upper tolerance limit (UTL) of concentrations from 37 background soil samples collected at Cannon AFB and by literature values for regional soils (USGS 1984). The background UTL was defined as the mean plus two times the standard deviation; see Appendix D.

Table 11-3 shows the comparison of the maximum detected SWMU concentrations to background levels. The maximum detected concentrations of aluminum, arsenic, barium, beryllium, copper, lead, selenium, and vanadium did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern. The maximum concentrations of antimony, cadmium, chromium, cobalt, manganese, mercury, nickel, silver, thallium, and zinc exceeded background levels; therefore, these metals were retained for further evaluation as chemicals of concern. A brief discussion of the interpretations of the background comparison is given here.

Eight of forty soil/sediment samples contained aluminum at concentrations (ranging from 11,600 to 24,700 mg/kg) which exceeded the background UTL of 10,540 mg/kg. These concentrations also exceeded the range of detected Base-wide background concentrations. However, these concentrations are significantly less than the regional aluminum value of 50,000 mg/kg. Therefore, aluminum was considered to be within background levels and was not evaluated further.

One of forty soil/sediment samples contained barium at a concentration (1,300 mg/kg) which exceeded the background UTL of 642 mg/kg. This concentration also exceeded the regional literature value for barium (500 mg/kg). However, the concentration only slightly exceeded the range of detected Base-wide background concentrations, and the frequency of exceedance was very low (2.5 percent). In addition, all the other detected concentrations for barium were well below the background UTL and the regional literature values. Finally, since barium has been shown to substitute for calcium (Klein and Hurlbutt 1985), it is believed that the barium is a naturally occurring constituent of the caliche. Therefore, barium was considered to be within background levels and was not retained for further evaluation.

Seven of forty soil/sediment samples contained beryllium at concentrations (ranging from 0.8 to 1.6 mg/kg) which exceeded the background UTL of 0.73 mg/kg. These concentrations also exceeded the range of detected Base-wide background concentrations. However, these concentrations are within the regional beryllium literature range of 1 to 2 mg/kg. Therefore, beryllium was considered to be within background levels and was not retained for further evaluation.

A background UTL for copper could not be calculated due to a large number of nondetects in the background data set; therefore, copper was compared to the Base-wide background range and literature values. The maximum detected concentration of copper (18.9 mg/kg) only slightly exceeded the maximum detected concentration of the background range (18.4 mg/kg). In addition, the maximum detected SWMU concentration was below the regional literature value for copper (20 mg/kg). Therefore, copper was considered to be within background levels and was not retained for further evaluation.

Three of forty soil/sediment samples contained vanadium at concentrations (26.2 mg/kg to 32.1 mg/kg) which exceeded the background UTL of 25.3 mg/kg. The maximum detected

concentration (32.1 mg/kg) was the only concentration which exceeded the range of detected Base-wide background. In addition, the maximum detected concentration did not exceed the regional literature value range (30-70 mg/kg). Therefore, vanadium was considered to be within background levels and was not retained for further evaluation.

11.7 RISK EVALUATION

11.7.1 Site Conceptual Exposure Model

Figure 11-4 shows the site conceptual exposure model (SCEM) of chemical sources and potential human exposure pathways associated with water and sediment in the wastewater Playa Lake. In the SCEM, potentially complete exposure pathways are indicated with solid lines; incomplete or insignificant pathways are indicated with broken lines.

The primary potential contaminant sources are wastewater (historic) and treated wastewater effluent (current) that have been discharged into the lake. Mixing with sediments and surface water is the primary chemical release mechanism. Once released to the lake water and sediment, the chemicals may then be released to groundwater by infiltration, or chemicals could be released directly to receptors via contact with the surface water and sediments.

As shown in Figure 11-4, sediments could provide exposures to Base workers (occupational exposures), hypothetical construction workers, farmers involved in pumping irrigation water from the lake, or hypothetical future trespassers (if the Base is closed in the future) via soil/sediment ingestion and dermal contact. Surface water may provide exposures to Base workers, construction worker, farmers, and trespassers via dermal contact or ingestion. Phase I surface water concentrations met drinking water standards for the detected analytes; therefore, it is not considered a significant exposure medium of concern and was not part of the Phase II investigation. Inhalation is considered an insignificant pathway for this site because volatile chemicals are not likely to be present in the wastewater discharge and because the water covering the sediments limits particulate emissions.

Groundwater is used for domestic purposes both on and off the Base. Chemicals may be released from the Playa Lake into the soil column beneath the lake, where they could potentially be transported to groundwater. However, groundwater is probably an insignificant

pathway because very little organic contamination was found in the soils beneath the lake, and metals are not very mobile in soils or groundwater.

In summary, the potentially complete human exposure pathways at SWMU 103 are:

Occupational Worker

- Ingestion of and dermal contact with sediment

Hypothetical Construction Workers

- Ingestion of and dermal contact with sediment

Hypothetical Trespassers

- Ingestion of and dermal contact with sediment

Farm Workers

- Ingestion of and dermal contact with sediment

11.7.2 Comparison of Phase II Concentrations to Phase I Concentrations and RBCs

The objective of the Phase II risk evaluation was to verify whether or not the Phase I Baseline Risk Assessment (W-C 1994) conclusion that no unacceptable human health risk were anticipated from exposure to the lake sediments is valid and to further evaluate the groundwater pathway (i.e., the potential for contaminant transport to groundwater). To meet these objectives, maximum detected Phase II concentrations were compared to maximum detected Phase I concentrations. This comparison was made to evaluate whether the extent of contamination and potential risk from sediments had been adequately defined in Phase I and to assess whether the conclusion that no unacceptable health risks were expected from exposures to the sediments was valid.

Phase II concentrations that exceeded Phase I concentrations were compared to highly conservative EPA Region III risk-based concentrations (RBCs) for residential soil (EPA 1994). This comparison was made to evaluate if chemicals detected in Phase II were at concentrations that could pose a significant human health risk (i.e.,if the potential risk at the SWMU is higher than predicted in Phase I).

EPA Region III RBCs were used for the comparison because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. Note that the RBCs are based on conservative residential exposure assumptions that significantly overestimate exposures that are likely to occur at this SWMU. Therefore, risks predicted from the RBC comparison significantly overestimate actual risks at the SWMU. A discussion of the methodology used to derive the RBCs is given in Section 3.4 and Appendix D.

Table 11-4 shows the comparison of Phase II maximum concentrations with Phase I concentrations and with RBCs. As would be expected, the maximum concentrations of some chemicals detected during the Phase II investigation exceeded the maximum Phase I concentrations, while for others the Phase II concentrations were lower. Of the chemicals that exceeded Phase I concentrations, only Aroclor-1248, manganese, and beryllium were detected at concentrations which exceeded the residential soil RBCs. Aroclor-1248 and beryllium also exceed the industrial soil RBCs.

The estimated potential hazard based on residential exposures associated with the maximum concentration of manganese is 2.3. However, the potential hazard is overestimated because the maximum concentration was detected in the soils beneath the Playa Lake where residential exposures are not likely to occur. In addition, the maximum concentration of manganese detected in the surrounding soil was 175 mg/kg which is well below the residential soil RBC of 390 mg/kg. Therefore, no unacceptable human health effects are anticipated due to manganese.

The estimated potential risk based on residential exposures associated with the maximum concentration of beryllium is 1×10^{-5}. This is within the EPA's target risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) for exposures to chemicals released from a hazardous waste sites (EPA 1990a; 1990d; 1991d; 1992d). As stated earlier, the maximum concentration of beryllium also exceeded the industrial soil RBC resulting in an estimated risk

of 2 x 10^{-6} which is within the EPA's target risk range. However, the estimated potential risk is overestimated because the maximum concentration of beryllium was detected in the soil beneath the Playa Lake where exposure is limited. The maximum concentration of beryllium from the surrounding soil was (0.48 mg/kg) which also exceeds the residential soil RBC. The estimated potential risk from this concentration is 3 x 10^{-6} which is within the EPA's target risk range. Therefore, no unacceptable human health risks are anticipated from beryllium at this SWMU.

Aroclor-1248 was detected at a maximum concentration (750 μg/kg) which exceeded the residential and industrial soil RBCs. The potential estimated risks are 9 x 10^{-6} and 2 x 10^{-6}, respectively. Both of these risks are within the EPA's target risk range of 1 x 10^{-6} to 1 x 10^{-4} for exposures to chemicals released from hazardous waste sites (EPA 1990a, 1990d, 1991d, 1992d). Aroclor was detected only in Boring 1315 in the surface soil and at 5 feet (48 μg/kg). Since the area of contamination is small, exposures (residential or industrial) are limited and unlikely to occur. Therefore, no unacceptable human health risks are anticipated from Aroclor-1248 at this SWMU.

The potential cumulative risk at the SWMU was estimated by adding the incremental risk posed by Phase II concentrations to the risks calculated in the Phase I risk assessment. This is a very conservative approach that overestimates risk because it accounts for risk from the same chemical twice (i.e., in the Phase I risk assessment and in the Phase II risk evaluation). Chemicals for which the Phase II concentrations did not exceed Phase I concentrations were not included because higher concentrations were already evaluated in the Phase I risk assessment. Table 11-4a presents the incremental risk due to the Phase II concentrations, the Phase I risks, and the potential cumulative risks. Table 11-4a shows that the incremental effects of the Phase II concentrations do not significantly impact the results of the risk assessment. In addition, the potential cumulative cancer risk of 3 x 10^{-7} and the potential cumulative noncancer hazard of 0.2 are below or within EPA's target risk range.

TRPH is a complex mixture hundreds of branched, straight-chain, cyclic and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, naphthalene, pyrene, and toluene) were analyzed for individually in the soil samples collected at the SWMU.

In the Phase II investigation at SWMU 103, TRPH was detected at a maximum concentration of 734 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Potentially toxic constituents of the TRPH (e.g., toluene and PAHs) were detected at low concentrations (see Table 11-2) which were well below the RBCs for residential soil. Therefore, it is not likely that other TRPH constituents would contribute significantly to risks at the SWMU.

11.7.3 Evaluation of the Groundwater Pathway

Potential impacts to groundwater were not addressed in the Phase I investigation because the data needed to evaluate transport of chemicals leaching through the bottom of the Playa Lake were not available. In general, detected concentrations from Phase I did not exceed concentrations of concern (i.e., did not exceed residential soil RBCs). These concentrations would be further reduced by degradation, adsorption, and dilution during transport to and mixing with groundwater; therefore, contaminants in sediments at concentrations detected in Phase I were not likely to impact groundwater.

The vertical distribution of the soil contaminants detected during the Phase II investigation was used to evaluate whether chemical releases pose a threat to groundwater. Borings were originally planned to be drilled to a depth of 60 feet below the bottom of the lake. However, these borings could not be drilled because of technical difficulties. The deepest samples beneath the lake were collected from a depth of only 5 feet. Therefore, historical releases from the lake (i.e., that may have transported contaminants below the 5-foot-depth may not be completely defined. However, the results of the 5-foot samples can be used to help evaluate potential current and historical transport.

Metals, several pesticides, and a few VOCs were detected at a depth of 5 feet below the Playa Lake. However, of these only beryllium and manganese were detected at concentrations which exceeded RBCs. Metals are not very mobile in soils or groundwater; therefore, it is unlikely that these metals would be transported to groundwater (approximately 240 feet to 280 feet bgs) at concentrations of potential concern.

The pesticides and VOCs detected at a depth of 5 feet were below residential soil RBCs and are not likely to impact groundwater because their concentrations would be significantly decreased by soil adsorption during transport and by dilution with groundwater.

In addition, concentrations detected at 5 feet are generally lower than the concentrations detected at 0 feet indicating that infiltration and transport of chemicals from the Lake to groundwater is minimal. Therefore, it is unlikely that the groundwater beneath the Playa Lake would be impacted by chemical concentrations detected at SWMU 103.

Finally, the lack of contamination in the 5 foot sample (except for some common lab contaminants and manganese and beryllium which are likely at naturally occurring levels), is evidence that significant amounts of contamination have not been transported (either currently or historically) through these soils to groundwater.

11.7.4 Ecotoxicological Screening of Sediment

Approach and Methods

A brief toxicological screening was conducted of organochlorine concentrations in sediments of the Playa Lake at Cannon Air Force Base. The Playa Lake occupies approximately 13 acres, is 4 to 5 feet deep at its greatest depth, and provides open water and wetland habitat for a variety of ducks and wading birds. No threatened or endangered birds have been recorded at the lake. Fish are not thought to be present in the lake due to the poor water quality and anoxic conditions. Wading birds at the lake may be feeding on aquatic insects, invertebrates, and amphibians. A more detailed ecological description of the Playa Lake and wildlife in the area was provided in previous ecological risk assessments (W-C February 1994). Sediment concentrations were evaluated with respect to the hazard they pose for waterfowl populations at the lake. Mallards were selected as the surrogate receptor for the following toxicological screening.

Sediment concentrations for the following organochlorine pesticides (OCPs) were detected:

Dieldrin	2.4 μg/kg
Endrin	2.6 μg/kg

DDE	3.6 μg/kg
DDT	2.4 μg/kg
Chlordane	2.4 μg/kg

The dieldrin and endrin concentrations in Playa Lake are below EPA's draft freshwater sediment quality criteria (SQC) of 52 μg/kg and 20 μg/kg, respectively (criteria reported in EPA's January 1996 ECO-Update, Vol. 3., No. 2). The SQC is derived from the chronic ambient water quality criterion using an equilibrium partitioning approach and a total organic carbon content of 1 percent.

The DDT slightly exceeds the effects-range low (ERL) sediment benchmark of 1.6 μg/kg (EPA 1996, ECO-Update, Vol. 3, No. 2). The ERL is based on effects levels from a variety of studies on estuarine sediments and is considered a benchmark below which effects are very unlikely. Due to the manner in which ERL values were developed, slight exceedances of this benchmark do not necessarily mean adverse effects are occurring or are likely to occur to aquatic benthic organisms.

A screening toxicity assessment was conducted for waterfowl using a hazard quotient approach and mallards as the surrogate receptor. Benchmarks for each OCP were obtained from the following sources:

OCP	Literature value	Benchmark Dose (mg/kg-bw/d)	Reference
Dieldrin	Dietary NOAEL of 0.3 mg/kg for mallard duckling	0.08	Nebeker et al. 1992
Endrin	Chronic NOAEL for mallard	0.3	Opresko et al. 1994
DDE	Chronic LOAEL of 0.58 mg/kg-bw/d for mallard and 0.1 uncertainty factor	0.058	EPA 1993a
DDT	Chronic NOAEL for mallard	0.58	EPA 1993a
Chlordane	Chronic NOAEL for blackbird	2.14	Opresko et al. 1994

Input values (e.g., body weight, percent sediment ingestion) to calculate hazard quotients for sediment and food ingestion were obtained from EPA's (1993b) Wildlife Exposure Factors Handbook. The mallard's food intake rate was assumed to be 20 percent of the mallard's

body weight, which is in keeping with measured values for other aquatic-feeding birds (Newell et al. 1987). The sediment intake rate was set at 2 percent of the food intake rate (EPA 1993b).

A bioaccumulation factor of 50, from sediment to food, was estimated, although with considerable uncertainty. Bioaccumulation values from sediment to mallard plant food items are not readily found in the literature. Bioaccumulation of pesticides was investigated in two relatively small lakes in Amsterdam with different levels of contamination (Van der Oost et al. 1990). Ratios between contaminant concentrations in organisms (including fish) and sediments ranged from 0.1 to 41.7. Other literature values were found for bioaccumulation factors from soil to plants, insects, and invertebrates and bioconcentration factors from surface water to aquatic plant, insects and invertebrates. For dieldrin, literature bioaccumulation factors from soils range from 0.5 for terrestrial plants (ESE 1986) to 5 for earthworms (Korschgen 1970) and 10 for insects (Thorne et al. 1979). Bioconcentration factors for dieldrin in surface water range from 450 for aquatic plants to over 5,000 for aquatic insects (chironomids) (Rosenlund et al. 1986).

Results

Table 11-5 presents the results of the hazard quotient and hazard index (sum of hazard quotient) calculations for the mallard. A hazard index of 0.0004 was obtained based on the mallard's sediment ingestion pathway and a hazard index of 1.06 was obtained based on the mallard's food ingestion pathway. The hazard index of 1.06 from food ingestion was largely due to the DDE hazard quotient of 0.62 and the dieldrin quotient of 0.3. Hazard index values less than 1 are generally interpreted as the risk is negligible; values between 1 and 10 should be interpreted with caution, and values greater than 10 are interpreted as an indication of likely risk. It would appear that potential risk for the mallard, given the hazard index of 1.1, resides in the assumption that the mallard's regular diet is composed of food items from Playa Lake that have accumulated OCPs to a concentration substantially (50 times) greater than that in the sediment.

An additional risk calculation was performed based on the Dieldrin sediment concentration and a recently proposed screening level wildlife criterion (SLWC) of 0.1 μg/L for dieldrin, based on the mallard (Nebeker et al. 1992). Using the sediment concentration for dieldrin

of 2.4 μg/kg, an equilibrium approach, a K_{oc} value of 1.78E+05 (Hull and Suter 1994), and a value of 10 for total organic carbon (TOC) in sediment, results in a water concentration of 0.0013 μg/L, which is well below the SLWC.

$$\textit{Sediment Concentration}\left(\frac{\mu g\text{-}chemical}{kg\text{-}sediment}\right) \div \textit{TOC}\left(\frac{gOC}{kg\text{-}sediment}\right) = \textit{Sediment Criterion}\left(\frac{\mu g\text{-}chemical}{gOC \in sediment}\right)$$

$$\left[\textit{Sediment Criterion} \div \textit{Unit Conversion}\left(\frac{1\ kg\ -\ OC}{1{,}000\ OC \in sediment}\right)\right] \div K_{oc}\left(\frac{L}{kg}\right) =$$

$$\textit{Surface Water Concentration}\left(\frac{\mu g\text{-}chemical}{L\text{-}water}\right)$$

Using this same approach for DDT and a K_{oc} value of 2.40E+05 results in a surface water concentration of 0.001 μg/L. The freshwater chronic ambient water quality criterion (AWQC) for DDT is 0.001 μg/L. Given the conservative nature of the AWQC, chronic effects are not considered likely, based on this approach.

11.7.5 Conclusions

No unacceptable human health risks due to chemicals detected during Phase II are expected form this SWMU; therefore, the results of the Phase I Baseline Risk Assessment are supported, and no further action regarding lake sediments and the surrounding soils is necessary. The vertical distribution of soil contamination showed no evidence of potential impacts to groundwater; therefore, no further action is recommended regarding groundwater at this SWMU.

The hazard index for waterfowl from food and sediment ingestion based on the maximum concentrations detected in sediment is 1.1. As each of the pesticides was detected in only 1 of 10 samples (Phase I and Phase II), the hazard index would be well below 1.0, if a more reasonable maximum exposure (RME) scenario were used. Waterfowl are not expected to spend all their time feeding in the one location at Playa Lake where the one (maximum) value was detected, so risk to waterfowl populations at Playa Lake are considered negligible. Comparison of a water concentration for Dieldrin (0.0013 μg/L), derived through partitioning

from sediment (2.4 μg/kg) against a screening wildlife criterion of 0.1 μg/L also indicates a negligible potential risk for waterfowl for dieldrin. Although the DDT sediment concentration slightly exceeds the ERL sediment criterion for the protection of benthic organisms, adverse effects to aquatic populations in Playa Lake are considered unlikely as DDT was detected in only 1 of 10 sediment samples.

Additionally, the exposure scenario used to calculate the HI assumed that the Playa Lake accounted for 100 percent to the mallards' home range. A mallard's home range varies markedly based on the time of year and the sex of the bird. Females in spring lay have the smallest home range (94 acres to 593 acres; averages of 274 acres) (Dwyer 1979), while adult males have a much larger and variable home range (173 acres to 2,816 acres; average of 1,531 acres) (Kirby 1985). The Playa Lake is approximately 13 acres. If the average home range for a female in lay is 274 acres, the HI at the Playa Lake is likely overestimated by a factor of 2, and the actual potential for adverse effects closer to 0.011 than 1.1. Therefore, the potential for adverse health effects to waterfowl at the Playa Lake from the detected pesticides is likely minimal and would more likely pertain to an individual than to the Playa Lake population as a whole.

11.8 SUMMARY AND RECOMMENDATIONS

Ten sediment samples from five hand-augered borings in lake sediment to depths of 5 feet and thirty soil samples collected from five soil borings around the perimeter of the Playa Lake to a depth of 10 feet were collected and analyzed. The sediment and soil samples were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, and TRPH. Phase II results were compared to Phase I results, background levels, and RBCs if necessary to assess potential risks posed by chemicals at the SWMU.

Low concentrations of VOCs, SVOCs, and pesticides were detected in the lake sediments. The shallow soil borings surrounding the Playa Lake also contained relatively low concentrations of VOCs, SVOCs, pesticides, and one PCB (Aroclor-1248) mainly in the surface and shallow subsurface soil. Ten metals detected exceeded background ranges. Four of these metals and seventeen organic compounds exceeded the Phase I concentrations. Only one metal (manganese) exceeded residential RBCs, and only one organic compound (Aroclor-1248) exceeded residential and industrial RBCs. However, the estimated risk from

Aroclor-1248 was within EPA's target risk range of 10^{-6} to 10^{-4}. The estimated hazard quotient of manganese (2.3) exceeded the recommended hazard quotient of 1.0. However, the maximum concentration was detected under the Playa Lake where residential exposure is unlikely to occur.

Since no unacceptable health risks are expected from any of the chemicals detected at the SWMU, and the vertical distribution of contaminants does not indicate a potential threat to groundwater at the SWMU, it is recommended that no further investigation is necessary.

TABLE 11-1
SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
PLAYA LAKE (SWMU NO. 103)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters						Sample Containers	
					VOCs	SVOCs	Metals	TRPH	Herbicides	Pest/PCBs	4 oz. jars	16 oz. jars
Boring 10308	2 - 3	CAN103 -1308 -0003		Soil	X	X	X	X	X	X	2	2
	4 - 5	CAN103 -1308 -0005		Soil	X	X	X	X	X	X	2	2
Boring 10309	2 - 3	CAN103 -1309 -0003		Soil	X	X	X	X	X	X	2	2
	4 - 5	CAN103 -1309 -0005		Soil	X	X	X	X	X	X	2	2
	4 - 5	CAN103 -1309 -1301	MRD	Soil	X	X	X	X	X	X	2	2
Boring 10310	2 - 3	CAN103 -1310-0003		Soil	X	X	X	X	X	X	2	2
	2 - 3	CAN103 -1310-1361	FD	Soil	X	X	X	X	X	X	2	2
	4 - 5	CAN103 -1310 -0005		Soil	X	X	X	X	X	X	2	2
Boring 10311	2 - 3	CAN103 -1311 -0003		Soil	X	X	X	X	X	X	2	2
	4 - 5	CAN103 -1311 -0005		Soil	X	X	X	X	X	X	2	2
Boring 10312	2 - 3	CAN103 -1312 -0003		Soil	X	X	X	X	X	X	2	2
	2 - 3	CAN103 -1312 -6003	MS/MSD	Soil	X	X	X	X	X	X	2	2
	4 - 5	CAN103 -1312 -0005		Soil	X	X	X	X	X	X	2	2
Boring 10313	0 - 2	CAN103 -1313 -0005		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1313 -0005		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1313 -0005		Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1313 -0005		Soil	X	X	X	X	X	X	2	1
	18 - 20	CAN103 -1313 -0005		Soil	X	X	X	X	X	X	2	1

TABLE 11-1
SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
PLAYA LAKE (SWMU NO. 103)
CANNON AFB, NEW MEXICO

Sample Location	Target Interval (ft-bgs)	Sample Identification Number	QA/QC Type	Sample Matrix	Analytical Parameters						Sample Containers	
					VOCs	SVOCs	Metals	TRPH	Herbicides	Pest/PCBs	4 oz. jars	16 oz. jars
Boring 10314	0 - 2	CAN103 -1314 -0000		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1314 -0005		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1314 -0010		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1314 -1363	FD	Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1314 -0015		Soil	X	X	X	X	X	X	2	1
	18 - 20	CAN103 -1314 -0020		Soil	X	X	X	X	X	X	2	1
Boring 10315	0 - 2	CAN103 -1315 -0000		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1315 -0005		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1315 -0010		Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1315 -0015		Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1315 -1362	FD	Soil	X	X	X	X	X	X	2	1
	18 - 20	CAN103 -1315 -0020		Soil	X	X	X	X	X	X	2	1
Boring 10316	0 - 2	CAN103 -1316 -0000		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1316 -0005		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1316 -0010		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1316 -1364	FD	Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1316 -0015		Soil	X	X	X	X	X	X	2	1
	18 - 20	CAN103 -1316 -0020		Soil	X	X	X	X	X	X	2	1
Boring 10317	0 - 2	CAN103 -1317 -0000		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1317 -0005		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1317 -1303	MRD	Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1317 -0010		Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1317 -0015		Soil	X	X	X	X	X	X	2	1
	18 - 20	CAN103 -1317 -0020		Soil	X	X	X	X	X	X	2	1

TABLE 11-1
SUMMARY OF ANALYTICAL AND QA/QC SAMPLING
PLAYA LAKE (SWMU NO. 103)
CANNON AFB, NEW MEXICO

Sample	Target Interval	Sample Identification	QA/QC	Sample	Analytical Parameters						Sample Containers	
Location	(ft-bgs)	Number	Type	Matrix	VOCs	SVOCs	Metals	TRPH	Herbicides	Pest/PCBs	4 oz. jars	16 oz. jars
Boring 10318	0 - 2	CAN103 -1318 -0000		Soil	X	X	X	X	X	X	2	1
	3 - 5	CAN103 -1318 -0005		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1318 -0010		Soil	X	X	X	X	X	X	2	1
	8 - 10	CAN103 -1318 -1304	MRD	Soil	X	X	X	X	X	X	2	1
	13 - 15	CAN103 -1318 -0015		Soil	X	X	X	X	X	X	2	1
	18 - 20	CAN103 -1318 -0020		Soil	X	X	X	X	X	X	2	1

FD = Field Duplicate
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

See Figure 11-1 for locations of the borings.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003			CAN103-1038-005			CAN103-1039-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080008SA			0396080009SA			0396080001SA			0396080002SA			0396080003SA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/01/94			12/01/94			12/02/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	27	11		20	11		60	12		35	12		100	13		85	13		61	13	
2-Butanone (MEK)	<	11	U	<	11	U	<	12	U	<	12	U	21	13		16	13		<	13	U
Carbon disulfide	<	5.7	U	<	5.7	U	<	6	U	7.1	5.9		<	6.5	U	<	6.4	U	13	6.4	
Methylene chloride	3.4	5.7	J	2.3	5.7	J	2.6	6	J	1.9	5.9	J	<	6.5	U	<	6.4	U	<	6.4	U
Toluene	<	5.7	U	<	5.7	U	<	6	U	2.7	5.9	J	1.6	6.5	J	3.6	6.4	J	1.4	6.4	J
Semivolatile Organics (µg/kg)																					
Benzo(a)anthracene	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Benzo(a)pyrene	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Benzo(b)fluoranthene	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
bis(2-Ethylhexyl)phthalate	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Butyl benzyl phthalate	71	380	J	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Chrysene	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Di-n-octyl phthalate	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Fluoranthene	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Pyrene	<	380	U	<	380	U	<	400	U	<	390	U	<	430	U	<	420	U	<	420	U
Pesticides/PCB's (µg/kg)																					
Aroclor 1248	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U	<	42	U	<	42	U
4,4'-DDE	3.6	3.8	J	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U	<	4.2	U	<	4.2	U
4,4'-DDT	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	2.4	4.3	J	<	4.2	U	<	4.2	U
Dieldrin	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	2.4	4.3	J	<	4.2	U	<	4.2	U
Endrin	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	2.6	4.3	J	<	4.2	U	<	4.2	U
gamma-Chlordane	2.4	1.9		1.2	2	J	<	2.1	U	<	2	U	<	2.2	U	<	2.2	U	<	2.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003			CAN103-1038-005			CAN103-1039-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080008SA			0396080009SA			0396080001SA			0396080002SA			0396080003SA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/01/94			12/01/94			12/02/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Antimony	<	6.8	UJ	<	6.9	UJ	3.3	7.3	J	<	7.1	UJ	<	7.8	UJ	<	7.7	UJ	<	7.7	UJ
Arsenic	4.6	0.57		3	0.57		1.2	0.6		2	0.59		2.2	0.65		1.9	0.64		2	0.64	
Barium	94.4	1.1		110	1.1		111	1.2		132	1.2		183	1.3		176	1.3		184	1.3	
Beryllium	0.86	0.23		0.72	0.23		0.8	0.24		0.85	0.24		1.5	0.26		1.4	0.26		1.4	0.26	
Cadmium	<	0.57	U	0.66	0.57		<	0.6	U	<	0.59	U	<	0.65	U	<	0.64	U	<	0.64	U
Calcium	2100	22.8		2180	23		1290	24.2		1410	23.6		3740	25.9		3290	25.6		3300	25.6	
Chromium	11.3	1.1		12.1	1.1		13.4	1.2		12.5	1.2		20.5	1.3		20.1	1.3		21.4	1.3	
Cobalt	5.1	1.1		7.2	1.1		6.4	1.2		7.6	1.2		10.7	1.3		8.3	1.3		9.9	1.3	
Copper	8.3	2.3		9.6	2.3		9.2	2.4		9.9	2.4		17.5	2.6		15	2.6		16.5	2.6	
Iron	12500	11.4		12200	11.5		12400	12.1		11300	11.8		20800	12.9		17200	12.8		20200	12.8	
Lead	7.6	0.57	J	7.6	0.57	J	7.6	0.6	J	8.2	0.59	J	15.5	3.2	J	12.2	1.3	J	14	1.3	J
Magnesium	2100	22.8		2030	23		2760	24.2		2740	23.6		4730	25.9		3920	25.6		4400	25.6	
Manganese	392	1.1		501	1.1		124	1.2		198	1.2		541	1.3		452	1.3		554	1.3	
Mercury	<	0.11	U	<	0.11	U	<	0.12	U	<	0.12	U	<	0.13	U	<	0.13	U	<	0.13	U
Nickel	9.6	4.6		10.6	4.6		10.1	4.8		11.3	4.7		16.4	5.2		15.2	5.1		15.2	5.1	
Potassium	2370	569		2280	574		2920	605		2460	591		4540	647		3960	640		4580	640	
Selenium	0.13	0.57	J	<	0.57	UJ	0.15	0.6	J	0.13	0.59	J	<	1.3	UJ	0.17	1.3	J	0.18	0.64	J
Silver	<	1.1	U	<	1.1	U	<	1.2	U	<	1.2	U	<	1.3	U	<	1.3	U	<	1.3	U
Sodium	99.1	569	J	124	574	J	392	605	J	345	591	J	572	647	J	560	640	J	614	640	J
Thallium	0.18	0.57	J	0.15	0.57	J	0.16	0.6	J	0.21	0.59	J	0.34	0.65	J	0.31	0.64	J	0.26	0.64	J
Vanadium	24.5	1.1		21.8	1.1		18.7	1.2		19.8	1.2		27.3	1.3		24.6	1.3		26.2	1.3	
Zinc	27.2	2.3		29	2.3		28.9	2.4		27.1	2.4		56.2	2.6		47.1	2.6		56.1	2.6	
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	45.5	U	<	45.9	U	<	48.4	U	<	47.2	U	<	51.8	U	<	51.2	U	<	51.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005			CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015		
LAB SAMPLE NUMBER	0396080004SA			0396550001SA			0396550002SA			0397970007SA			0397970008SA			0397970009SA			0397970010SA		
COLLECT DATE	12/02/94			12/04/94			12/04/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	76	13		34	12		81	12		<	10	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	14	13		<	12	U	12	12		<	10	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	6.4	U	<	6	U	<	5.9	U	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U
Methylene chloride	<	6.4	U	<	6	U	<	5.9	U	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U
Toluene	2.7	6.4	J	<	6	U	<	5.9	U	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U
Semivolatile Organics (µg/kg)																					
Benzo(a)anthracene	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Benzo(a)pyrene	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Benzo(b)fluoranthene	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
bis(2-Ethylhexyl)phthalate	<	420	U	<	400	U	<	390	U	<	570	U	<	600	U	<	600	U	<	430	U
Butyl benzyl phthalate	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Chrysene	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Di-n-octyl phthalate	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Fluoranthene	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Pyrene	<	420	U	<	400	U	<	390	U	<	340	U	<	370	U	<	360	U	<	370	U
Pesticides/PCB's (µg/kg)																					
Aroclor 1248	<	42	U	<	40	U	<	39	U	<	34	U	<	37	U	<	36	U	<	37	U
4,4'-DDE	<	4.2	U	<	4	U	<	3.9	U	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U
4,4'-DDT	<	4.2	U	<	4	U	<	3.9	U	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U
Dieldrin	<	4.2	U	<	4	U	<	3.9	U	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U
Endrin	<	4.2	U	<	4	U	<	3.9	U	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U
gamma-Chlordane	1.1	2.2	J	<	2	U	<	2	U	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005			CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015		
LAB SAMPLE NUMBER	0396080004SA			0396550001SA			0396550002SA			0397970007SA			0397970008SA			0397970009SA			0397970010SA		
COLLECT DATE	12/02/94			12/04/94			12/04/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Antimony	<	7.6	UJ	<	14.4	UJ	<	14.1	UJ	<	12.2	UJ	<	33.5	UJ	<	13.2	U	<	6.8	U
Arsenic	1.9	0.64		0.92	0.6		0.84	0.59		1.2	0.51		2.5	0.56		2	0.55		1.5	0.56	
Barium	250	1.3		278	2.4	J	78.8	2.3	J	145	2	J	1300	5.6	J	377	2.2		179	1.1	
Beryllium	1.6	0.25		0.45	0.48	J	0.32	0.47	J	0.26	0.41	J	<	1.1	U	<	0.44	U	0.25	0.23	
Cadmium	0.72	0.64		<	1.2	U	<	1.2	U	<	1	U	<	2.8	U	<	1.1	U	<	0.56	U
Calcium	4780	25.4		143000	48		173000	46.9		162000	40.6		329000	112		191000	43.8		91700	22.6	
Chromium	22.7	1.3		6.4	2.4		4	2.3		2.4	2	J	<	5.6	UJ	5.3	2.2		3.6	1.1	
Cobalt	11.3	1.3		<	2.4	U	<	2.3	U	<	2	U	<	5.6	U	1.7	2.2	J	2.2	1.1	
Copper	18.9	2.5		3.9	4.8	J	2.9	4.7	J	2.6	4.1	J	<	11.2	U	2.5	4.4	J	2.6	2.3	
Iron	21700	12.7		6340	24		4380	23.4		3780	20.3		1530	55.9		3620	21.9		2730	11.3	
Lead	19.6	3.2	J	3.7	0.6	J	3.3	0.59	J	3.4	0.51		1.5	0.56		2.2	5.5	J	3.2	0.56	
Magnesium	4630	25.4		3860	48		3190	46.9		2360	40.6		4880	112		5950	43.8		5800	22.6	
Manganese	902	1.3		93.8	2.4		118	2.3		42.6	2	J	15	5.6	J	50.6	2.2		51.9	1.1	
Mercury	<	0.13	U	<	0.12	U	<	0.12	U	<	0.1	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	17	5.1		8.6	9.6	J	3.5	9.4	J	3.4	8.1	J	<	22.4	U	6.6	8.8	J	4.4	4.5	J
Potassium	4750	636		2130	1200		1500	1170		957	1020	J	<	2800	U	812	1100	J	837	565	
Selenium	0.18	1.3	J	<	2.4	UJ	<	1.2	U	<	1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	1.3	U	<	2.4	U	<	2.3	U	<	2	UJ	<	5.6	UJ	<	2.2	U	<	1.1	U
Sodium	576	636	J	<	1200	U	<	1170	U	<	1020	U	<	2800	U	<	1100	U	<	565	U
Thallium	0.27	0.64	J	<	1.2	UJ	<	1.2	UJ	<	1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	32.1	1.3		17	2.4	J	11	2.3	J	10.4	2		9	5.6		20.8	2.2		17.4	1.1	
Zinc	61.8	2.5		15.1	4.8		10.5	4.7		9.9	4.1	J	5.7	11.2	J	9	4.4		6.1	2.3	
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	50.9	U	<	48	U	<	46.9	U	<	40.6	U	<	44.7	U	<	43.8	U	<	45.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0020			CAN103-1314-0000			CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970011SA			0397970001SA			0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	<	11	U	2.2	10	J	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
2-Butanone (MEK)	<	11	U	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Carbon disulfide	<	5.4	U	<	5.2	U	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	6	U
Methylene chloride	<	5.4	U	<	5.2	U	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	6.8	U
Toluene	<	5.4	U	<	5.2	U	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	6	U
Semivolatile Organics (µg/kg)																					
Benzo(a)anthracene	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	53	390	J
Benzo(a)pyrene	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	61	390	J
Benzo(b)fluoranthene	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	95	390	J
bis(2-Ethylhexyl)phthalate	<	620	U	<	350	U	<	350	U	<	800	U	<	510	U	<	480	U	<	390	U
Butyl benzyl phthalate	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	<	390	U
Chrysene	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	67	390	J
Di-n-octyl phthalate	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	<	390	U
Fluoranthene	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	69	390	J
Pyrene	<	360	U	<	350	U	<	350	U	<	350	U	<	360	U	<	360	U	71	390	J
Pesticides/PCB's (µg/kg)																					
Aroclor 1248	<	36	U	<	35	U	<	35	U	<	35	U	<	36	U	<	36	U	750	390	
4,4'-DDE	<	3.6	U	<	3.5	U	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	39	U
4,4'-DDT	<	3.6	U	<	3.5	U	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	39	U
Dieldrin	<	3.6	U	<	3.5	U	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	39	U
Endrin	<	3.6	U	<	3.5	U	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	39	U
gamma-Chlordane	<	1.9	U	<	1.8	U	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	20	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0020			CAN103-1314-0000			CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970011SA			0397970001SA			0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Antimony	<	6.5	UJ	<	31.4	UJ	<	6.4	UJ	<	12.7	UJ	<	13	UJ	<	6.6	U	<	7.2	UJ
Arsenic	0.96	0.54		2.1	0.52		2.9	0.53		1.6	0.53		1.6	0.54		0.87	0.55		1.2	0.6	
Barium	86.2	1.1	J	249	5.2	J	90.7	1.1	J	240	2.1	J	309	2.2	J	146	1.1		87.5	1.2	
Beryllium	0.15	0.22	J	<	1	U	0.4	0.21		<	0.42	U	<	0.43	U	0.25	0.22		0.4	0.24	
Cadmium	<	0.54	U	<	2.6	U	<	0.53	U	<	1.1	U	<	1.1	U	<	0.55	U	<	0.6	U
Calcium	81100	21.8		260000	105		58700	21.2		193000	42.4		190000	43.3		99500	21.9		21700	23.8	J
Chromium	2.6	1.1	J	<	5.2	UJ	8.4	1.1	J	2.4	2.1	J	3.1	2.2	J	3.8	1.1		5.6	1.2	
Cobalt	1.4	1.1		2.7	5.2	J	3.4	1.1		1.7	2.1	J	1.6	2.2	J	1.6	1.1		2.7	1.2	
Copper	1.3	2.2	J	6.4	10.5	J	5.2	2.1		2.6	4.2	J	2.9	4.3	J	2.3	2.2		7.1	2.4	
Iron	1860	10.9		4430	52.4		7990	10.6		3640	21.2		3640	21.6		3750	11		6010	11.9	
Lead	2.2	0.54		2.5	0.52		5.2	0.53		2.9	0.53		2.7	0.54		3.6	0.55		6.9	0.6	J
Magnesium	3400	21.8		2850	105		2260	21.2		2880	42.4		4550	43.3		3840	21.9		1960	23.8	
Manganese	21.7	1.1	J	175	5.2	J	96.3	1.1	J	95.6	2.1	J	56.8	2.2	J	31.4	1.1		94.7	1.2	
Mercury	<	0.11	U	<	0.1	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U
Nickel	2.5	4.4	J	<	20.9	U	8.8	4.2	J	3.9	8.5	J	4.9	8.7	J	4.2	4.4	J	5.7	4.8	
Potassium	604	545		918	2620	J	1560	531		980	1060	J	1030	1080	J	1130	548		2280	596	
Selenium	<	1.1	UJ	<	1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.2	UJ
Silver	<	1.1	UJ	<	5.2	UJ	<	1.1	UJ	<	2.1	UJ	<	2.2	UJ	<	1.1	U	<	1.2	U
Sodium	<	545	U	<	2620	U	<	531	U	<	1060	U	<	1080	U	<	548	U	<	596	U
Thallium	<	1.1	UJ	<	2.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	0.14	0.6	J
Vanadium	6.7	1.1		14.9	5.2		15.1	1.1		7.7	2.1		7.8	2.2		6.6	1.1		12.4	1.2	
Zinc	3.8	2.2	J	9.1	10.5	J	16.9	2.1	J	8.5	4.2	J	8.8	4.3	J	7.3	2.2		18.7	2.4	
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	43.6	U	<	41.9	U	<	42.5	U	<	42.4	U	<	43.3	U	<	43.9	U	734	47.7	J

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1316-0000			CAN103-1316-0005			CAN103-1316-0010		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0398000013SA			0398000014SA			0397970012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	<	11	U	<	11	U	<		U	<		U	<	11	U	<	10	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U	<	11	U
Carbon disulfide	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.2	U	<	5.4	U
Methylene chloride	<	5.3	U	<	5.5	U	<		U	<		U	2	5.5	J	2	5.2	J	<	5.4	U
Toluene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.2	U	<	5.4	U
Semivolatile Organics (µg/kg)																					
Benzo(a)anthracene	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
Benzo(a)pyrene	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
Benzo(b)fluoranthene	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
bis(2-Ethylhexyl)phthalate	<	350	U	<	370	U	<	370	U	5800	370		<	360	U	<	340	U	<	620	U
Butyl benzyl phthalate	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
Chrysene	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
Di-n-octyl phthalate	<	350	U	<	370	U	<	370	U	430	370		<	360	U	<	340	U	<	350	U
Fluoranthene	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
Pyrene	<	350	U	<	370	U	<	370	U	<	370	U	<	360	U	<	340	U	<	350	U
Pesticides/PCB's (µg/kg)																					
Aroclor 1248	48	35		<	37	U	<	37	U	<	37	U							<	35	U
4,4'-DDE	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U							<	3.5	U
4,4'-DDT	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U							<	3.5	U
Dieldrin	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U							<	3.5	U
Endrin	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U							<	3.5	U
gamma-Chlordane	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U							<	1.8	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1316-0000			CAN103-1316-0005			CAN103-1316-0010		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0398000013SA			0398000014SA			0397970012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Antimony	<	6.4	UJ	<	33.3	UJ	<	33.6	U	<	6.7	UJ	<	13.3	UJ	<	6.2	UJ	<	6.4	UJ
Arsenic	1.4	0.53		1.6	0.55		1.6	0.56		0.65	0.56		1.5	0.55		0.76	0.52		1.1	0.54	
Barium	143	1.1		176	5.5		147	5.6		82.2	1.1		182	2.2	J	58.7	1	J	47	1.1	J
Beryllium	0.37	0.21		<	1.1	U	<	1.1	U	<	0.22	U	0.32	0.44	J	0.4	0.21		0.36	0.21	
Cadmium	<	0.53	U	<	2.8	U	<	2.8	U	<	0.56	U	<	1.1	U	<	0.52	U	<	0.54	U
Calcium	78600	21.4	J	305000	111	J	249000	112	J	96500	22.3	J	176000	44.2	J	1520	20.8	J	28900	21.5	
Chromium	9.4	1.1		<	5.5	U	<	5.6	U	2.3	1.1		1.4	2.2	J	9.1	1	J	3.9	1.1	J
Cobalt	2.4	1.1		<	5.5	U	<	5.6	U	0.87	1.1	J	1.5	2.2	J	2.3	1		3.4	1.1	
Copper	6.4	2.1		2.5	11.1	J	4.1	11.2	J	1.8	2.2	J	3.7	4.4	J	7.1	2.1		3.9	2.1	
Iron	5890	10.7		3180	55.5		3740	56		2370	11.2		3110	22.1	J	7110	10.4	J	4750	10.7	
Lead	5.3	1.1	J	1.7	1.1	J	1.5	0.56	J	1.6	0.56	J	3.6	1.1	J	7.2	0.52	J	5.9	0.54	
Magnesium	1900	21.4		5800	111		6650	112		2240	22.3		2860	44.2		1160	20.8		1940	21.5	
Manganese	139	1.1		110	5.5		107	5.6		54.8	1.1		83.8	2.2		31.2	1		77.1	1.1	J
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	0.14	0.1		<	0.11	U
Nickel	6.3	4.3		<	22.2	U	<	22.4	U	<	4.5	U	5.5	8.8	J	4.9	4.2		6.1	4.3	J
Potassium	1230	534		385	2770	J	431	2800	J	684	559		1430	1100		1410	521		1060	537	
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	0.52	UJ	<	1.1	U
Silver	<	1.1	U	<	5.5	U	<	5.6	U	<	1.1	U	<	2.2	U	1.9	1		<	1.1	UJ
Sodium	213	534	J	<	2770	U	<	2800	U	<	559	U	<	1100	U	<	521	U	<	537	U
Thallium	<	1.1	UJ	<	2.2	U	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	0.52	UJ	<	1.1	U
Vanadium	13.4	1.1		16.9	5.5		18.2	5.6		5.5	1.1		10	2.2	J	15.5	1	J	16.6	1.1	
Zinc	14.2	2.1		4.9	11.1	J	3.3	11.2	J	4.4	2.2		9	4.4	J	31.3	2.1	J	8.3	2.1	J
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<		R	<		R	<	44.8	U	<		R	<	44.2	U	<	41.7	U	58.5	43	

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0015			CAN103-1316-0020			CAN103-1317-0000			CAN103-1317-0005			CAN103-1317-0010			CAN103-1317-0015			CAN103-1317-0020		
LAB SAMPLE NUMBER	0397970013SA			0397970014SA			0397900001SA			0397900002SA			0397900003SA			0397900004SA			0397900005SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	<	11	U	8	11	J	<	11	U	5.8	11	UJ	7.2	11	UJ	5.7	11	J	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	5.7	U	<	5.6	U	<	5.4	U	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U
Methylene chloride	<	5.7	U	<	5.6	U	2.4	5.4	UJ	2.4	5.3	UJ	3	5.6	UJ	2.4	5.6	J	2	5.5	UJ
Toluene	<	5.7	U	<	5.6	U	<	5.4	U	2	5.3	J	<	5.6	U	<	5.6	U	<	5.5	U
Semivolatile Organics (µg/kg)																					
Benzo(a)anthracene	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Benzo(a)pyrene	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Benzo(b)fluoranthene	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
bis(2-Ethylhexyl)phthalate	<	970	U	<	490	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Butyl benzyl phthalate	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Chrysene	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Di-n-octyl phthalate	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Fluoranthene	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Pyrene	<	380	U	<	370	U	<	360	U	<	350	U	<	370	U	<	370	U	<	370	U
Pesticides/PCB's (µg/kg)																					
Aroclor 1248	<	38	U	<	37	U	<	36	U	<	350	U	<	37	U	<	37	U	<	37	U
4,4'-DDE	<	3.8	U	<	3.7	U	<	3.6	U	200	35		<	3.7	U	<	3.7	U	<	3.7	U
4,4'-DDT	<	3.8	U	<	3.7	U	<	3.6	U	240	35		<	3.7	U	<	3.7	U	<	3.7	U
Dieldrin	<	3.8	U	<	3.7	U	<	3.6	U	<	35	U	<	3.7	U	<	3.7	U	<	3.7	U
Endrin	<	3.8	U	<	3.7	U	<	3.6	U	<	35	U	<	3.7	U	<	3.7	U	<	3.7	U
gamma-Chlordane	<	1.9	U	<	1.9	U	<	1.8	U	<	18	U	<	1.9	U	<	1.9	U	<	1.9	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.

J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0015			CAN103-1316-0020			CAN103-1317-0000			CAN103-1317-0005			CAN103-1317-0010			CAN103-1317-0015			CAN103-1317-0020		
LAB SAMPLE NUMBER	0397970013SA			0397970014SA			0397900001SA			0397900002SA			0397900003SA			0397900004SA			0397900005SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Antimony	<	13.7	UJ	<	6.7	UJ	4.9	6.5	J	<	6.4	UJ	<	13.5	UJ	<	13.5	UJ	<	6.6	UJ
Arsenic	1.5	0.57		0.78	0.56		2.2	0.54		1.7	0.53		1.8	0.56		1	0.56		1.2	0.55	
Barium	313	2.3	J	92.4	1.1	J	105	1.1		144	1.1		333	2.2		67.5	2.2		223	1.1	
Beryllium	<	0.46	U	0.3	0.22		0.43	0.22		0.36	0.21		<	0.45	U	<	0.45	U	0.4	0.22	
Cadmium	<	1.1	U	<	0.56	U	<	0.54	U	<	0.53	U	<	1.1	U	<	1.1	U	<	0.55	U
Calcium	144000	45.7		29300	22.3		73600	21.7		77700	21.3		197000	44.9		140000	44.9		11800	22.1	
Chromium	2.9	2.3	J	3.5	1.1	J	5.4	1.1		6.3	1.1		3.9	2.2		2.2	2.2		5.5	1.1	
Cobalt	2.2	2.3	J	2.6	1.1		2.6	1.1		2.9	1.1		3.2	2.2		1.7	2.2	J	2.3	1.1	
Copper	4.5	4.6	J	2.9	2.2		6.6	2.2		8.6	2.1		2.6	4.5	J	1.4	4.5	J	3	2.2	
Iron	4680	22.8		3710	11.2		5670	10.8		5310	10.6		2460	22.4		2920	22.4		5140	11.1	
Lead	6.2	1.1		4	2.8		6	0.54		6.2	1.1		1.7	1.1		2.4	1.1		4.3	0.55	
Magnesium	3140	45.7		2110	22.3		1950	21.7		1980	21.3		9160	44.9		7140	44.9		5120	22.1	
Manganese	74.9	2.3	J	41.2	1.1	J	127	1.1	J	77.3	1.1	J	24.9	2.2	J	30.1	2.2	J	34.6	1.1	J
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	0.14	0.11		<	0.11	U	<	0.11	U	<	0.11	U
Nickel	3.3	9.1	J	4.7	4.5	J	6.9	4.3		6.7	4.3		9.2	9		5.2	9	J	5.5	4.4	
Potassium	1380	1140		1250	558		2140	542		1280	532		723	1120	J	696	1120	J	2100	553	
Selenium	<	2.3	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	2.3	UJ	<	1.1	UJ	<	1.1	U	4.6	1.1		<	2.2	U	<	2.2	U	<	1.1	U
Sodium	<	1140	U	<	558	U	<	542	U	354	532	J	<	1120	U	<	1120	U	310	553	J
Thallium	<	1.1	UJ	<	0.56	UJ	<	1.1	UJ	<	1.1	UJ	<	2.2	U	<	1.1	UJ	<	0.55	U
Vanadium	13.8	2.3		9.5	1.1		15.6	1.1		16.4	1.1		18.4	2.2		18.7	2.2		14.3	1.1	
Zinc	8.2	4.6	J	8.3	2.2	J	15.7	2.2		43.3	2.1		6.2	4.5		6.3	4.5		9.3	2.2	
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydrocarbons	<	45.7	U	<	44.6	U	<	43.4	U	64.4	42.5		<	44.9	U	<	44.9	U	<	44.2	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
A complete summary of chemical results are presented in Table A-5.
J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1318-0000			CAN103-1318-0005			CAN103-1318-0010			CAN103-1318-0015			CAN103-1318-0020		
LAB SAMPLE NUMBER	0397900006SA			0397900019SA			0397900007SA			0397900008SA			0397900009SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	2.6	11	UJ	<	11	U	3.8	11	J	22	11		18	11	
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	5.5	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.5	U
Methylene chloride	2.1	5.5	UJ	<	5.7	U	5.5	5.6	J	4.1	5.7	UJ	4.2	5.5	UJ
Toluene	1.1	5.5	J	<	5.7	U	<	5.6	U	<	5.7	U	1.9	5.5	J
Semivolatile Organics (µg/kg)															
Benzo(a)anthracene	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Benzo(a)pyrene	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Benzo(b)fluoranthene	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
bis(2-Ethylhexyl)phthalate	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Butyl benzyl phthalate	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Chrysene	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Di-n-octyl phthalate	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Fluoranthene	44	360	J	<	370	U	<	370	U	<	380	U	<	370	U
Pyrene	<	360	U	<	370	U	<	370	U	<	380	U	<	370	U
Pesticides/PCB's (µg/kg)															
Aroclor 1248	<	36	U	<	37	U	<	37	U	<	38	U	<	37	U
4,4'-DDE	2.4	3.6	J	<	3.7	U	<	3.7	U	<	3.8	U	<	3.7	U
4,4'-DDT	3.7	3.6		<	3.7	U	<	3.7	U	<	3.8	U	<	3.7	U
Dieldrin	<	3.6	U	<	3.7	U	<	3.7	U	<	3.8	U	<	3.7	U
Endrin	<	3.6	U	<	3.7	U	<	3.7	U	<	3.8	U	<	3.7	U
gamma-Chlordane	<	1.9	U	<	1.9	U	<	1.9	U	<	2	U	<	1.9	U

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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1318-0000			CAN103-1318-0005			CAN103-1318-0010			CAN103-1318-0015			CAN103-1318-0020		
LAB SAMPLE NUMBER	0397900006SA			0397900019SA			0397900007SA			0397900008SA			0397900009SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)															
Antimony	<	6.6	UJ	<	13.6	U	<	6.7	UJ	<	13.8	UJ	<	13.3	UJ
Arsenic	1.9	0.55		0.95	0.57		1.5	0.56		1.1	0.57		1.1	0.55	
Barium	124	1.1		133	2.3		89.6	1.1		88.8	2.3		66.5	2.2	
Beryllium	0.48	0.22		<	0.45	U	0.44	0.22		<	0.46	U	<	0.44	U
Cadmium	<	0.55	U	<	1.1	U	<	0.56	U	<	1.1	U	<	1.1	U
Calcium	22300	22.1		147000	45.2		50000	22.4		172000	45.9		127000	44.3	
Chromium	6.8	1.1		3.8	2.3		5.7	1.1		1.6	2.3	J	1.8	2.2	J
Cobalt	2.9	1.1		2.4	2.3		3.7	1.1		3	2.3		2	2.2	J
Copper	7.2	2.2		5.1	4.5		6.6	2.2		2.2	4.6	J	1.9	4.4	J
Iron	6900	11		4450	22.6		5730	11.2		2690	23		2220	22.2	
Lead	9.8	1.1		3.8	0.57		5.3	0.56		2.1	0.57		1.7	1.1	
Magnesium	1700	22.1		2840	45.2		2650	22.4		5230	45.9		2310	44.3	
Manganese	142	1.1	J	70.5	2.3		336	1.1	J	25.8	2.3	J	28.2	2.2	J
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	6.5	4.4		4.3	9	J	7.7	4.5		8	9.2	J	5	8.9	J
Potassium	1750	552		1060	1130	J	1360	560		656	1150	J	678	1110	J
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	1.1	U	<	2.3	U	<	1.1	U	<	2.3	U	<	2.2	U
Sodium	<	552	U	<	1130	U	<	560	U	<	1150	U	<	1110	U
Thallium	<	0.55	U	0.12	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	15.6	1.1		10.2	2.3		10.8	1.1		9.8	2.3		5.2	2.2	
Zinc	20.6	2.2		11.9	4.5		14.5	2.2		5.8	4.6		4.8	4.4	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	132	44.2		<	45.2	U	<	44.8	U	<	45.9	U	<	44.3	U

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.
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J = Estimated value.
R = Rejected value. D = Sample was diluted for analysis.
U = Nondetected value. RL = Reporting Limit.

TABLE 11-3
COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SEDIMENT TO BACKGROUND (1)
SWMU 103, CANNON AFB, NM
Wastewater Playa Lake

Sample ID	Metal	Maximum detected concentration	Range of Background concentrations (2)	Upper tolerance limit (UTL) background concentration(3)	Reported Level in Clovis, NM Region (4)	Does maximum detected exceed background
CAN103-1039-005	Aluminum	24,700	1,410 - 11,000	10,540	50,000	NO**
CAN103-1317-0000	Antimony	4.9	<4.9 - <13	*	<1	YES
CAN103-10310-003	Arsenic	4.6	0.67 - 28	15.5	6.5	NO
CAN103-1313-005	Barium	1,300	14.5 - 1200	642	500	NO**
CAN103-1039-005	Beryllium	1.6	0.17 - 0.77	0.73	1-2	NO**
CAN103-1039-005	Cadmium	0.72	<0.51 - 4.2	*	----	YES
CAN103-1039-005	Chromium	22.7	4 - 15.4	12.5	30	YES
CAN103-1039-005	Cobalt	11.3	0.85 - 5.3	4.5	3-7	YES
CAN103-1039-005	Copper	18.9	<2 - 18.4	*	20	NO**
CAN103-1039-005	Lead	19.6	1.1 - 46	25.8	15	NO
CAN103-1039-005	Manganese	902	22.4 - 216	164	500	YES
CAN103-1317-0005	Mercury	0.14	<0.1 - <0.12	*	0.032-0085	YES
CAN103-1316-0005	Mercury					
CAN103-1039-005	Nickel	17	1.3 - 9.8	9	15	YES
CAN103-1039-003	Selenium	0.18	<0.21 - 124	*	0.15 - 0.3	NO
CAN103-1039-005	Selenium					
CAN103-1317-005	Silver	4.6	<0.87 - 0.93	*	----	YES
CAN103-1038-003	Thallium	0.34	0.14 - 0.22	*	----	YES
CAN103-1309-005	Vanadium	32.1	5.2 - 28.3	25.3	30-70	NO**
CAN103-1039-005	Zinc	61.8	<4.3 - 27.5	21.9	45	YES

(1) All units in mg/kg.
(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and WC-1993) and Walk, Haydel and Associates for the IRP (Walk, Haydel and Associates 1990).
Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, NM: (W-C 1994).
(3) Upper Tolerance Limit (UTL) = mean + 2 * standard deviation. See Appendix D. This is for all practical purposes the same as the 90% upper confidence limit of the 95th percentile where UTL = mean + standard deviation * k, where k=2.02 for n=37.
(4) USGS 1984.
*Data insufficient to calculate UTL of background concentration.
** Maximum concentration within or only slightly above Base-wide background range and within naturally occurring levels (USGS 1984); therefore, concentration is not considered to exceed background.

TABLE 11-4

COMPARISON OF PHASE II SEDIMENT/SOIL CONCENTRATIONS TO PHASE I SEDIMENT/SOIL CONCENTRATIONS AND RBCS SWMU 103, CANNON AFB

Wastewater Playa Lake

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II concentration greater than Phase I Concentration	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Estimated Risk(3)	Risk Type	Industrial Soil Risk-based Concentration(2) (mg/kg)	Exceeds RBC?	Estimated Risk(3)
Acetone	ND	0.1	YES	7,800	NO					
2-Butanone	0.068	0.021	NO	47,000	----					
Methylene Chloride	ND	0.0055	YES	85	NO					
Benzene	0.022	ND	NO	22	----					
Carbon Disulfide	0.023	0.013	NO	7800	----					
Chloromethane	0.004	ND	NO	49	----					
Toluene	ND	0.0036	YES	16,000	----					
Benzo(a)anthracene	ND	0.053	YES	0.88	NO					
Benzo(a)pyrene	ND	0.061	YES	0.088	NO					
Benzo(b)fluoranthene	ND	0.095	YES	0.88	NO					
Bis(2-ethylhexyl)phthalate	3.9	5.8	YES	46	NO					
Butylbenzylphthalate	0.32	0.071	NO	16,000	NO					
Chrysene	ND	0.067	YES	88	NO					
Di-n-butylphthalate	0.2	ND	NO	NA(a)	----					
Di-n-octylphthalate	ND	0.43	YES	1,600	----					
Fluoranthene	ND	0.069	YES	3,100	NO					
Pyrene	ND	0.071	YES	2,300	NO					
4,4'-DDD	0.22	ND	NO	2.7	----					
4,4'-DDE	ND	0.2	YES	1.9	NO					
4,4'-DDT	ND	0.24	YES	1.9	NO					
Aroclor-1248	ND	0.75	YES	0.083	YES	9×10^{-6}	Carcinogenic	0.37	Yes	2×10^{-6}
Dieldrin	ND	0.0024	YES	0.04	NO					
Endrin	ND	0.0026	YES	23	NO					
gamma-Chlordane	ND	0.0024	YES	0.49	NO					
TRPH	5890	734	NO	NA(a)	----					
Antimony	ND	4.9	YES	31	NO					
Cadmium	2.6	0.72	NO	39	----					
Chromium	35.5	22.7	NO	390	----					
Cobalt	5.9	11.3	YES	4700	NO					
Copper	102	18.9	NO	2900	----					
Lead*	39.3	19.6	NO	400	----					
Manganese	228	902	YES	390	YES	2.3	Noncarcinogenic	5100	NO	

TABLE 11-4

COMPARISON OF PHASE II SEDIMENT/SOIL CONCENTRATIONS TO PHASE I SEDIMENT/SOIL CONCENTRATIONS AND RBCS SWMU 103, CANNON AFB Wastewater Playa Lake

Chemical	Phase I Maximum Detected Concentration (mg/kg)	Phase II Maximum Detected Concentration (mg/kg)	Phase II concentration greater than Phase I Concentration	Residential Soil Risk-Based Concentration(1) (mg/kg)	Exceeds RBC?	Estimated Risk(3)	Risk Type	Industrial Soil Risk-based Concentration(2) (mg/kg)	Exceeds RBC?	Estimated Risk(3)
Mercury	0.51	0.14	NO	23	----					
Nickel	27.7	17	NO	1600	----					
Selenium	13.2	0.18	NO	390	----					
Silver	33.7	4.6	NO	390	----					
Thallium	ND	0.34	YES	6.3	----					
Vanadium	130	32.1	NO	550	----					
Zinc	275	61.8	NO	23000	----					

(1) EPA Region III Risk-Based Concentrations for residential soil (EPA 1994).
(2) EPA Region III Risk-Based Concentrations for industrial soil (EPA 1994).
(3) Estimated risk based on maximum Phase II concentrations that exceeded previously evaluated Phase I levels.
Estimated risk = 1×10^{-6} * concentrations/RBC for carcinogens; Estimated risk = concentration/RBC for noncarcinogens.
(a) Not Applicable: EPA has not established a toxicity factor for these chemicals, so RBCs could not be calculated.
* No RBC has been calculated for lead; however, EPA recommends an interim residential soil concentration of 400 mg/kg (EPA 1994).
ND = Not Detected

TABLE 11-4a

POTENTIAL CUMULATIVE RISK AT SWMU 103
CANNON AFB, NEW MEXICO

Chemical[1]	Carcinogen?	Phase II Concentration (mg/kg)	Residential RBC (mg/kg)	Industrial RBC (mg/kg)	Risk Residential[2]	Hazard Residential[3]	Risk Industrial[2]	Hazard Industrial[3]
Acetone	No	0.1	7,800	100,000		0.00001		0.0000010
Methylene chloride	Yes	0.0055	85	380	6.47E-11		1.45E-11	
Toluene	No	0.0036	16,000	200,000		0.0000002		0.000000018
Benzo(a)anthracene	Yes	0.053	0.88	3.9	6.02E-08		1.36E-08	
Benzo(a)pyrene	Yes	0.061	0.088	0.39	6.93E-07		1.56E-07	
Benzo(b)fluoranthene	Yes	0.095	0.88	3.9	1.08E-07		2.44E-08	
Bis(2-ethylhexyl) phthalate	Yes	5.8	46	200	1.26E-07		2.90E-08	
Chrysene	No	0.067	88	390		0.0008		0.00017
Di-n-octyl phthalate	No	0.43	1,600	20,000				
Fluoranthene	No	0.069	3,100	41000		0.00002		0.0000017
Pyrene	No	0.071	2,300	31,000		0.00003		0.000002
4,4-DDE	Yes	0.2	1.9	8.4	1.05E-07		2.38E-08	
4,4-DDT	Yes	0.24	1.9	8.4				
Aroclor-1248	Yes	0.75	0.083	0.37				
Dieldrin	Yes	0.0024	0.04	0.18				
Endrin	No	0.0026	23	310		0.0001		0.000008
Chlordane	Yes	0.0024	0.49	2.2				
Antimony	No	4.9	31	410		0.2		0.012
Cobalt	No	11.3	4,700	61,000		0.002		0.00019
Manganese	No	902	390	5,100		2		0.18
Thallium	No	0.34	6.3	92		0.05		0.004
Totals					1E-06	3	2E-07	0.2
Phase I Risk[4]					NA	NA	9E-08	0.020
Cumulative Risk[5]					NA	NA	3E-07	0.2

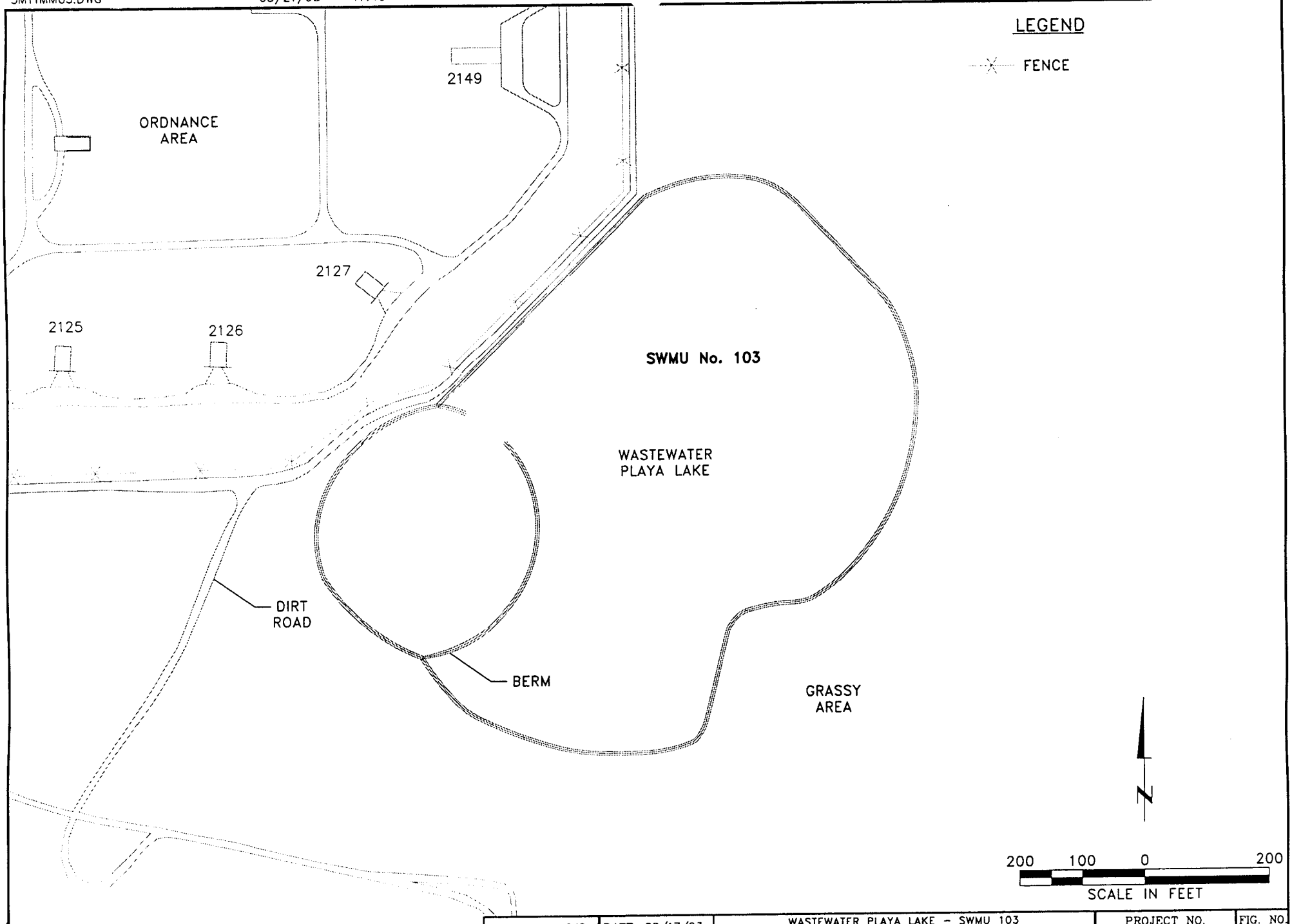
(1) Chemicals with maximum Phase II concentration exceeding Phase I concentrations
(2) Risk = 1E-06 x concentration/RBC
(3) Hazard = concentration/RBC
(4) Highest calculated risk and hazard for all receptors evaluated in risk assessment (W-C 1994d)
(5) Sum of Phase I risk and incremental risk from Phase II concentrations (i.e., that exceeded Phase I levels)
* No RBC is available for lead; 400 is residential level generally acceptable based on EPA lead uptake model.

TABLE 11-5

HAZARD INDEX CALCULATION FOR DUCKS FROM OCP INGESTION IN FOOD AND SEDIMENT

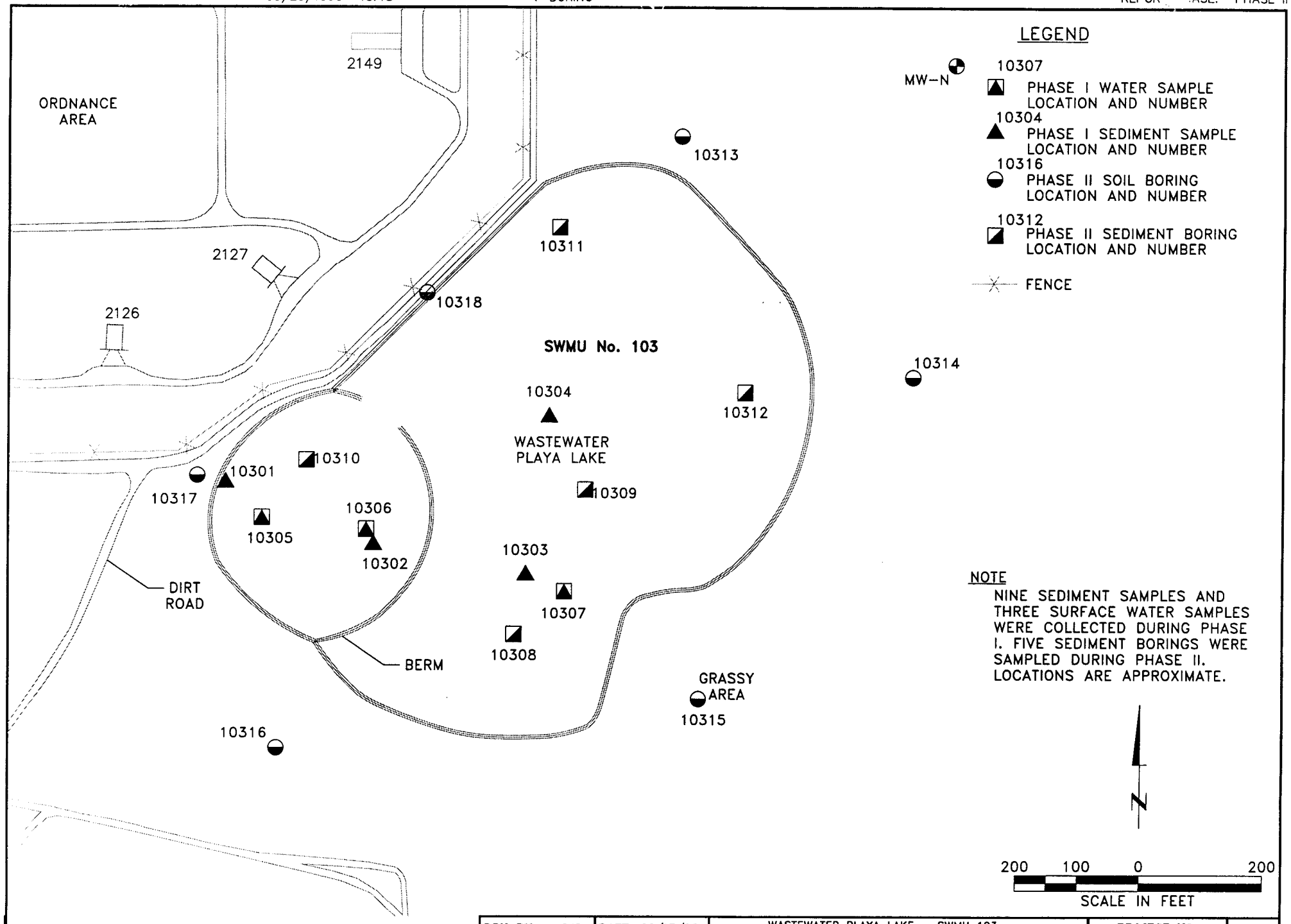
Food	Dieldrin	Endrin	DDE	DDT	Chlordane	
Food Intake Rate (kg/day)(20%*BW)	0.24	0.24	0.24	0.24	0.24	
Body Weight (kg)	1.2	1.2	1.2	1.2	1.2	
Sediment Concentration (mg/kg)	0.0024	0.0026	0.0036	0.0024	0.0024	
Bioaccumulation Factor (food/sediment)	50	50	50	50	50	
Food Concentration (mg/kg)	0.12	0.13	0.18	0.12	0.12	
Dose (mg/kg/d)	0.02	0.03	0.04	0.02	0.02	
Screening Value (mg/kg/d)	0.08	0.3	0.058	0.58	2.14	
Hazard Quotient	0.3	0.09	0.62	0.04	0.01	1.06

Sediment	Dieldrin	Endrin	DDE	DDT	Chlordane	
Food Intake Rate (kg/day)	0.24	0.24	0.24	0.24	0.24	
Body Weight (kg)	1.2	1.2	1.2	1.2	1.2	
% Sediment in Diet	0.02	0.02	0.02	0.02	0.02	
Matrix Effect	1	1	1	1	1	
Sediment Intake (kg/day)	0.0048	0.0048	0.0048	0.0048	0.0048	
Concentration (mg/kg)	0.0024	0.0026	0.0036	0.0024	0.0024	
Dose (mg/kg/d)	0.00001	0.00001	0.00001	0.00001	0.00001	
Screening Value (mg/kg/d)	0.08	0.3	0.058	0.58	2.14	
Hazard Quotient	0.0001	0.00003	0.0002	0.00002	0.000004	0.0004
Hazard Index	0.3	0.09	0.62	0.04	0.01	1.06



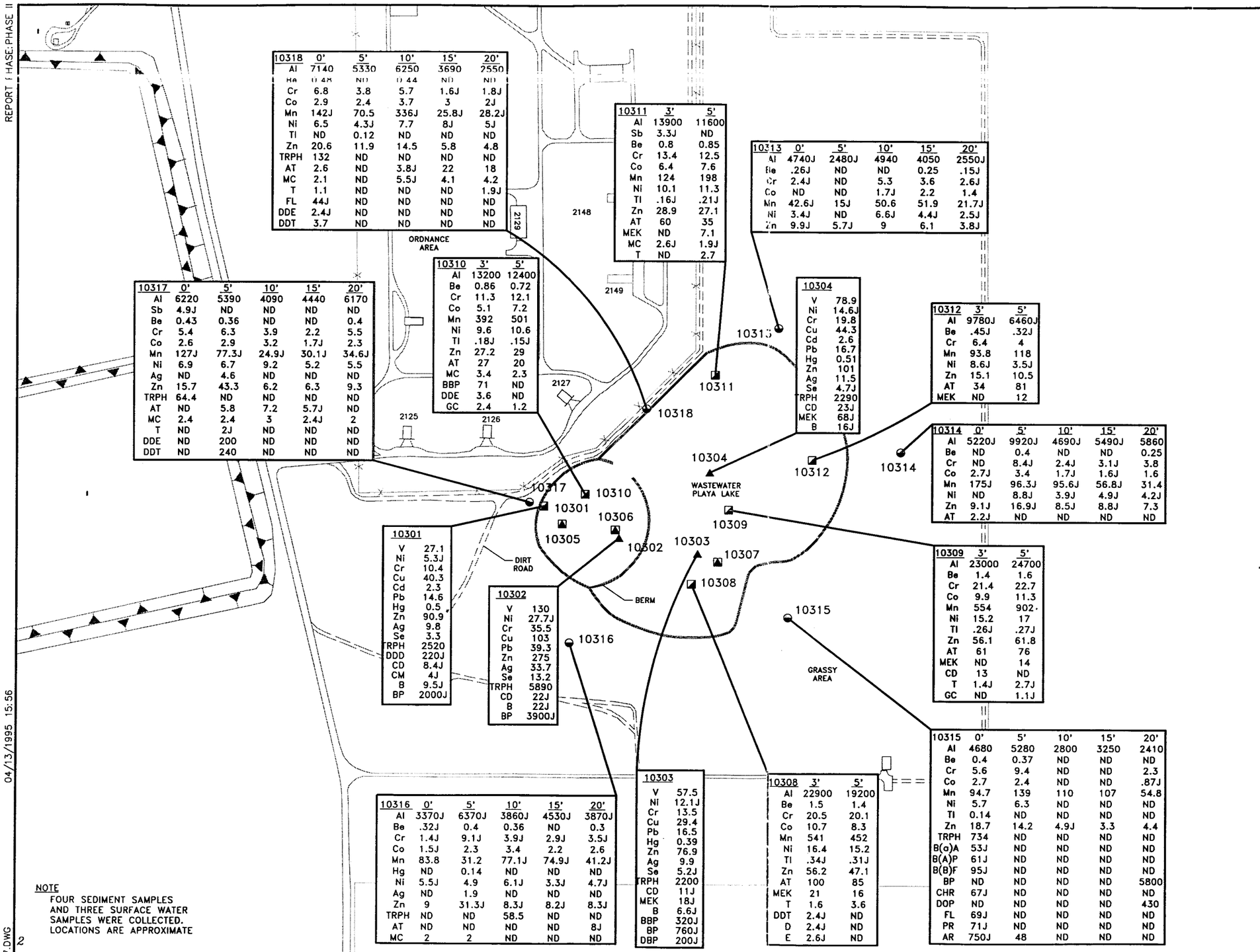
SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	WASTEWATER PLAYA LAKE - SWMU 103 SITE PLAN CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 11-1



SOURCE: CANNON AFB CAD FILES AND CANNON AFB RFI FIELD SAMPLING PLAN.

DRN BY: CJG	DATE: 08/17/93	WASTEWATER PLAYA LAKE – SWMU 103 SITE PLAN WITH BORING AND SAMPLING LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM
CHK'D BY: .	REVISION: 0		FIG. NO. 11-2



10318	0'	5'	10'	15'	20'
Al	7140	5330	6250	3690	2550
Be	0.48	ND	0.44	ND	ND
Cr	6.8	3.8	5.7	1.6J	1.8J
Co	2.9	2.4	3.7	3	2J
Mn	142J	70.5	336J	25.8J	28.2J
Ni	6.5	4.3J	7.7	8J	5J
Tl	ND	0.12	ND	ND	ND
Zn	20.6	11.9	14.5	5.8	4.8
TRPH	132	ND	ND	ND	ND
AT	2.6	ND	3.8J	22	18
MC	2.1	ND	5.5J	4.1	4.2
T	1.1	ND	ND	ND	1.9J
FL	44J	ND	ND	ND	ND
DDE	2.4J	ND	ND	ND	ND
DDT	3.7	ND	ND	ND	ND

10311	3'	5'
Al	13900	11600
Sb	3.3J	ND
Be	0.8	0.85
Cr	13.4	12.5
Co	6.4	7.6
Mn	124	198
Ni	10.1	11.3
Tl	.16J	.21J
Zn	28.9	27.1
AT	60	35
MEK	ND	7.1
MC	2.6J	1.9J
T	ND	2.7

10313	0'	5'	10'	15'	20'
Al	4740J	2480J	4940	4050	2550J
Be	.26J	ND	ND	0.25	.15J
Cr	2.4J	ND	5.3	3.6	2.6J
Co	ND	ND	1.7J	2.2	1.4
Mn	42.6J	15J	50.6	51.9	21.7J
Ni	3.4J	ND	6.6J	4.4J	2.5J
Zn	9.9J	5.7J	9	6.1	3.8J

10317	0'	5'	10'	15'	20'
Al	6220	5390	4090	4440	6170
Sb	4.9J	ND	ND	ND	ND
Be	0.43	0.36	ND	ND	0.4
Cr	5.4	6.3	3.9	2.2	5.5
Co	2.6	2.9	3.2	1.7J	2.3
Mn	127J	77.3J	24.9J	30.1J	34.6J
Ni	6.9	6.7	9.2	5.2	5.5
Ag	ND	4.6	ND	ND	ND
Zn	15.7	43.3	6.2	6.3	9.3
TRPH	64.4	ND	ND	ND	ND
AT	ND	5.8	7.2	5.7J	ND
MC	2.4	2.4	3	2.4J	2
T	ND	2J	ND	ND	ND
DDE	ND	200	ND	ND	ND
DDT	ND	240	ND	ND	ND

10310	3'	5'
Al	13200	12400
Be	0.86	0.72
Cr	11.3	12.1
Co	5.1	7.2
Mn	392	501
Ni	9.6	10.6
Tl	.18J	.15J
Zn	27.2	29
AT	27	20
MC	3.4	2.3
BBP	71	ND
DDE	3.6	ND
GC	2.4	1.2

10304	
V	78.9
Ni	14.6J
Cr	19.8
Cu	44.3
Cd	2.6
Pb	16.7
Hg	0.51
Zn	101
Ag	11.5
Se	4.7J
TRPH	2290
CD	23J
MEK	68J
B	16J

10312	3'	5'
Al	9780J	6460J
Be	.45J	.32J
Cr	6.4	4
Mn	93.8	118
Ni	8.6J	3.5J
Zn	15.1	10.5
AT	34	81
MEK	ND	12

10314	0'	5'	10'	15'	20'
Al	5220J	9920J	4690J	5490J	5860
Be	ND	0.4	ND	ND	0.25
Cr	ND	8.4J	2.4J	3.1J	3.8
Co	2.7J	3.4	1.7J	1.6J	1.6
Mn	175J	96.3J	95.6J	56.8J	31.4
Ni	ND	8.8J	3.9J	4.9J	4.2J
Zn	9.1J	16.9J	8.5J	8.8J	7.3
AT	2.2J	ND	ND	ND	ND

10301	
V	27.1
Ni	5.3J
Cr	10.4
Cu	40.3
Cd	2.3
Pb	14.6
Hg	0.5
Zn	90.9
Ag	9.8
Se	3.3
TRPH	2520
DDD	220J
CD	8.4J
CM	4J
B	9.5J
BP	2000J

10302	
V	130
Ni	27.7J
Cr	35.5
Cu	103
Pb	39.3
Zn	275
Ag	33.7
Se	13.2
TRPH	5890
CD	22J
B	22J
BP	3900J

10309	3'	5'
Al	23000	24700
Be	1.4	1.6
Cr	21.4	22.7
Co	9.9	11.3
Mn	554	902
Ni	15.2	17
Tl	.26J	.27J
Zn	56.1	61.8
AT	61	76
MEK	ND	14
CD	13	ND
T	1.4J	2.7J
GC	ND	1.1J

10315	0'	5'	10'	15'	20'
Al	4680	5280	2800	3250	2410
Be	0.4	0.37	ND	ND	ND
Cr	5.6	9.4	ND	ND	2.3
Co	2.7	2.4	ND	ND	.87J
Mn	94.7	139	110	107	54.8
Ni	5.7	6.3	ND	ND	ND
Tl	0.14	ND	ND	ND	ND
Zn	18.7	14.2	4.9J	3.3	4.4
TRPH	734	ND	ND	ND	ND
B(a)A	53J	ND	ND	ND	ND
B(A)P	61J	ND	ND	ND	ND
B(B)F	95J	ND	ND	ND	ND
BP	ND	ND	ND	ND	5800
CHR	67J	ND	ND	ND	ND
DOP	ND	ND	ND	ND	430
FL	69J	ND	ND	ND	ND
PR	71J	ND	ND	ND	ND
AR	750J	48	ND	ND	ND

10316	0'	5'	10'	15'	20'
Al	3370J	6370J	3860J	4530J	3870J
Be	.32J	0.4	0.36	ND	0.3
Cr	1.4J	9.1J	3.9J	2.9J	3.5J
Co	1.5J	2.3	3.4	2.2	2.6
Mn	83.8	31.2	77.1J	74.9J	41.2J
Hg	ND	0.14	ND	ND	ND
Ni	5.5J	4.9	6.1J	3.3J	4.7J
Ag	ND	1.9	ND	ND	ND
Zn	9	31.3J	8.3J	8.2J	8.3J
TRPH	ND	ND	58.5	ND	ND
AT	ND	ND	ND	ND	8J
MC	2	2	ND	ND	ND

10303	
V	57.5
Ni	12.1J
Cr	13.5
Cu	29.4
Pb	16.5
Hg	0.39
Zn	76.9
Ag	9.9
Se	5.2J
TRPH	2200
CD	11J
MEK	18J
B	6.6J
BBP	320J
BP	760J
DBP	200J

10308	3'	5'
Al	22900	19200
Be	1.5	1.4
Cr	20.5	20.1
Co	10.7	8.3
Mn	541	452
Ni	16.4	15.2
Tl	.34J	.31J
Zn	56.2	47.1
AT	100	85
MEK	21	16
T	1.6	3.6
DDT	2.4J	ND
D	2.4J	ND
E	2.6J	ND

LEGEND

10307 — PHASE I WATER SAMPLE LOCATION AND NUMBER

10304 — PHASE I SEDIMENT SAMPLE LOCATION AND NUMBER

10316 — PHASE II SOIL BORING LOCATION AND NUMBER

10312 — PHASE II SEDIMENT BORING LOCATION AND NUMBER

FENCE

Al = ALUMINUM (mg/kg)
AR = AROCLOR-1248
Be = BERYLLIUM (mg/kg)
Co = COBALT (mg/kg)
Mn = MANGANESE (mg/kg)
Tl = THALLIUM (mg/kg)
AT = ACETONE
GC = gamma-Chlordane
CD = CARBON DISULFIDE
MC = METHYLENE CHLORIDE
Ni = NICKEL (mg/kg)
Cr = CHROMIUM (mg/kg)
Cu = COPPER (mg/kg)
FL = FLUORANTHENE
PR = PYRENE
Cd = CADMIUM (mg/kg)
Pb = LEAD (mg/kg)
Hg = MERCURY (mg/kg)
Zn = ZINC (mg/kg)
Ag = SILVER (mg/kg)
Se = SELENIUM (mg/kg)
DDE = 4,4'-DDE
TRPH = TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (mg/kg)
DDD = 4,4'-DDD
CD = CHLORDANE
CM = CHLOROMETHANE
MEK = 2-BUTANONE
B = BENZENE
BBP = BENZYL BUTYL PHTHALATE
BP = BIS(2-ETHYLHEXYL)PHTHLATE
DBP = DI-N-BUTYLPHTHLATE
DDT = 4,4'-DDT
B(c)A = BENZO(A)ANTHRACENE
B(A)P = BENZO(A)PYRENE
B(B)F = BENZO(B)FLUORANTHENE
CHR = CHRYSENE
DOP = Di-N-OCTYLPHTHALATE
V = VANADIUM (mg/kg)
D = Dieldrin
E = Endrin
T = TOLUENE

CONCENTRATIONS ARE $\mu g/kg$ EXCEPT WHERE NOTED

ND= CHEMICALS ANALYZED FOR WERE NOT DETECTED

* = ANALYSIS FOR THIS CHEMICAL WAS NOT PERFORMED

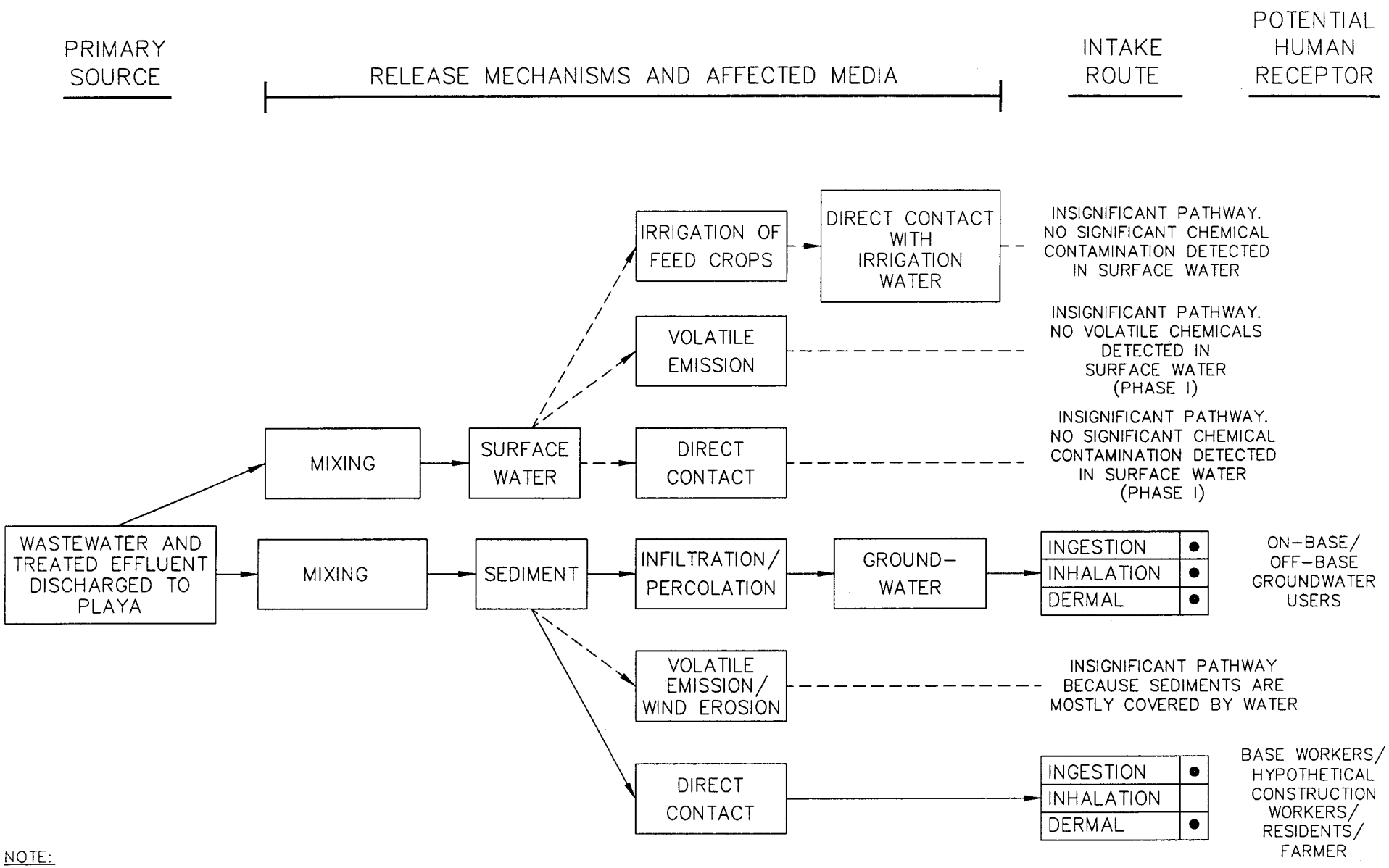
300 150 0 300
SCALE IN FEET

N

NOTE
FOUR SEDIMENT SAMPLES AND THREE SURFACE WATER SAMPLES WERE COLLECTED. LOCATIONS ARE APPROXIMATE

SOURCE: CANNON AFB CAD FILES AND CANNON AFB FIELD SAMPLING PLAN.

DRN BY TBS	DATE 03/29/95	WASTE WATER PLAYA LAKE - SWMU 103 CONCENTRATIONS OF CHEMICALS DETECTED IN WATER, SEDIMENT AND SOIL CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11MM	FIG. NO. 11-3
CHK'D BY	REVISION 0			



NOTE:

SOLID LINES REPRESENT POTENTIALLY COMPLETE PATHWAYS

DASHED LINES REPRESENT INCOMPLETE OR INSIGNIFICANT PATHWAYS

DRN BY JWB	DATE 08/19/93	SITE CONCEPTUAL EXPOSURE MODEL WASTEWATER PLAYA LAKE SWMU – 103 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY .	REVISIONS: 0		C3M11W	11–4

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10310-603			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080006SA			0396080008SA			0396080009SA			0396080001RA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/02/94			12/01/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	27	11		20	11		28	11		60	12		35	12				
Benzene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Bromodichloromethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Bromoform	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Bromomethane	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Carbon disulfide	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	7.1	5.9				
Carbon tetrachloride	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Chlorobenzene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Chloroethane	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Chloroform	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Chloromethane	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Dibromochloromethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,1-Dichloroethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,2-Dichloroethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,1-Dichloroethene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,2-Dichloroethene (total)	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,2-Dichloropropane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
cis-1,3-Dichloropropene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
trans-1,3-Dichloropropene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Ethylbenzene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
2-Hexanone	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Methylene chloride	3.4	5.7	J	2.3	5.7	J	2.7	5.7	J	2.6	6	J	1.9	5.9	J			
Styrene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,1,2,2-Tetrachloroethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Tetrachloroethene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10310-603			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080006SA			0396080008SA			0396080009SA			0396080001RA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/02/94			12/01/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Toluene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	2.7	5.9	J			
1,1,1-Trichloroethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
1,1,2-Trichloroethane	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Trichloroethene	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Vinyl acetate	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Vinyl chloride	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Xylenes (total)	<	5.7	U	<	5.7	U	<	5.7	U	<	6	U	<	5.9	U			
Semivolatile Organics (ug/kg)																		
Acenaphthene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Acenaphthylene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Anthracene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Benzo(a)anthracene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Benzo(a)pyrene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Benzo(b)fluoranthene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Benzo(g,h,i)perylene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Benzo(k)fluoranthene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Benzoic acid	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
Benzyl alcohol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
bis(2-Chloroethoxy)methane	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
bis(2-Chloroethyl) ether	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
bis(2-Chloroisopropyl)ether	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
bis(2-Ethylhexyl)phthalate	<	380	U	<	380	U	38	380	J	<	400	U	<	390	U			
4-Bromophenyl phenyl ether	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Butyl benzyl phthalate	71	380	J	<	380	U	<	380	U	<	400	U	<	390	U			
Carbazole	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
4-Chloro-3-methylphenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
4-Chloroaniline	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2-Chloronaphthalene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10310-603			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080006SA			0396080008SA			0396080009SA			0396080001RA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/02/94			12/01/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Chlorophenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
4-Chlorophenyl phenyl ether	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Chrysene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Di-n-butyl phthalate	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Di-n-octyl phthalate	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Dibenz(a,h)anthracene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Dibenzofuran	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
1,2-Dichlorobenzene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
1,3-Dichlorobenzene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
1,4-Dichlorobenzene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2,4-Dichlorophenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
3,3'-Dichlorobenzidine	<	750	U	<	760	U	<	750	U	<	800	U	<	780	U			
Diethyl phthalate	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2,4-Dimethylphenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Dimethyl phthalate	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
4,6-Dinitro-2-methylphenol	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
2,4-Dinitrophenol	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
2,4-Dinitrotoluene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2,6-Dinitrotoluene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Fluoranthene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Fluorene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Hexachlorobenzene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Hexachlorobutadiene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Hexachlorocyclopentadiene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Hexachloroethane	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Indeno(1,2,3-cd)pyrene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Isophorone	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2-Methylnaphthalene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10310-603			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080006SA			0396080008SA			0396080009SA			0396080001RA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/02/94			12/01/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Methylphenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
4-Methylphenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Naphthalene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
3-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
4-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
Nitrobenzene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2-Nitrophenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
4-Nitrophenol	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
N-Nitroso-di-n-propylamine	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
N-Nitrosodiphenylamine	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Pentachlorophenol	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
Phenanthrene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Phenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Pyrene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
1,2,4-Trichlorobenzene	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
2,4,5-Trichlorophenol	<	1800	U	<	1800	U	<	1800	U	<	1900	U	<	1900	U			
2,4,6-Trichlorophenol	<	380	U	<	380	U	<	380	U	<	400	U	<	390	U			
Pesticides/PCB's (ug/kg)																		
Aroclor 1016	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
Aroclor 1221	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
Aroclor 1232	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
Aroclor 1242	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
Aroclor 1248	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
Aroclor 1254	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
Aroclor 1260	<	38	U	<	38	U	<	38	U	<	40	U	<	39	U	<	43	U
4,4'-DDD	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
4,4'-DDE	3.6	3.8	J	<	3.8	U	3.2	3.8	J	<	4	U	<	3.9	U	<	4.3	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10310-603			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080006SA			0396080008SA			0396080009SA			0396080001RA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/02/94			12/01/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
4,4'-DDT	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
Aldrin	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
alpha-BHC	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
alpha-Chlordane	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
beta-BHC	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
delta-BHC	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
Dieldrin	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
Endosulfan I	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
Endosulfan II	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
Endosulfan sulfate	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
Endrin	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
Endrin aldehyde	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
Endrin ketone	<	3.8	U	<	3.8	U	<	3.8	U	<	4	U	<	3.9	U	<	4.3	U
gamma-BHC (Lindane)	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
gamma-Chlordane	2.4	1.9		1.2	2	J	2.2	1.9		<	2.1	U	<	2	U	<	2.2	U
Heptachlor	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
Heptachlor epoxide	<	1.9	U	<	2	U	<	1.9	U	<	2.1	U	<	2	U	<	2.2	U
Methoxychlor	<	19	U	<	20	U	<	19	U	<	21	U	<	20	U	<	22	U
Toxaphene	<	190	U	<	200	U	<	190	U	<	210	U	<	200	U	<	220	U
Herbicides (ug/kg)																		
2,4-D	<	46	U	<	46	U	<	46	U	<	48	U	<	47	U			
2,4-DB	<	110	U	<	110	U	<	110	U	<	120	U	<	120	U			
Dalapon	<	110	U	<	110	U	<	110	U	<	120	U	<	120	U			
Dicamba	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Dichlorprop	<	23	U	<	23	U	<	23	U	<	24	U	<	24	U			
Dinoseb	<	23	U	<	23	U	<	23	U	<	24	U	<	24	U			
MCPA	<	5700	U	<	5700	U	<	5700	U	<	6000	U	<	5900	U			
MCPP	<	5700	U	<	5700	U	<	5700	U	<	6000	U	<	5900	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-10310-003			CAN103-10310-005			CAN103-10310-603			CAN103-10311-003			CAN103-10311-005			CAN103-1038-003		
LAB SAMPLE NUMBER	0396080005SA			0396080007SA			0396080006SA			0396080008SA			0396080009SA			0396080001RA		
COLLECT DATE	12/02/94			12/02/94			12/02/94			12/02/94			12/02/94			12/01/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2,4,5-T	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
2,4,5-TP (Silvex)	<	11	U	<	11	U	<	11	U	<	12	U	<	12	U			
Metals (mg/kg)																		
Aluminum	13200	11.4		12400	11.5		14100	11.4		13900	12.1		11600	11.8				
Antimony	<	6.8	UJ	<	6.9	UJ	<	6.8	UJ	3.3	7.3	J	<	7.1	UJ			
Arsenic	4.6	0.57		3	0.57		4.3	0.57		1.2	0.6		2	0.59				
Barium	94.4	1.1		110	1.1		99.2	1.1		111	1.2		132	1.2				
Beryllium	0.86	0.23		0.72	0.23		0.82	0.23		0.8	0.24		0.85	0.24				
Cadmium	<	0.57	U	0.66	0.57		0.93	0.57	J	<	0.6	U	<	0.59	U			
Calcium	2100	22.8		2180	23		2140	22.8		1290	24.2		1410	23.6				
Chromium	11.3	1.1		12.1	1.1		12.7	1.1		13.4	1.2		12.5	1.2				
Cobalt	5.1	1.1		7.2	1.1		5.8	1.1		6.4	1.2		7.6	1.2				
Copper	8.3	2.3		9.6	2.3		8.9	2.3		9.2	2.4		9.9	2.4				
Iron	12500	11.4		12200	11.5		12800	11.4		12400	12.1		11300	11.8				
Lead	7.6	0.57	J	7.6	0.57	J	8.4	1.1	J	7.6	0.6	J	8.2	0.59	J			
Magnesium	2100	22.8		2030	23		2190	22.8		2760	24.2		2740	23.6				
Manganese	392	1.1		501	1.1		410	1.1		124	1.2		198	1.2				
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U	<	0.12	U			
Nickel	9.6	4.6		10.6	4.6		10.1	4.6		10.1	4.8		11.3	4.7				
Potassium	2370	569		2280	574		2460	569		2920	605		2460	591				
Selenium	0.13	0.57	J	<	0.57	UJ	0.16	0.57	J	0.15	0.6	J	0.13	0.59	J			
Silver	<	1.1	U	<	1.1	U	<	1.1	U	<	1.2	U	<	1.2	U			
Sodium	99.1	569	J	124	574	J	170	569	J	392	605	J	345	591	J			
Thallium	0.18	0.57	J	0.15	0.57	J	0.16	0.57	J	0.16	0.6	J	0.21	0.59	J			
Vanadium	24.5	1.1		21.8	1.1		24.7	1.1		18.7	1.2		19.8	1.2				
Zinc	27.2	2.3		29	2.3		30	2.3		28.9	2.4		27.1	2.4				
TPH (mg/kg)																		
Total Petroleum Hydrocarbons	<	45.5	U	<	45.9	U	47.5	45.5		<	48.4	U	<	47.2	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1038-003			CAN103-1038-005			CAN103-1039-003			CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005		
LAB SAMPLE NUMBER	0396080001SA			0396080002SA			0396080003SA			0396080004SA			0396550001SA			0396550002SA		
COLLECT DATE	12/01/94			12/01/94			12/02/94			12/02/94			12/04/94			12/04/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	100	13		85	13		61	13		76	13		34	12		81	12	
Benzene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Bromodichloromethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Bromoform	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Bromomethane	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
2-Butanone (MEK)	21	13		16	13		<	13	U	14	13		<	12	U	12	12	
Carbon disulfide	<	6.5	U	<	6.4	U	13	6.4		<	6.4	U	<	6	U	<	5.9	U
Carbon tetrachloride	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Chlorobenzene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Chloroethane	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Chloroform	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Chloromethane	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Dibromochloromethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,1-Dichloroethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,2-Dichloroethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,1-Dichloroethene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,2-Dichloroethene (total)	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,2-Dichloropropane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
cis-1,3-Dichloropropene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
trans-1,3-Dichloropropene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Ethylbenzene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
2-Hexanone	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
4-Methyl-2-pentanone (MIBK)	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Methylene chloride	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Styrene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,1,2,2-Tetrachloroethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Tetrachloroethene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1038-003			CAN103-1038-005			CAN103-1039-003			CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005		
LAB SAMPLE NUMBER	0396080001SA			0396080002SA			0396080003SA			0396080004SA			0396550001SA			0396550002SA		
COLLECT DATE	12/01/94			12/01/94			12/02/94			12/02/94			12/04/94			12/04/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Toluene	1.6	6.5	J	3.6	6.4	J	1.4	6.4	J	2.7	6.4	J	<	6	U	<	5.9	U
1,1,1-Trichloroethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
1,1,2-Trichloroethane	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Trichloroethene	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Vinyl acetate	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Vinyl chloride	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Xylenes (total)	<	6.5	U	<	6.4	U	<	6.4	U	<	6.4	U	<	6	U	<	5.9	U
Semivolatile Organics (ug/kg)																		
Acenaphthene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Acenaphthylene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Anthracene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Benzo(a)anthracene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Benzo(a)pyrene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Benzo(b)fluoranthene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Benzo(g,h,i)perylene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Benzo(k)fluoranthene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Benzoic acid	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
Benzyl alcohol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
bis(2-Chloroethoxy)methane	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
bis(2-Chloroethyl) ether	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
bis(2-Chloroisopropyl)ether	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
bis(2-Ethylhexyl)phthalate	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4-Bromophenyl phenyl ether	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Butyl benzyl phthalate	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Carbazole	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4-Chloro-3-methylphenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4-Chloroaniline	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2-Chloronaphthalene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1038-003			CAN103-1038-005			CAN103-1039-003			CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005		
LAB SAMPLE NUMBER	0396080001SA			0396080002SA			0396080003SA			0396080004SA			0396550001SA			0396550002SA		
COLLECT DATE	12/01/94			12/01/94			12/02/94			12/02/94			12/04/94			12/04/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Chlorophenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4-Chlorophenyl phenyl ether	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Chrysene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Di-n-butyl phthalate	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Di-n-octyl phthalate	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Dibenz(a,h)anthracene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Dibenzofuran	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
1,2-Dichlorobenzene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
1,3-Dichlorobenzene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
1,4-Dichlorobenzene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2,4-Dichlorophenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
3,3'-Dichlorobenzidine	<	850	U	<	850	U	<	850	U	<	840	U	<	790	U	<	770	U
Diethyl phthalate	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2,4-Dimethylphenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Dimethyl phthalate	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4,6-Dinitro-2-methylphenol	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
2,4-Dinitrophenol	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
2,4-Dinitrotoluene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2,6-Dinitrotoluene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Fluoranthene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Fluorene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Hexachlorobenzene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Hexachlorobutadiene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Hexachlorocyclopentadiene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Hexachloroethane	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Indeno(1,2,3-cd)pyrene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Isophorone	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2-Methylnaphthalene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1038-003			CAN103-1038-005			CAN103-1039-003			CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005		
LAB SAMPLE NUMBER	0396080001SA			0396080002SA			0396080003SA			0396080004SA			0396550001SA			0396550002SA		
COLLECT DATE	12/01/94			12/01/94			12/02/94			12/02/94			12/04/94			12/04/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Methylphenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4-Methylphenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Naphthalene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2-Nitroaniline	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
3-Nitroaniline	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
4-Nitroaniline	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
Nitrobenzene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2-Nitrophenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
4-Nitrophenol	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
N-Nitroso-di-n-propylamine	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
N-Nitrosodiphenylamine	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Pentachlorophenol	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
Phenanthrene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Phenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Pyrene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
1,2,4-Trichlorobenzene	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
2,4,5-Trichlorophenol	<	2100	U	<	2000	U	<	2000	U	<	2000	U	<	1900	U	<	1900	U
2,4,6-Trichlorophenol	<	430	U	<	420	U	<	420	U	<	420	U	<	400	U	<	390	U
Pesticides/PCB's (ug/kg)																		
Aroclor 1016	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
Aroclor 1221	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
Aroclor 1232	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
Aroclor 1242	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
Aroclor 1248	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
Aroclor 1254	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
Aroclor 1260	<	43	U	<	42	U	<	42	U	<	42	U	<	40	U	<	39	U
4,4'-DDD	<	4.3	U	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
4,4'-DDE	<	4.3	U	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U

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U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1038-003			CAN103-1038-005			CAN103-1039-003			CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005		
LAB SAMPLE NUMBER	0396080001SA			0396080002SA			0396080003SA			0396080004SA			0396550001SA			0396550002SA		
COLLECT DATE	12/01/94			12/01/94			12/02/94			12/02/94			12/04/94			12/04/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
4,4'-DDT	2.4	4.3	J	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
Aldrin	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
alpha-BHC	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
alpha-Chlordane	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
beta-BHC	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
delta-BHC	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
Dieldrin	2.4	4.3	J	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
Endosulfan I	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
Endosulfan II	<	4.3	U	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
Endosulfan sulfate	<	4.3	U	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
Endrin	2.6	4.3	J	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
Endrin aldehyde	<	4.3	U	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
Endrin ketone	<	4.3	U	<	4.2	U	<	4.2	U	<	4.2	U	<	4	U	<	3.9	U
gamma-BHC (Lindane)	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
gamma-Chlordane	<	2.2	U	<	2.2	U	<	2.2	U	1.1	2.2	J	<	2	U	<	2	U
Heptachlor	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
Heptachlor epoxide	<	2.2	U	<	2.2	U	<	2.2	U	<	2.2	U	<	2	U	<	2	U
Methoxychlor	<	22	U	<	22	U	<	22	U	<	22	U	<	20	U	<	20	U
Toxaphene	<	220	U	<	220	U	<	220	U	<	220	U	<	200	U	<	200	U
Herbicides (ug/kg)																		
2,4-D	<	52	U	<	51	U	<	51	U	<	51	U	<	48	U	<	47	U
2,4-DB	<	130	U	<	130	U	<	130	U	<	130	U	<	120	U	<	120	U
Dalapon	<	130	U	<	130	U	<	130	U	<	130	U	<	120	U	<	120	U
Dicamba	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Dichlorprop	<	26	U	<	26	U	<	26	U	<	25	U	<	24	U	<	23	U
Dinoseb	<	26	U	<	26	U	<	26	U	<	25	U	<	24	U	<	23	U
MCPA	<	6500	U	<	6400	U	<	6400	U	<	6400	U	<	6000	U	<	5900	U
MCPP	<	6500	U	<	6400	U	<	6400	U	<	6400	U	<	6000	U	<	5900	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1038-003			CAN103-1038-005			CAN103-1039-003			CAN103-1039-005			CAN103-1312-0003			CAN103-1312-0005		
LAB SAMPLE NUMBER	0396080001SA			0396080002SA			0396080003SA			0396080004SA			0396550001SA			0396550002SA		
COLLECT DATE	12/01/94			12/01/94			12/02/94			12/02/94			12/04/94			12/04/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2,4,5-T	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
2,4,5-TP (Silvex)	<	13	U	<	13	U	<	13	U	<	13	U	<	12	U	<	12	U
Metals (mg/kg)																		
Aluminum	22900	12.9		19200	12.8		23000	12.8		24700	12.7		9780	24	J	6460	23.4	J
Antimony	<	7.8	UJ	<	7.7	UJ	<	7.7	UJ	<	7.6	UJ	<	14.4	UJ	<	14.1	UJ
Arsenic	2.2	0.65		1.9	0.64		2	0.64		1.9	0.64		0.92	0.6		0.84	0.59	
Barium	183	1.3		176	1.3		184	1.3		250	1.3		278	2.4	J	78.8	2.3	J
Beryllium	1.5	0.26		1.4	0.26		1.4	0.26		1.6	0.25		0.45	0.48	J	0.32	0.47	J
Cadmium	<	0.65	U	<	0.64	U	<	0.64	U	0.72	0.64		<	1.2	U	<	1.2	U
Calcium	3740	25.9		3290	25.6		3300	25.6		4780	25.4		143000	48		173000	46.9	
Chromium	20.5	1.3		20.1	1.3		21.4	1.3		22.7	1.3		6.4	2.4		4	2.3	
Cobalt	10.7	1.3		8.3	1.3		9.9	1.3		11.3	1.3		<	2.4	U	<	2.3	U
Copper	17.5	2.6		15	2.6		16.5	2.6		18.9	2.5		3.9	4.8	J	2.9	4.7	J
Iron	20800	12.9		17200	12.8		20200	12.8		21700	12.7		6340	24		4380	23.4	
Lead	15.5	3.2	J	12.2	1.3	J	14	1.3	J	19.6	3.2	J	3.7	0.6	J	3.3	0.59	J
Magnesium	4730	25.9		3920	25.6		4400	25.6		4630	25.4		3860	48		3190	46.9	
Manganese	541	1.3		452	1.3		554	1.3		902	1.3		93.8	2.4		118	2.3	
Mercury	<	0.13	U	<	0.13	U	<	0.13	U	<	0.13	U	<	0.12	U	<	0.12	U
Nickel	16.4	5.2		15.2	5.1		15.2	5.1		17	5.1		8.6	9.6	J	3.5	9.4	J
Potassium	4540	647		3960	640		4580	640		4750	636		2130	1200		1500	1170	
Selenium	<	1.3	UJ	0.17	1.3	J	0.18	0.64	J	0.18	1.3	J	<	2.4	UJ	<	1.2	U
Silver	<	1.3	U	<	1.3	U	<	1.3	U	<	1.3	U	<	2.4	U	<	2.3	U
Sodium	572	647	J	560	640	J	614	640	J	576	636	J	<	1200	U	<	1170	U
Thallium	0.34	0.65	J	0.31	0.64	J	0.26	0.64	J	0.27	0.64	J	<	1.2	UJ	<	1.2	UJ
Vanadium	27.3	1.3		24.6	1.3		26.2	1.3		32.1	1.3		17	2.4	J	11	2.3	J
Zinc	56.2	2.6		47.1	2.6		56.1	2.6		61.8	2.5		15.1	4.8		10.5	4.7	
TPH (mg/kg)																		
Total Petroleum Hydrocarbons	<	51.8	U	<	51.2	U	<	51.2	U	<	50.9	U	<	48	U	<	46.9	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
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RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015			CAN103-1313-0020			CAN103-1314-0000		
LAB SAMPLE NUMBER	0397970007SA			0397970008SA			0397970009SA			0397970010SA			0397970011SA			0397970001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	2.2	10	J
Benzene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Bromodichloromethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Bromoform	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Bromomethane	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
2-Butanone (MEK)	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
Carbon disulfide	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Carbon tetrachloride	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Chlorobenzene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Chloroethane	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
Chloroform	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Chloromethane	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
Dibromochloromethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,1-Dichloroethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,2-Dichloroethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,1-Dichloroethene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,2-Dichloroethene (total)	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,2-Dichloropropane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
cis-1,3-Dichloropropene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
trans-1,3-Dichloropropene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Ethylbenzene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
2-Hexanone	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
4-Methyl-2-pentanone (MIBK)	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
Methylene chloride	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Styrene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,1,2,2-Tetrachloroethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Tetrachloroethene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U

J = Estimated value.
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TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015			CAN103-1313-0020			CAN103-1314-0000		
LAB SAMPLE NUMBER	0397970007SA			0397970008SA			0397970009SA			0397970010SA			0397970011SA			0397970001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Toluene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,1,1-Trichloroethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
1,1,2-Trichloroethane	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Trichloroethene	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Vinyl acetate	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
Vinyl chloride	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	10	U
Xylenes (total)	<	5.1	U	<	5.6	U	<	5.5	U	<	5.6	U	<	5.4	U	<	5.2	U
Semivolatile Organics (ug/kg)																		
Acenaphthene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Acenaphthylene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Anthracene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Benzo(a)anthracene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Benzo(a)pyrene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Benzo(b)fluoranthene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Benzo(g,h,i)perylene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Benzo(k)fluoranthene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Benzoic acid	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
Benzyl alcohol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
bis(2-Chloroethoxy)methane	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
bis(2-Chloroethyl) ether	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
bis(2-Chloroisopropyl)ether	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
bis(2-Ethylhexyl)phthalate	<	570	U	<	600	U	<	600	U	<	430	U	<	620	U	<	350	U
4-Bromophenyl phenyl ether	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Butyl benzyl phthalate	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Carbazole	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
4-Chloro-3-methylphenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
4-Chloroaniline	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2-Chloronaphthalene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U

J = Estimated value.
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U = Nondetected value.
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TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015			CAN103-1313-0020			CAN103-1314-0000		
LAB SAMPLE NUMBER	0397970007SA			0397970008SA			0397970009SA			0397970010SA			0397970011SA			0397970001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Chlorophenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
4-Chlorophenyl phenyl ether	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Chrysene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Di-n-butyl phthalate	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Di-n-octyl phthalate	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Dibenz(a,h)anthracene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Dibenzofuran	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
1,2-Dichlorobenzene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
1,3-Dichlorobenzene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
1,4-Dichlorobenzene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2,4-Dichlorophenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
3,3'-Dichlorobenzidine	<	670	U	<	740	U	<	720	U	<	750	U	<	720	U	<	690	U
Diethyl phthalate	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2,4-Dimethylphenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Dimethyl phthalate	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
4,6-Dinitro-2-methylphenol	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
2,4-Dinitrophenol	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
2,4-Dinitrotoluene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2,6-Dinitrotoluene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Fluoranthene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Fluorene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Hexachlorobenzene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Hexachlorobutadiene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Hexachlorocyclopentadiene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Hexachloroethane	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Indeno(1,2,3-cd)pyrene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Isophorone	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2-Methylnaphthalene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U

J = Estimated value.
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TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015			CAN103-1313-0020			CAN103-1314-0000		
LAB SAMPLE NUMBER	0397970007SA			0397970008SA			0397970009SA			0397970010SA			0397970011SA			0397970001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Methylphenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
4-Methylphenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Naphthalene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2-Nitroaniline	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
3-Nitroaniline	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
4-Nitroaniline	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
Nitrobenzene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2-Nitrophenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
4-Nitrophenol	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
N-Nitroso-di-n-propylamine	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
N-Nitrosodiphenylamine	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Pentachlorophenol	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
Phenanthrene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Phenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Pyrene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
1,2,4-Trichlorobenzene	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
2,4,5-Trichlorophenol	<	1600	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
2,4,6-Trichlorophenol	<	340	U	<	370	U	<	360	U	<	370	U	<	360	U	<	350	U
Pesticides/PCB's (ug/kg)																		
Aroclor 1016	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
Aroclor 1221	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
Aroclor 1232	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
Aroclor 1242	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
Aroclor 1248	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
Aroclor 1254	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
Aroclor 1260	<	34	U	<	37	U	<	36	U	<	37	U	<	36	U	<	35	U
4,4'-DDD	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
4,4'-DDE	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U

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TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015			CAN103-1313-0020			CAN103-1314-0000		
LAB SAMPLE NUMBER	0397970007SA			0397970008SA			0397970009SA			0397970010SA			0397970011SA			0397970001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
4,4'-DDT	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
Aldrin	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
alpha-BHC	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
alpha-Chlordane	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
beta-BHC	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
delta-BHC	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
Dieldrin	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
Endosulfan I	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
Endosulfan II	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
Endosulfan sulfate	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
Endrin	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
Endrin aldehyde	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
Endrin ketone	<	3.4	U	<	3.7	U	<	3.6	U	<	3.7	U	<	3.6	U	<	3.5	U
gamma-BHC (Lindane)	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
gamma-Chlordane	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
Heptachlor	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
Heptachlor epoxide	<	1.7	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.8	U
Methoxychlor	<	17	U	<	19	U	<	19	U	<	19	U	<	19	U	<	18	U
Toxaphene	<	170	U	<	190	U	<	190	U	<	190	U	<	190	U	<	180	U
Herbicides (ug/kg)																		
2,4-D	<	41	UJ	<	45	UJ	<	44	U	<	45	U	<	44	U	<	42	U
2,4-DB	<	100	UJ	<	110	UJ	<	110	U	<	110	U	<	110	U	<	100	U
Dalapon	<	100	UJ	<	110	UJ	<	110	U	<	110	U	<	110	U	<	100	U
Dicamba	<	10	UJ	<	11	UJ	<	11	U	<	11	U	<	11	U	<	10	U
Dichlorprop	<	20	UJ	<	22	UJ	<	22	U	<	23	U	<	22	U	<	21	U
Dinoseb	<	20	UJ	<	22	UJ	<	22	U	<	23	U	<	22	U	<	21	U
MCPA	<	5100	UJ	<	5600	UJ	<	5500	U	<	5600	U	<	5400	U	<	5200	U
MCPP	<	5100	UJ	<	5600	UJ	<	5500	U	<	5600	U	<	5400	U	<	5200	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1313-0000			CAN103-1313-0005			CAN103-1313-0010			CAN103-1313-0015			CAN103-1313-0020			CAN103-1314-0000		
LAB SAMPLE NUMBER	0397970007SA			0397970008SA			0397970009SA			0397970010SA			0397970011SA			0397970001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2,4,5-T	<	10	UJ	<	11	UJ	<	11	U	<	11	U	<	11	U	<	10	U
2,4,5-TP (Silvex)	<	10	UJ	<	11	UJ	<	11	U	<	11	U	<	11	U	<	10	U
Metals (mg/kg)																		
Aluminum	4740	20.3	J	2480	55.9	J	4940	21.9		4050	11.3		2550	10.9	J	5220	52.4	J
Antimony	<	12.2	UJ	<	33.5	UJ	<	13.2	U	<	6.8	U	<	6.5	UJ	<	31.4	UJ
Arsenic	1.2	0.51		2.5	0.56		2	0.55		1.5	0.56		0.96	0.54		2.1	0.52	
Barium	145	2	J	1300	5.6	J	377	2.2		179	1.1		86.2	1.1	J	249	5.2	J
Beryllium	0.26	0.41	J	<	1.1	U	<	0.44	U	0.25	0.23		0.15	0.22	J	<	1	U
Cadmium	<	1	U	<	2.8	U	<	1.1	U	<	0.56	U	<	0.54	U	<	2.6	U
Calcium	162000	40.6		329000	112		191000	43.8		91700	22.6		81100	21.8		260000	105	
Chromium	2.4	2	J	<	5.6	UJ	5.3	2.2		3.6	1.1		2.6	1.1	J	<	5.2	UJ
Cobalt	<	2	U	<	5.6	U	1.7	2.2	J	2.2	1.1		1.4	1.1		2.7	5.2	J
Copper	2.6	4.1	J	<	11.2	U	2.5	4.4	J	2.6	2.3		1.3	2.2	J	6.4	10.5	J
Iron	3780	20.3		1530	55.9		3620	21.9		2730	11.3		1860	10.9		4430	52.4	
Lead	3.4	0.51		1.5	0.56		2.2	5.5	J	3.2	0.56		2.2	0.54		2.5	0.52	
Magnesium	2360	40.6		4880	112		5950	43.8		5800	22.6		3400	21.8		2850	105	
Manganese	42.6	2	J	15	5.6	J	50.6	2.2		51.9	1.1		21.7	1.1	J	175	5.2	J
Mercury	<	0.1	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.1	U
Nickel	3.4	8.1	J	<	22.4	U	6.6	8.8	J	4.4	4.5	J	2.5	4.4	J	<	20.9	U
Potassium	957	1020	J	<	2800	U	812	1100	J	837	565		604	545		918	2620	J
Selenium	<	1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1	UJ
Silver	<	2	UJ	<	5.6	UJ	<	2.2	U	<	1.1	U	<	1.1	UJ	<	5.2	UJ
Sodium	<	1020	U	<	2800	U	<	1100	U	<	565	U	<	545	U	<	2620	U
Thallium	<	1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	2.1	UJ
Vanadium	10.4	2		9	5.6		20.8	2.2		17.4	1.1		6.7	1.1		14.9	5.2	
Zinc	9.9	4.1	J	5.7	11.2	J	9	4.4		6.1	2.3		3.8	2.2	J	9.1	10.5	J
TPH (mg/kg)																		
Total Petroleum Hydrocarbons	<	40.6	U	<	44.7	U	<	43.8	U	<	45.2	U	<	43.6	U	<	41.9	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1314-1363			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397970006SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Benzene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Bromodichloromethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Bromoform	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Bromomethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Carbon disulfide	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Carbon tetrachloride	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Chlorobenzene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Chloroethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Chloroform	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Chloromethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Dibromochloromethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,1-Dichloroethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,2-Dichloroethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,1-Dichloroethene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,2-Dichloroethene (total)	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,2-Dichloropropane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
cis-1,3-Dichloropropene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
trans-1,3-Dichloropropene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Ethylbenzene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
2-Hexanone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Methylene chloride	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6.8	U
Styrene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,1,2,2-Tetrachloroethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Tetrachloroethene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U

J = Estimated value.
R = Rejected value.
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RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1314-1363			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397970006SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Toluene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,1,1-Trichloroethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
1,1,2-Trichloroethane	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Trichloroethene	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Vinyl acetate	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Vinyl chloride	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Xylenes (total)	<	5.3	U	<	5.3	U	<	5.4	U	<	5.5	U	<	5.3	U	<	6	U
Semivolatile Organics (ug/kg)																		
Acenaphthene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Acenaphthylene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Anthracene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Benzo(a)anthracene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	53	390	J
Benzo(a)pyrene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	61	390	J
Benzo(b)fluoranthene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	95	390	J
Benzo(g,h,i)perylene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Benzo(k)fluoranthene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Benzoic acid	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
Benzyl alcohol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
bis(2-Chloroethoxy)methane	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
bis(2-Chloroethyl) ether	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
bis(2-Chloroisopropyl)ether	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
bis(2-Ethylhexyl)phthalate	<	350	U	<	800	U	<	510	U	<	480	U	<	520	U	<	390	U
4-Bromophenyl phenyl ether	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Butyl benzyl phthalate	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Carbazole	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
4-Chloro-3-methylphenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
4-Chloroaniline	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2-Chloronaphthalene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1314-1363			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397970006SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Chlorophenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
4-Chlorophenyl phenyl ether	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Chrysene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	67	390	J
Di-n-butyl phthalate	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Di-n-octyl phthalate	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Dibenz(a,h)anthracene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Dibenzofuran	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
1,2-Dichlorobenzene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
1,3-Dichlorobenzene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
1,4-Dichlorobenzene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2,4-Dichlorophenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
3,3'-Dichlorobenzidine	<	700	U	<	700	U	<	710	U	<	720	U	<	700	U	<	790	U
Diethyl phthalate	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2,4-Dimethylphenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Dimethyl phthalate	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
4,6-Dinitro-2-methylphenol	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
2,4-Dinitrophenol	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
2,4-Dinitrotoluene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2,6-Dinitrotoluene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Fluoranthene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	69	390	J
Fluorene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Hexachlorobenzene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Hexachlorobutadiene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Hexachlorocyclopentadiene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Hexachloroethane	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Indeno(1,2,3-cd)pyrene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Isophorone	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2-Methylnaphthalene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U

J = Estimated value.
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U = Nondetected value.
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TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1314-1363			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397970006SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Methylphenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
4-Methylphenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Naphthalene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2-Nitroaniline	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
3-Nitroaniline	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
4-Nitroaniline	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
Nitrobenzene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2-Nitrophenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
4-Nitrophenol	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
N-Nitroso-di-n-propylamine	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
N-Nitrosodiphenylamine	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Pentachlorophenol	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
Phenanthrene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Phenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Pyrene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	71	390	J
1,2,4-Trichlorobenzene	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
2,4,5-Trichlorophenol	<	1700	U	<	1700	U	<	1700	U	<	1800	U	<	1700	U	<	1900	U
2,4,6-Trichlorophenol	<	350	U	<	350	U	<	360	U	<	360	U	<	350	U	<	390	U
Pesticides/PCB's (ug/kg)																		
Aroclor 1016	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	<	390	U
Aroclor 1221	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	<	390	U
Aroclor 1232	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	<	390	U
Aroclor 1242	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	<	390	U
Aroclor 1248	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	750	390	
Aroclor 1254	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	<	390	U
Aroclor 1260	<	35	U	<	35	U	<	36	U	<	36	U	<	35	U	<	390	U
4,4'-DDD	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
4,4'-DDE	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1314-1363			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397970006SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
4,4'-DDT	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
Aldrin	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
alpha-BHC	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
alpha-Chlordane	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
beta-BHC	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
delta-BHC	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
Dieldrin	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
Endosulfan I	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
Endosulfan II	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
Endosulfan sulfate	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
Endrin	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
Endrin aldehyde	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
Endrin ketone	<	3.5	U	<	3.5	U	<	3.6	U	<	3.6	U	<	3.5	U	<	39	U
gamma-BHC (Lindane)	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
gamma-Chlordane	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
Heptachlor	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
Heptachlor epoxide	<	1.8	U	<	1.8	U	<	1.8	U	<	1.9	U	<	1.8	U	<	20	U
Methoxychlor	<	18	U	<	18	U	<	18	U	<	19	U	<	18	U	<	200	U
Toxaphene	<	180	U	<	180	U	<	180	U	<	190	U	<	180	U	<	2000	U
Herbicides (ug/kg)																		
2,4-D	<	42	U	<	42	U	<	43	U	<	44	U	<	42	U	<	48	U
2,4-DB	<	110	U	<	110	U	<	110	U	<	110	U	<	110	U	<	120	U
Dalapon	<	110	U	<	110	U	<	110	U	<	110	U	<	110	U	<	120	U
Dicamba	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Dichlorprop	<	21	U	<	21	U	<	22	U	<	22	U	<	21	U	<	24	U
Dinoseb	<	21	U	<	21	U	<	22	U	<	22	U	<	21	U	<	24	U
MCPA	<	5300	U	<	5300	U	<	5400	U	<	5500	U	<	5300	U	<	6000	U
MCPP	<	5300	U	<	5300	U	<	5400	U	<	5500	U	<	5300	U	<	6000	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1314-0005			CAN103-1314-0010			CAN103-1314-0015			CAN103-1314-0020			CAN103-1314-1363			CAN103-1315-0000		
LAB SAMPLE NUMBER	0397970002SA			0397970003SA			0397970004SA			0397970005SA			0397970006SA			0397780001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2,4,5-T	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
2,4,5-TP (Silvex)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U
Metals (mg/kg)																		
Aluminum	9920	10.6	J	4690	21.2	J	5490	21.6	J	5860	11		5920	21.1		4680	11.9	
Antimony	<	6.4	UJ	<	12.7	UJ	<	13	UJ	<	6.6	U	<	12.7	U	<	7.2	UJ
Arsenic	2.9	0.53		1.6	0.53		1.6	0.54		0.87	0.55		1.7	0.53		1.2	0.6	
Barium	90.7	1.1	J	240	2.1	J	309	2.2	J	146	1.1		226	2.1		87.5	1.2	
Beryllium	0.4	0.21		<	0.42	U	<	0.43	U	0.25	0.22		<	0.42	U	0.4	0.24	
Cadmium	<	0.53	U	<	1.1	U	<	1.1	U	<	0.55	U	<	1.1	U	<	0.6	U
Calcium	58700	21.2		193000	42.4		190000	43.3		99500	21.9		195000	42.3		21700	23.8	J
Chromium	8.4	1.1	J	2.4	2.1	J	3.1	2.2	J	3.8	1.1		4.1	2.1		5.6	1.2	
Cobalt	3.4	1.1		1.7	2.1	J	1.6	2.2	J	1.6	1.1		1.1	2.1	J	2.7	1.2	
Copper	5.2	2.1		2.6	4.2	J	2.9	4.3	J	2.3	2.2		2.6	4.2	J	7.1	2.4	
Iron	7990	10.6		3640	21.2		3640	21.6		3750	11		4110	21.1		6010	11.9	
Lead	5.2	0.53		2.9	0.53		2.7	0.54		3.6	0.55		3.2	0.53		6.9	0.6	J
Magnesium	2260	21.2		2880	42.4		4550	43.3		3840	21.9		2980	42.3		1960	23.8	
Manganese	96.3	1.1	J	95.6	2.1	J	56.8	2.2	J	31.4	1.1		116	2.1		94.7	1.2	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U
Nickel	8.8	4.2	J	3.9	8.5	J	4.9	8.7	J	4.2	4.4	J	3.9	8.5	J	5.7	4.8	
Potassium	1560	531		980	1060	J	1030	1080	J	1130	548		1210	1060		2280	596	
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.2	UJ
Silver	<	1.1	UJ	<	2.1	UJ	<	2.2	UJ	<	1.1	U	<	2.1	U	<	1.2	U
Sodium	<	531	U	<	1060	U	<	1080	U	<	548	U	<	1060	U	<	596	U
Thallium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	0.14	0.6	J
Vanadium	15.1	1.1		7.7	2.1		7.8	2.2		6.6	1.1		8.1	2.1		12.4	1.2	
Zinc	16.9	2.1	J	8.5	4.2	J	8.8	4.3	J	7.3	2.2		10	4.2		18.7	2.4	
TPH (mg/kg)																		
Total Petroleum Hydrocarbons	<	42.5	U	<	42.4	U	<	43.3	U	<	43.9	U	<	42.3	U	734	47.7	J

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1315-1362			CAN103-1316-0000		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0397780004SA			0398000013SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	<	11	U	<	11	U	<		U	<		U	<	11	U	<	11	U
Benzene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Bromodichloromethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Bromoform	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Bromomethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Carbon tetrachloride	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Chlorobenzene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Chloroethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chloroform	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Chloromethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Dibromochloromethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,1-Dichloroethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,2-Dichloroethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,1-Dichloroethene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,2-Dichloroethene (total)	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,2-Dichloropropane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
cis-1,3-Dichloropropene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
trans-1,3-Dichloropropene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Ethylbenzene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
2-Hexanone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.3	U	<	5.5	U	<		U	<		U	<	5.6	U	2	5.5	J
Styrene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,1,2,2-Tetrachloroethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Tetrachloroethene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1315-1362			CAN103-1316-0000		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0397780004SA			0398000013SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Toluene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,1,1-Trichloroethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
1,1,2-Trichloroethane	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Trichloroethene	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Vinyl acetate	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Vinyl chloride	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Xylenes (total)	<	5.3	U	<	5.5	U	<	5.6	U	<	5.6	U	<	5.6	U	<	5.5	U
Semivolatile Organics (ug/kg)																		
Acenaphthene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Acenaphthylene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Anthracene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(a)anthracene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(a)pyrene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(b)fluoranthene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(g,h,i)perylene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(k)fluoranthene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzoic acid	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Benzyl alcohol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Chloroethoxy)methane	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Chloroethyl) ether	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Chloroisopropyl)ether	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	350	U	<	370	U	<	370	U	5800	370		<	370	U	<	360	U
4-Bromophenyl phenyl ether	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Butyl benzyl phthalate	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Carbazole	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Chloro-3-methylphenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Chloroaniline	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Chloronaphthalene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1315-1362			CAN103-1316-0000		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0397780004SA			0398000013SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Chlorophenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Chlorophenyl phenyl ether	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Chrysene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Di-n-butyl phthalate	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Di-n-octyl phthalate	<	350	U	<	370	U	<	370	U	430	370		<	370	U	<	360	U
Dibenz(a,h)anthracene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Dibenzofuran	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,2-Dichlorobenzene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,3-Dichlorobenzene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,4-Dichlorobenzene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,4-Dichlorophenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
3,3'-Dichlorobenzidine	<	710	U	<	730	U	<	740	U	<	740	U	<	740	U	<	730	U
Diethyl phthalate	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,4-Dimethylphenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Dimethyl phthalate	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4,6-Dinitro-2-methylphenol	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4-Dinitrophenol	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4-Dinitrotoluene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,6-Dinitrotoluene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Fluoranthene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Fluorene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachlorobenzene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachlorobutadiene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachlorocyclopentadiene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachloroethane	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Isophorone	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Methylnaphthalene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1315-1362			CAN103-1316-0000		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0397780004SA			0398000013SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Methylphenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Methylphenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Naphthalene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Nitroaniline	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
3-Nitroaniline	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
4-Nitroaniline	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Nitrobenzene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Nitrophenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Nitrophenol	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
N-Nitroso-di-n-propylamine	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
N-Nitrosodiphenylamine	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Pentachlorophenol	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Phenanthrene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Phenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Pyrene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,2,4-Trichlorobenzene	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,4,5-Trichlorophenol	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4,6-Trichlorophenol	<	350	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Pesticides/PCB's (ug/kg)																		
Aroclor 1016	<	35	U	<	37	U	<	37	U	<	37	U	<	37	U			
Aroclor 1221	<	35	U	<	37	U	<	37	U	<	37	U	<	37	U			
Aroclor 1232	<	35	U	<	37	U	<	37	U	<	37	U	<	37	U			
Aroclor 1242	<	35	U	<	37	U	<	37	U	<	37	U	<	37	U			
Aroclor 1248	48	35		<	37	U	<	37	U	<	37	U	<	37	U			
Aroclor 1254	<	35	U	<	37	U	<	37	U	<	37	U	<	37	U			
Aroclor 1260	<	35	U	<	37	U	<	37	U	<	37	U	<	37	U			
4,4'-DDD	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
4,4'-DDE	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1315-1362			CAN103-1316-0000		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0397780004SA			0398000013SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
4,4'-DDT	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
Aldrin	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
alpha-BHC	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
alpha-Chlordane	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
beta-BHC	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
delta-BHC	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
Dieldrin	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
Endosulfan I	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
Endosulfan II	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
Endosulfan sulfate	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
Endrin	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
Endrin aldehyde	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
Endrin ketone	<	3.5	U	<	3.7	U	<	3.7	U	<	3.7	U	<	3.7	U			
gamma-BHC (Lindane)	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
gamma-Chlordane	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
Heptachlor	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
Heptachlor epoxide	<	1.8	U	<	1.9	U	<	1.9	U	<	1.9	U	<	1.9	U			
Methoxychlor	<	18	U	<	19	U	<	19	U	<	19	U	<	19	U			
Toxaphene	<	180	U	<	190	U	<	190	U	<	190	U	<	190	U			
Herbicides (ug/kg)																		
2,4-D	<	43	U	<	44	U	<	45	U	<	45	U	<	45	U			
2,4-DB	<	110	U	<	110	U	<	110	U	<	110	U	<	110	U			
Dalapon	<	110	U	<	110	U	<	110	U	<	110	U	<	110	U			
Dicamba	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U			
Dichlorprop	<	21	U	<	22	U	<	22	U	<	22	U	<	22	U			
Dinoseb	<	21	U	<	22	U	<	22	U	<	22	U	<	22	U			
MCPA	<	5300	U	<	5500	U	<	5600	U	<	5600	U	<	5600	U			
MCPP	<	5300	U	<	5500	U	<	5600	U	<	5600	U	<	5600	U			

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1315-0005			CAN103-1315-0010			CAN103-1315-0015			CAN103-1315-0020			CAN103-1315-1362			CAN103-1316-0000		
LAB SAMPLE NUMBER	0397780002SA			0397780003SA			0397780005SA			0397780006SA			0397780004SA			0398000013SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2,4,5-T	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U			
2,4,5-TP (Silvex)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U			
Metals (mg/kg)																		
Aluminum	5280	10.7		2800	55.5		3250	56		2410	11.2		2600	22.3		3370	22.1	J
Antimony	<	6.4	UJ	<	33.3	UJ	<	33.6	U	<	6.7	UJ	<	13.4	UJ	<	13.3	UJ
Arsenic	1.4	0.53		1.6	0.55		1.6	0.56		0.65	0.56		1.3	0.56		1.5	0.55	
Barium	143	1.1		176	5.5		147	5.6		82.2	1.1		111	2.2		182	2.2	J
Beryllium	0.37	0.21		<	1.1	U	<	1.1	U	<	0.22	U	<	0.45	U	0.32	0.44	J
Cadmium	<	0.53	U	<	2.8	U	<	2.8	U	<	0.56	U	<	1.1	U	<	1.1	U
Calcium	78600	21.4	J	305000	111	J	249000	112	J	96500	22.3	J	203000	44.6	J	176000	44.2	J
Chromium	9.4	1.1		<	5.5	U	<	5.6	U	2.3	1.1		1.7	2.2	J	1.4	2.2	J
Cobalt	2.4	1.1		<	5.5	U	<	5.6	U	0.87	1.1	J	2.2	2.2		1.5	2.2	J
Copper	6.4	2.1		2.5	11.1	J	4.1	11.2	J	1.8	2.2	J	3.3	4.5	J	3.7	4.4	J
Iron	5890	10.7		3180	55.5		3740	56		2370	11.2		3060	22.3		3110	22.1	J
Lead	5.3	1.1	J	1.7	1.1	J	1.5	0.56	J	1.6	0.56	J	1.6	0.56	J	3.6	1.1	J
Magnesium	1900	21.4		5800	111		6650	112		2240	22.3		5600	44.6		2860	44.2	
Manganese	139	1.1		110	5.5		107	5.6		54.8	1.1		99.3	2.2		83.8	2.2	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	6.3	4.3		<	22.2	U	<	22.4	U	<	4.5	U	4.6	8.9	J	5.5	8.8	J
Potassium	1230	534		385	2770	J	431	2800	J	684	559		595	1120	J	1430	1100	
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	1.1	U	<	5.5	U	<	5.6	U	<	1.1	U	<	2.2	U	<	2.2	U
Sodium	213	534	J	<	2770	U	<	2800	U	<	559	U	<	1120	U	<	1100	U
Thallium	<	1.1	UJ	<	2.2	U	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	13.4	1.1		16.9	5.5		18.2	5.6		5.5	1.1		15.9	2.2		10	2.2	J
Zinc	14.2	2.1		4.9	11.1	J	3.3	11.2	J	4.4	2.2		3.6	4.5	J	9	4.4	J
TPH (mg/kg)																		
Total Petroleum Hydrocarbons	<		R	<		R	<	44.8	U	<		R	<		R	<	44.2	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0005			CAN103-1316-0010			CAN103-1316-0015			CAN103-1316-0020			CAN103-1316-1364			CAN103-1317-0000		
LAB SAMPLE NUMBER	0398000014SA			0397970012SA			0397970013SA			0397970014SA			0397970015SA			0397900001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	<	10	U	<	11	U	<	11	U	8	11	J	4.9	11	J	<	11	U
Benzene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Bromodichloromethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Bromoform	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Bromomethane	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Carbon tetrachloride	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Chlorobenzene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Chloroethane	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chloroform	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Chloromethane	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Dibromochloromethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,1-Dichloroethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,2-Dichloroethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,1-Dichloroethene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,2-Dichloroethene (total)	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,2-Dichloropropane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
cis-1,3-Dichloropropene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
trans-1,3-Dichloropropene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Ethylbenzene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
2-Hexanone	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	2	5.2	J	<	5.4	U	<	5.7	U	<	5.6	U	4.9	5.4	J	2.4	5.4	UJ
Styrene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,1,2,2-Tetrachloroethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Tetrachloroethene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0005			CAN103-1316-0010			CAN103-1316-0015			CAN103-1316-0020			CAN103-1316-1364			CAN103-1317-0000		
LAB SAMPLE NUMBER	0398000014SA			0397970012SA			0397970013SA			0397970014SA			0397970015SA			0397900001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Toluene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,1,1-Trichloroethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
1,1,2-Trichloroethane	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Trichloroethene	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Vinyl acetate	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Vinyl chloride	<	10	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Xylenes (total)	<	5.2	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.4	U	<	5.4	U
Semivolatile Organics (ug/kg)																		
Acenaphthene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Acenaphthylene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Anthracene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Benzo(a)anthracene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Benzo(a)pyrene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Benzo(b)fluoranthene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Benzo(g,h,i)perylene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Benzo(k)fluoranthene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Benzoic acid	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
Benzyl alcohol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
bis(2-Chloroethoxy)methane	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
bis(2-Chloroethyl) ether	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
bis(2-Chloroisopropyl)ether	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	340	U	<	620	U	<	970	U	<	490	U	<	720	U	<	360	U
4-Bromophenyl phenyl ether	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Butyl benzyl phthalate	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Carbazole	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
4-Chloro-3-methylphenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
4-Chloroaniline	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2-Chloronaphthalene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0005			CAN103-1316-0010			CAN103-1316-0015			CAN103-1316-0020			CAN103-1316-1364			CAN103-1317-0000		
LAB SAMPLE NUMBER	0398000014SA			0397970012SA			0397970013SA			0397970014SA			0397970015SA			0397900001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Chlorophenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
4-Chlorophenyl phenyl ether	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Chrysene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Di-n-butyl phthalate	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Di-n-octyl phthalate	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Dibenz(a,h)anthracene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Dibenzofuran	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
1,2-Dichlorobenzene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
1,3-Dichlorobenzene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
1,4-Dichlorobenzene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2,4-Dichlorophenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
3,3'-Dichlorobenzidine	<	690	U	<	710	U	<	750	U	<	740	U	<	710	U	<	720	U
Diethyl phthalate	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2,4-Dimethylphenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Dimethyl phthalate	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
4,6-Dinitro-2-methylphenol	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
2,4-Dinitrophenol	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
2,4-Dinitrotoluene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2,6-Dinitrotoluene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Fluoranthene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Fluorene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Hexachlorobenzene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Hexachlorobutadiene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Hexachlorocyclopentadiene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Hexachloroethane	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Isophorone	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2-Methylnaphthalene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0005			CAN103-1316-0010			CAN103-1316-0015			CAN103-1316-0020			CAN103-1316-1364			CAN103-1317-0000		
LAB SAMPLE NUMBER	0398000014SA			0397970012SA			0397970013SA			0397970014SA			0397970015SA			0397900001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Methylphenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
4-Methylphenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Naphthalene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2-Nitroaniline	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
3-Nitroaniline	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
4-Nitroaniline	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
Nitrobenzene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2-Nitrophenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
4-Nitrophenol	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
N-Nitroso-di-n-propylamine	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
N-Nitrosodiphenylamine	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Pentachlorophenol	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
Phenanthrene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Phenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Pyrene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
1,2,4-Trichlorobenzene	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
2,4,5-Trichlorophenol	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1700	U	<	1700	U
2,4,6-Trichlorophenol	<	340	U	<	350	U	<	380	U	<	370	U	<	350	U	<	360	U
Pesticides/PCB's (ug/kg)																		
Aroclor 1016				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
Aroclor 1221				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
Aroclor 1232				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
Aroclor 1242				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
Aroclor 1248				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
Aroclor 1254				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
Aroclor 1260				<	35	U	<	38	U	<	37	U	<	35	U	<	36	U
4,4'-DDD				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
4,4'-DDE				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0005			CAN103-1316-0010			CAN103-1316-0015			CAN103-1316-0020			CAN103-1316-1364			CAN103-1317-0000		
LAB SAMPLE NUMBER	0398000014SA			0397970012SA			0397970013SA			0397970014SA			0397970015SA			0397900001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
4,4'-DDT				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
Aldrin				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
alpha-BHC				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
alpha-Chlordane				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
beta-BHC				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
delta-BHC				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
Dieldrin				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
Endosulfan I				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
Endosulfan II				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
Endosulfan sulfate				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
Endrin				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
Endrin aldehyde				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
Endrin ketone				<	3.5	U	<	3.8	U	<	3.7	U	<	3.5	U	<	3.6	U
gamma-BHC (Lindane)				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
gamma-Chlordane				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
Heptachlor				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
Heptachlor epoxide				<	1.8	U	<	1.9	U	<	1.9	U	<	1.8	U	<	1.8	U
Methoxychlor				<	18	U	<	19	U	<	19	U	<	18	U	<	18	U
Toxaphene				<	180	U	<	190	U	<	190	U	<	180	U	<	180	U
Herbicides (ug/kg)																		
2,4-D				<	43	U	<	46	U	<	45	U	<	43	U	<	43	U
2,4-DB				<	110	U	<	110	U	<	110	U	<	110	U	<	110	U
Dalapon				<	110	U	<	110	U	<	110	U	<	110	U	<	110	U
Dicamba				<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Dichlorprop				<	21	U	<	23	U	<	22	U	<	21	U	<	22	U
Dinoseb				<	21	U	<	23	U	<	22	U	<	21	U	<	22	U
MCPA				<	5400	U	<	5700	U	<	5600	U	<	5400	U	<	5400	U
MCPP				<	5400	U	<	5700	U	<	5600	U	<	5400	U	<	5400	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
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RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1316-0005			CAN103-1316-0010			CAN103-1316-0015			CAN103-1316-0020			CAN103-1316-1364			CAN103-1317-0000		
LAB SAMPLE NUMBER	0398000014SA			0397970012SA			0397970013SA			0397970014SA			0397970015SA			0397900001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2,4,5-T				<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2,4,5-TP (Silvex)				<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Metals (mg/kg)																		
Aluminum	6370	10.4	J	3860	10.7	J	4530	22.8	J	3870	11.2	J	7300	10.7	J	6220	10.8	
Antimony	<	6.2	UJ	<	6.4	UJ	<	13.7	UJ	<	6.7	UJ	<	6.4	UJ	4.9	6.5	J
Arsenic	0.76	0.52		1.1	0.54		1.5	0.57		0.78	0.56		1.2	0.54		2.2	0.54	
Barium	58.7	1	J	47	1.1	J	313	2.3	J	92.4	1.1	J	48.8	1.1	J	105	1.1	
Beryllium	0.4	0.21		0.36	0.21		<	0.46	U	0.3	0.22		0.43	0.21		0.43	0.22	
Cadmium	<	0.52	U	<	0.54	U	<	1.1	U	<	0.56	U	<	0.54	U	<	0.54	U
Calcium	1520	20.8	J	28900	21.5		144000	45.7		29300	22.3		22800	21.5		73600	21.7	
Chromium	9.1	1	J	3.9	1.1	J	2.9	2.3	J	3.5	1.1	J	7	1.1	J	5.4	1.1	
Cobalt	2.3	1		3.4	1.1		2.2	2.3	J	2.6	1.1		3.5	1.1		2.6	1.1	
Copper	7.1	2.1		3.9	2.1		4.5	4.6	J	2.9	2.2		3.9	2.1		6.6	2.2	
Iron	7110	10.4	J	4750	10.7		4680	22.8		3710	11.2		7690	10.7		5670	10.8	
Lead	7.2	0.52	J	5.9	0.54		6.2	1.1		4	2.8		6.3	0.54		6	0.54	
Magnesium	1160	20.8		1940	21.5		3140	45.7		2110	22.3		2440	21.5		1950	21.7	
Manganese	31.2	1		77.1	1.1	J	74.9	2.3	J	41.2	1.1	J	105	1.1	J	127	1.1	J
Mercury	0.14	0.1		<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	4.9	4.2		6.1	4.3	J	3.3	9.1	J	4.7	4.5	J	8.1	4.3	J	6.9	4.3	
Potassium	1410	521		1060	537		1380	1140		1250	558		1600	536		2140	542	
Selenium	<	0.52	UJ	<	1.1	U	<	2.3	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	1.9	1		<	1.1	UJ	<	2.3	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	U
Sodium	<	521	U	<	537	U	<	1140	U	<	558	U	<	536	U	<	542	U
Thallium	<	0.52	UJ	<	1.1	U	<	1.1	UJ	<	0.56	UJ	<	0.54	UJ	<	1.1	UJ
Vanadium	15.5	1	J	16.6	1.1		13.8	2.3		9.5	1.1		18.8	1.1		15.6	1.1	
Zinc	31.3	2.1	J	8.3	2.1	J	8.2	4.6	J	8.3	2.2	J	13.6	2.1	J	15.7	2.2	
TPH (mg/kg)																		
Total Petroleum Hydrocarbons	<	41.7	U	58.5	43		<	45.7	U	<	44.6	U	50.8	42.9		<	43.4	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE A-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED AT SWMU 103
CANNON AFB

LOCATOR	CAN103-1317-0005			CAN103-1317-0010			CAN103-1317-0015			CAN103-1317-0020			CAN103-1318-0000			CAN103-1318-0005		
LAB SAMPLE NUMBER	0397900002SA			0397900003SA			0397900004SA			0397900005SA			0397900006SA			0397900019SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (ug/kg)																		
Acetone	5.8	11	UJ	7.2	11	UJ	5.7	11	J	<	11	U	2.6	11	UJ	<	11	U
Benzene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Bromodichloromethane	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Bromoform	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Bromomethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Carbon tetrachloride	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Chlorobenzene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Chloroethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chloroform	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Chloromethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Dibromochloromethane	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
1,1-Dichloroethane	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
1,2-Dichloroethane	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
1,1-Dichloroethene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
1,2-Dichloroethene (total)	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
1,2-Dichloropropane	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
cis-1,3-Dichloropropene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
trans-1,3-Dichloropropene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Ethylbenzene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
2-Hexanone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	2.4	5.3	UJ	3	5.6	UJ	2.4	5.6	J	2	5.5	UJ	2.1	5.5	UJ	<	5.7	U
Styrene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
1,1,2,2-Tetrachloroethane	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U
Tetrachloroethene	<	5.3	U	<	5.6	U	<	5.6	U	<	5.5	U	<	5.5	U	<	5.7	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
D = Sample was diluted for analysis.
RL = Reporting Limit.

12.0
LANDFILL NO. 25 (SWMU NO. 97)

12.1 SITE BACKGROUND

12.1.1 Site Description

SWMU 97 is a landfill occupying approximately 29 acres within the boundary of Cannon AFB in the east central portion of the Base (Figure 12-1). Landfill No. 25 is nearly rectangular-shaped in plan with overall dimensions of about 650 feet by 1,950 feet. The site is bounded by the road leading to the ordnance area to the north, the road leading to the north side of the playa lake to the south, the ordnance area to the east, and Perimeter Road to the west.

12.1.2 Site History

The landfill has been active since about 1945. The date that disposal stopped is unknown. After World War II, temporary buildings and runways were demolished and disposed of at the landfill. The site presently consists of piles of rubble covered with weeds, shrubs, and trees. The height of the rubble piles over most of the site are about 3 to 4 feet above natural grades and reach a maximum of about 14 to 15 feet above natural grades at the north end. The rubble includes large pieces of concrete mixed with wood, exterior asbestos tiles, metal and asbestos/cement pipe, and asphalt mixed with soil.

12.1.3 Current Use

The SWMU is no longer used for landfill disposal. Surface rubble remains covering the SWMU.

12.1.4 Potential Contaminants

Since this SWMU consists of a landfill, potential contaminants include VOCs, SVOCs, pesticides and PCBs, herbicides, TPH, TRPH, and metals.

12.1.5 Previous Investigations

Monitoring Well K (287 feet deep, screened 267 feet to 287 feet) was installed in Landfill No. 25 as a downgradient monitoring well during the Phase IV investigation of the Old Entomology Rinse Area (SWMU 96). A groundwater sample was analyzed for metals, PCBs, and pesticides. Metals, all at concentrations below the Maximum Contaminant Levels for drinking water, were the only analytes detected in the sample.

Nine trenches were excavated and sampled within the landfill in 1990. Samples of rubble were analyzed for asbestos, PCBs, and Toxicity Characteristics Leaching Procedure (TCLP) metals. Minor levels of barium, mercury and cadmium were detected. Soil samples from 0 to 1 foot and 4 to 5 feet below the native soil surface were collected and analyzed for VOCs, SVOCs, PCBs, and metals. One trench contained elevated levels of benzidine (one hit), barium, and cadmium.

Seven 10-foot-deep and six 60-foot-deep soil borings were drilled and sampled and nine trenches were excavated and sampled within the landfill in 1992. The samples collected were analyzed for VOCs, SVOCs, total metals, herbicides, pesticides/PCBs, TRPH, TPH, and pH. VOCs, including acetone, benzene, toluene, and methylene chloride, were detected at concentrations greater than the method reporting limits in some subsurface samples. TICs, including ethyl acetate, nonanal, 2-ethylhexyl acetate, and methyl acetate, were detected in the northern half of the landfill. SVOCs, including bis(2-ethylhexyl)phthalate, phenanthrene, benzo(a)pyrene, benzo(b)fluoranthene, tetrahydrofuran, cyclohexanol, chlorocyclohexanol, trichloropropane, and cyclohexanone, were detected in the shallow soil samples. Metals, including arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, mercury, molybdenum, selenium, vanadium, and zinc, were detected at concentrations which exceeded Upper Tolerance Levels (UTLs). Concentrations decreased with depth and exceeded the UTLs only for cadmium in one sample below 31 feet. Chlorinated herbicides and organochlorine pesticides including 4,4-DDD, 4,4-DDE, 4,4-DDT, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, epoxide, alpha-BHC, beta-BHC, delta-BHC, and gamma-BHC were detected in one or more of the samples. TRPH concentrations detected in numerous samples were highest at the surface and decreased with depth. TPH was detected in three samples and was suspected to be from asphalt rubble in the area.

12.1.6 Phase II Sampling Objectives

The overall objective of sampling Monitoring Well K within Landfill No. 25 was to evaluate whether or not contamination of the groundwater had occurred which could pose a significant risk to human health or the environment. The analytical data collected from this investigation will be used in a future health and environmental assessment and as a basis for evaluating if further investigation is needed. The specific sampling objectives at this SWMU are to:

- Characterize the concentrations of SWMU-related chemicals in the groundwater in Monitoring Well K and evaluate the potential for any chemicals of concern to impact the groundwater.

12.2 FIELD INVESTIGATION AND DATA COLLECTION

12.2.1 Water Sampling

One groundwater sample was collected from Monitoring Well K at Landfill 25. The well was sampled to assess whether contamination of the groundwater has occurred from the landfill. The well location and Phase II RFI sample numbers and sample descriptions are shown on Figure 12-1 and Table 12-1.

The groundwater sample was collected after development of the well had been done. As discussed in section 4.5, much difficulty was encountered during purging and sampling of MW-K.

Field water quality parameters collected during the well development are shown on the sample collection field sheet in Appendix B. The groundwater sample was collected and analyzed for the following target analytes:

- Volatile Organic Compounds (VOCs) by EPA Method 8240
- Pesticides and PCBs by EPA Method 8080
- Chlorinated Herbicides by EPA Method 8150 (Appendix IX)
- Semivolatile Organics (SVOCs) by EPA Method 8270
- GRO/TCO by EPA Method Modified 8015
- Total TAL Metals by EPA Method 6010 (including 7060, 7421, 7740, and 7471)

12.3 CHEMICAL INVESTIGATION RESULTS

12.3.1 General

Groundwater samples were collected from one monitoring well (MW-0K). Sampling and analyses performed are summarized in Table 12-1. A summary of the analytical results for the groundwater samples is shown in Table 12-2 and on Figure 12-2. For each sample type, the tables provide results for analytes only if they were detected at least once in this type of sample collected at the SWMU. Complete analytical summary results are provided in Appendix A.

12.3.2 Organic Results for Groundwater

The groundwater samples collected at this SWMU (CAN097-MW0K-01) were analyzed for VOCs, SVOCs, pesticides and PCBs, herbicides, total metals, TRPH, and TPH as indicated in Table 12-1. Except for methylene chloride, which was qualified as nondetect after it was determined to be a laboratory contaminant, the only VOCs detected were carbon disulfide (26 μg/L) and toluene (12 μg/L). While not detected in associated method blanks for this sample, historical data from the contracted laboratory indicate carbon disulfide has been detected as preview method blanks. Therefore, the existence of carbon disulfide may be due to laboratory contamination. Toluene was detected in the duplicate sample (CAN097-MW0K-02) at a similar concentration; however, carbon disulfide was not detected in the duplicate sample. The only SVOC detected was 2-methylphenol at an estimated concentration of 1.2 μg/L.

12.3.3 Inorganic Results

Metals analyses were performed on groundwater samples collected from this SWMU as indicated in Table 12-1. The only metals detected were arsenic, barium, copper, lead, selenium, vanadium, and zinc. Most of these metals were reported at estimated levels below their reporting limits (Table 12-2).

TABLE 12-A

Analyte	Result (mg/kg)
Aluminum	ND
Antimony	ND
Arsenic	.0014
Barium	.29
Beryllium	ND
Cadmium	ND
Calcium	ND
Chromium	ND
Cobalt	ND
Copper	ND
Iron	ND
Lead	.0013
Magnesium	ND
Manganese	ND
Mercury	ND
Nickel	ND
Potassium	ND
Selenium	.0048
Silver	ND
Sodium	ND
Thallium	ND
Vanadium	.026
Zinc	.013

ND = No Result

Note: See Table 12-3 for comparison to background ranges.

12.4 DATA ASSESSMENT

An assessment of the Landfill No. 25 (SWMU 97) data was done to identify quality issues that could potentially affect the use of the data for the decision making process.

12.4.1 Sampling Issues

A review of the data contained in the Daily Quality Control Reports (DQCRs) indicated that for the field duplicate sample not enough groundwater was available for all of the analyses. Due to the slow recovery of the well, only the VOC sample could be collected. This was judged not to impact the data usability because the precision could be assessed with the DCS, MS/MSD, and MS/D results. Also, as discussed in section 4.5, much difficulty was

encountered when purging well MW-K for sampling. Four days elapsed between the time when the well was first purged and sufficient recovery took place to obtain samples. The quality of the samples could have been adversely impacted by this. Also, although the water was observed to be clear upon sampling, muddy conditions were observed during the purging events. Since the turbidity meter was nonfunctional at the time of well purging and sampling, no assessment of the effect of turbidity on sample quality can be made.

12.4.2 Data Review Issues

For the laboratory chemical data, QA/QC criteria for the evaluation of the groundwater samples were specified in the Cannon AFB RFI QAPP Addendum (W-C, 1994). The criteria were used as indicators of the quality necessary to support the identification and quantitation of the analytes. The data were reviewed using the criteria and guidance from the National Functional Guidelines for Organic Data Review (EPA, 1991) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988). A detailed review of SWMU 97 data is provided in the QCSR.

For the organic and inorganic analyses, qualification of data was not required based on outlying accuracy parameters except for the total chromatographable organic (TCO) analyses. The MS/MSD recoveries for TCO were below evaluation criteria. TCO data were qualified as estimated **J** (detects) or **UJ** (nondetects) to indicate a potential low bias for CAN097-MWOK-01. Precision parameters met the evaluation criteria for all analytes except carbon disulfide. For the field duplicate samples, carbon disulfide was qualified as estimated **J** (detects) or **UJ** (nondetects) based on an outlying RPD samples. Additionally, methylene chloride data were qualified as nondetect **U** for the samples based on blank contamination.

12.4.3 Reporting Limits

Reporting limits were raised for the lead analysis and the thallium analysis by no more than 10 times the nominal RL. For sample CAN097-MW0K-01, thallium analyses required a dilution due to matrix inferences. For lead analysis of sample CAN097-MW0K-01, reporting limits were raised due to matrix interference, and the lead result was qualified estimated **J**. These RLs did not limit the data usability because the RL was below the RBC for thallium, and lead was detected.

12.4.4 Summary of Data Usability and Limitations

Overall, the data generated for SWMU 97 were determined to meet quality criteria, and elevated reporting limits were judged not to impact the data usability. Based on the data review and other information, including field observations, data were judged to be acceptable to determine nature and extent and to be used for the human health risk screening.

12.5 NATURE AND EXTENT OF CONTAMINATION

Monitoring Well K was developed and sampled to assess whether or not SWMU-related contaminants had impacted the groundwater under the landfill. Two VOCs (carbon disulfide and toluene) and one SVOC (2-methylphenol) were detected in relatively low concentrations.

12.6 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of groundwater. Sources and characteristics of the waste materials placed at the SWMU, as well as comparison of SWMU sample concentrations to background concentrations, were used to assess whether metals in environmental samples may be SWMU related. Metals that occur in concentrations within background levels are not considered SWMU-related chemicals of concern and were not evaluated further.

Metals concentrations in groundwater reported at the SWMU were compared to the calculated background UTLs. The UTLs were calculated according to methodologies described in Appendix D. Barium and copper were considered to exceed background levels. All other metals detected in groundwater were considered to be within background levels. Results of the comparison are presented in Table 12-3 and summarized below.

Both detected concentrations of barium (290 and 660 μg/L) exceeded the background UTL of 74 μg/L. Therefore, barium was considered to exceed background levels and was retained for further evaluation.

One of two groundwater samples contained copper at a concentration (150 μg/L) which exceeded the background UTL of 20 μg/L. Since the exceedance was of a relatively large

magnitude (greater than 7), copper was considered to exceed background levels and was retained for further evaluation.

One of two groundwater samples contained vanadium at a concentration (35 μg/L) which exceeded the background UTL of 31 μg/L. The exceedance was of low magnitude (less than 2); therefore, vanadium was considered to be within background levels and was not retained for further evaluation.

12.7 RISK EVALUATION

12.7.1 Comparison of Groundwater Concentrations Detected in MW-K with RBCs

The objective of the Phase II investigation was to evaluate whether or not waste materials placed in Landfill No. 25 have impacted the groundwater. To meet this objective, Monitoring Well K, which is located within the landfill, was sampled for VOCs, SVOCs, TAL metals, TPH, TRPH, pesticides/PCBs, and chlorinated herbicides. The maximum detected Phase II groundwater concentrations were then compared to highly conservative EPA Region III risk-based concentrations (RBCs) for tap water (EPA 1994). EPA Region III RBCs were used because they are a comprehensive and up-to-date list of RBCs derived from accepted risk assessment methodology. A discussion of the methodology used to derive the RBCs is given in section 3.4 and Appendix D.

Table 12-4 shows the comparison of Phase II maximum concentrations with RBCs. Carbon disulfide was the only chemical detected at concentrations which exceeded the RBCs. The estimated potential hazard index associated with the detected concentration is 1.7. A hazard index greater than 1.0 indicates that unacceptable health effects may occur.

There are four chemicals reported in groundwater that could impact the cumulative HI (i.e., that are within an order of magnitude of the RBC). These are carbon disulfide, methylene chloride, barium, and lead. These compounds do not all have the same target organs; therefore, the potential toxic effects are not additive. Carbon disulfide and barium are both fetotoxic. Their combined HI is 1.8. Since carbon disulfide contributes 1.7 of the HI, it is the major constituent of concern at this site. All of the other compounds added together do

not have an HI which exceeds (or approaches) 1.0, nor a carcinogenic risk which exceeds 1×10^{-6}. Therefore, they present no significant risk at the site.

Two monitoring wells are located side- to downgradient of Monitoring Well K and Landfill No. 25 (see Figure 12-3, Monitoring Wells N and O). These wells are located approximately 3,500 feet downgradient of Monitoring Well K and are also downgradient of Landfills No. 4 and No. 3, respectively. Both of these wells contained minimal contamination, and neither well contained carbon disulfide (W-C 1995).

The detected concentration of carbon disulfide is at a level of potential concern. There is no immediate hazard from the carbon disulfide in Monitoring Well K because none of the Base production wells are located downgradient of the SWMU, and the results from Monitoring Wells N and O indicate that carbon disulfide is not being transported off Base. However, further monitoring is recommended to fully evaluate the impact to groundwater from Landfill No. 25.

12.8 SUMMARY AND RECOMMENDATIONS

Monitoring Well MW-0K was sampled for VOCs, SVOCs, pesticides and PCBs, herbicides, metals, TPH, and TRPH to assess the impact of SWMU-related contaminants on the groundwater downgradient of the landfill (No. 25).

Toluene, carbon disulfide, and 2-methylphenol were detected in the groundwater sample from this monitoring well. Only carbon disulfide exceeded RBCs by a sufficient amount to pose a potential health risk. The estimated hazard index (1.7) indicates that unacceptable health effects may occur. It was suspected that the carbon disulfide may be a field contaminant. For this reason, it is recommended that one additional sample for VOC analysis be collected to confirm the results of the Phase II sampling and to fully assess the impact to groundwater from Landfill No. 25.

Monitoring Well K was abandoned and replaced with Monitoring Well R in the spring of 1997. Quarterly and semiannual sampling results for Monitoring Wells N, O, and R are provided as separate submittals.

TABLE 12-1
SUMMARY OF GROUNDWATER ANALYTICAL AND QA/QC SAMPLING
LANDFILL NO. 25 (SWMU NO. 97)

Sample Location	Sample Identification Number	QA/QC Type	Analytical Parameters							Sample Containers		
			VOCs	SVOCs	Metals	Pest/PCB	Herbicides	TPH[1]	TRPH[2]	40 mL	1-L jar	1-L poly
MW-K	CAN097-MW0K-01		X	X	X	X	X	X	X	6	7	1
MW-K	CAN097-MW0K-02	FD	X							3		
MW-K	CAN097-MW0K-03	MRD	X	X	X	X		X		3	5	1
MW-K	CAN097-MW0K-04	TB	X							3		
MW-K	CAN097-MW0K-05	SB	X	X	X	X	X	X	X	6	7	1

FD = Field Duplicate
TB = Trip Blank
SB = Source Blank
MRD = Missouri River Division Split
MS/MSD = Matrix spike/matrix spike duplicate

(1) TPH includes Gasoline Range Organics (GRO) and Total Chromatographable Organics (TCO) by Modified EPD Method 8015.
(2) TRPH by EPA Method 418.1.
See Figure 12-1 for location of MW-K.

TABLE 12-2
SUMMARY OF COMPOUNDS DETECTED IN GROUNDWATER SAMPLE COLLECTED AT SWMU 097
CANNON AFB

LOCATOR	CAN097-MW0K-01			CAN097-MW0K-02		
LAB SAMPLE NUMBER	0402760002SA			0402760003SA		
COLLECT DATE	01/23/95			01/23/95		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Carbon disulfide	36	5		<	5	U
Methylene chloride	1.7	5	J	1.3	5	J
Toluene	12	5		17	5	
Semivolatile Organics (µg/L)						
2-Methylphenol	1.2	10	J			
Metals (mg/L)						
Arsenic	0.0014	0.005	J			
Barium	0.29	0.01				
Copper	0.011	0.02	J			
Lead	0.0013	0.01	J			
Selenium	0.0048	0.005	J			
Vanadium	0.026	0.01				
Zinc	0.013	0.02	J			

Results presented here are only those chemicals which were detected at least once at this SWMU and have passed data review.

A complete summary of chemical results are presented in Table A-7.

J = Estimated value.

R = Rejected value. D = Sample was diluted for analysis.

U = Nondetected value. RL = Reporting Limit.

TABLE 12-3

COMPARISON OF MW-K GROUNDWATER METALS CONCENTRATIONS WITH BACKGROUND LEVELS

Sampling Date	Arsenic	Barium	Copper	Lead	Selenium	Vanadium	Zinc
Oct-92	4.7	660	150	34	ND	35	49
Jan-95	1.4	290	11	1.3	4.8	26	13
Bkg UTL(1)	50[b]	74[a]	20[b]	50[b]	4.9[a]	31[a]	90[a]
Site > Bkg	NO	**YES**	**YES**	NO	NO	NO	NO

[1] Upper Tolerance Limit (UTL) of background. See Appendix D for methodology.

[a] Highest detected concentration

[b] Highest reporting limit

Bkg - Background

ND = Not Detected

Shading indicates SWMU concentration exceeds the background UTL.

All concentrations given in µg/L.

TABLE 12-4

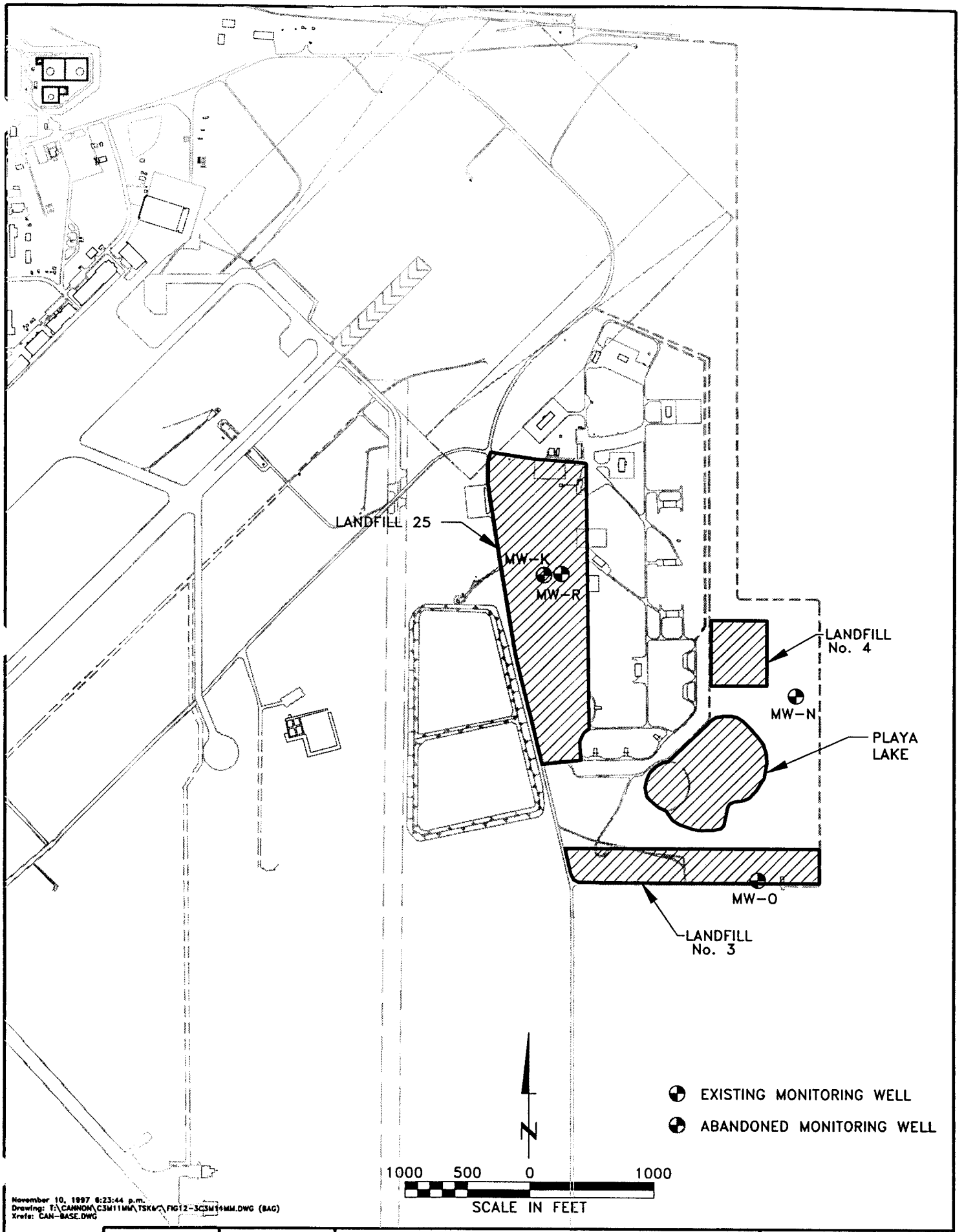
COMPARISON OF PHASE II GROUNDWATER CONCENTRATIONS TO TAP WATER RBCs
SWMU 97, CANNON AFB
Landfill 25, Monitoring Well K

Chemical	Detected Concentrations from 10/92 (µg/L)	Phase II Maximum Detected Concentration (µg/L)	Tap Water Risk-Based Concentration(1) (µg/L)	Phase II Exceeds RBC?	Estimated Risk(2)	Risk Type
Carbon disulfide	NA	36	21	YES	1.7	noncarcinogenic
Methylene chloride	NA	1.7	4.1	NO		
Toluene	NA	17	750	NO		
2-Methylphenol	NA	1.2	1,800	NO		
Barium	660	290	2,600	NO		
Copper	150	11	1,400	NO		
Lead	34	2.5	15(a)	NO		

(1) EPA Region III Risk-Based Concentrations for tap water (EPA 1994).

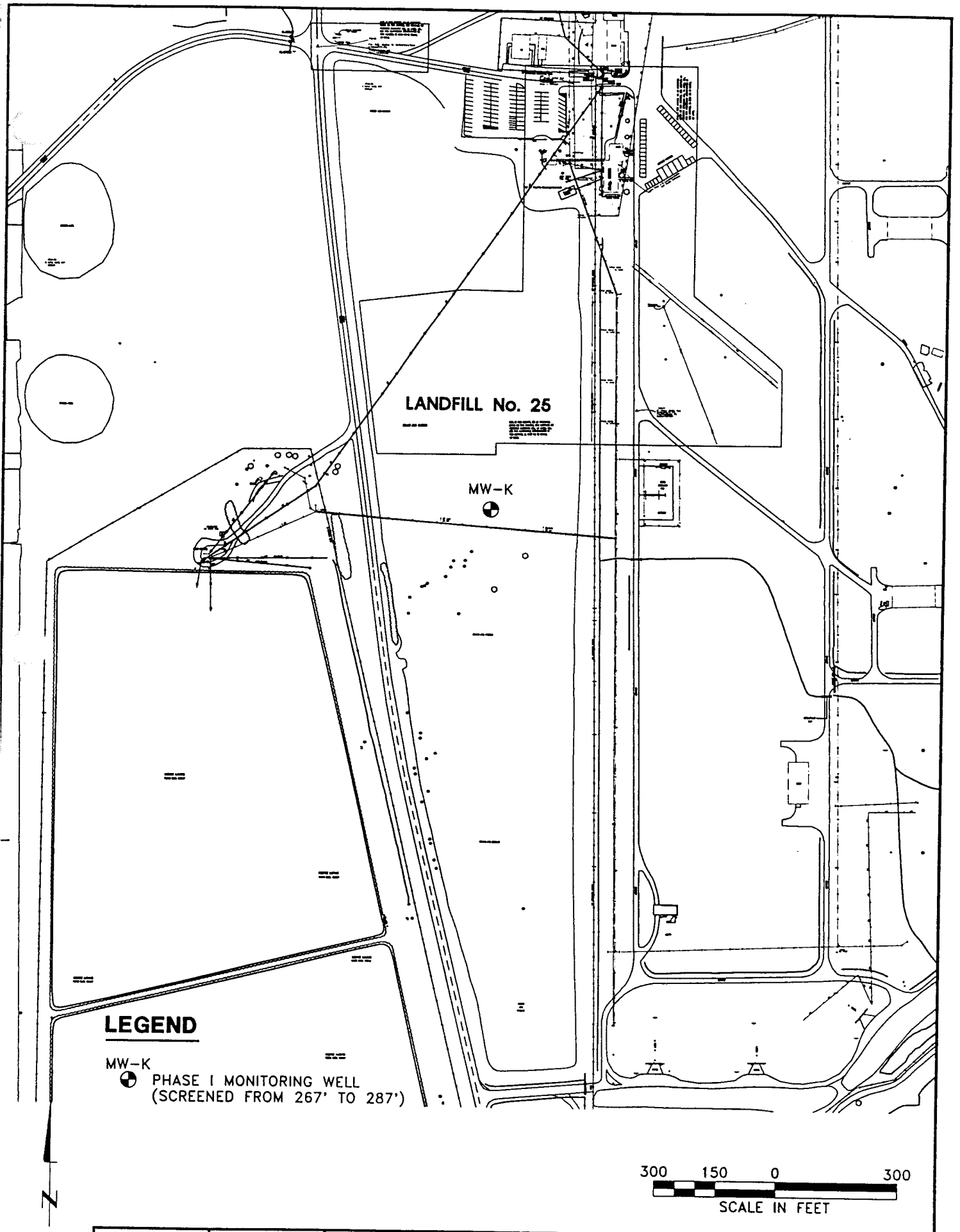
(2) Estimated risk = concentration/RBC (for noncarcinogens)

NA = Not Analyzed For (During the initial sampling of this well, analysis was done for only metals, PCBs, and pesticides).
Metals were the only chemicals detected at that time.

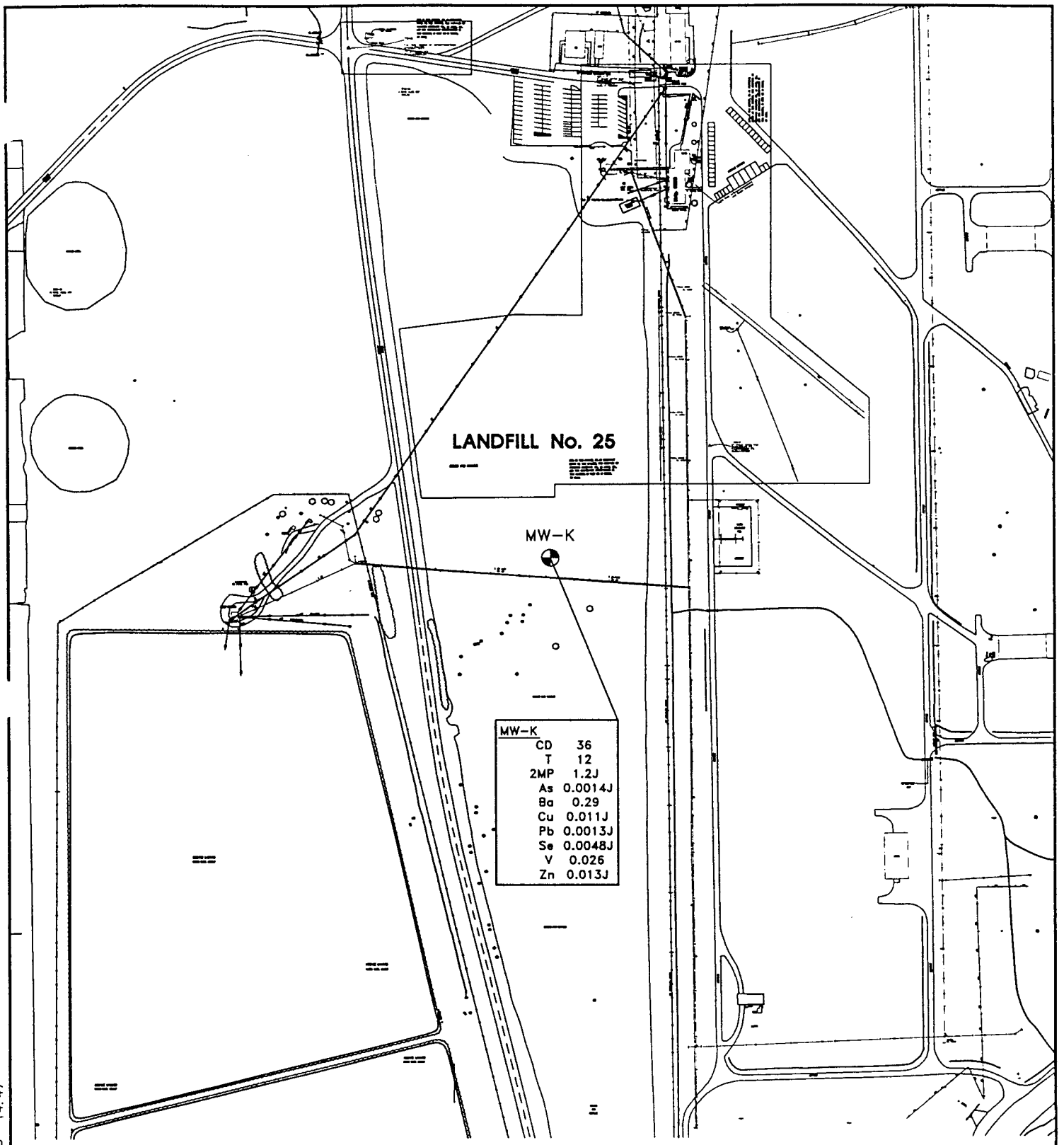


November 10, 1997 6:23:44 p.m.
Drawing: T:\CANNON\C3M11MM\TSK6\FIG12-3C3M11MM.DWG (BAG)
Xrefs: CAN-BASE.DWG

DRN BY BAG	DATE 11/10/97	LANDFILL LOCATIONS CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	12-3



DRN BY JWB	DATE: 06/17/94	LANDFILL No. 25 – SWMU 97 SITE PLAN AND MONITORING WELL K LOCATION CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	12-1



LEGEND:

MW-K
PHASE I MONITORING WELL
(SCREENED FROM 267' TO 287')

As=ARSENIC (mg/k
Ba=BARIUM (mg/kg)
Cu=COPPER (mg/kg
Pb=LEAD (mg/kg)
Se=SELENIUM (mg/kg)

V=VANADIUM (mg/kg)
Zn=ZINC (mg/kg)
CD=CARBON DISULFIDE
T=TOLUENE
2MP=2-METHYLPHENOL

CONCENTRATIONS ARE μg/kg
EXCEPT WHERE NOTED

ND=CHEMICALS ANALYZED FOR
WERE NOT DETECTED

300 150 0 300
SCALE IN FEET

DRN BY TBS	DATE: 03/29/95	LANDFILL No. 25 – SWMU 97 MONITORING WELL K LOCATION CHEMICAL CONCENTRATIONS DETECTED IN GROUNDWATER CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. C3M11MM
CHK'D BY	REVISIONS: 0		FIG. No. 12-2

REPORT : APP III RFI
04/05/1995 14:47
3M11MM18.DWG

13.0
SUMMARY OF RECOMMENDATIONS

The seven SWMUs in the Appendix III group, investigated under the Phase II RFI as a whole, do not appear to be seriously contaminated. Table 13-A shows a summary of the recommendations made for each SWMU.

TABLE 13-A

SWMU Number	Recommendation
31	~~NFA~~ CMS
93	NFA
127	~~NFA~~ CMS
55	NFA
77	~~NFA~~ CMS
103	NFA
97	~~FE~~ CMS

Note: The key to column 2 above is as follows:

- NFA = No Further Action
- FE = Further Evaluation

14.0
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