DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 27th FIGHTER WING (ACC)
CANNON AIR FORCE BASE, NEW MEXICO

Colonel James A. Thomas III
Commander, 27th Support Group
110 E Sextant Avenue Suite 1098
Cannon AFB NM 88103-5323

15 DEC 1997

Mr. Benito J. Garcia, Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo Street
PO Box 26110
Santa Fe NM 87502

Dear Mr. Garcia

Enclosed for your review and approval is the response to your request for additional information in your 19 Sep 97 approval letter for the Phase III Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for Solid Waste Management Units (SWMUs) 86-90.

A Statement of Services (SOS) to be performed for the Corrective Measures Study (CMS), requested by your bureau for the SWMUs 86-90, is also included for your review. The SOS is being submitted in lieu of a CMS Plan because the time necessary to acquire funding and award a contract to generate the plan exceeds the New Mexico Environment Department (NMED) time limitation for submittal. The action has been approved by members of your staff as an interim measure until environmental funds can be acquired for the CMS Plan.

If you have any questions, please contact Mr. Sanford Hutsell of my environmental staff, at (505) 784-6378.

Sincerely

JAMES A THOMAS III, Colonel, USAF

Attachments:
1. Contractors Response
2. Statement of Services

cc:
NMED (C. Will)
NMED GW Bureau (J. Jacobs)
EPA Region VI (D. Neleigh)
HQ ACC CES/ESVW (M. Patterson)
27 FW/CC

RESPONSE TO COMMENTS
ISSUED BY STATE OF NEW MEXICO ENVIRONMENT DEPARTMENT
TECHNICAL ADEQUACY REVIEW OF PHASE III RFI REPORT FOR
SWMUs 86-90
CANNON AIR FORCE BASE, NEW MEXICO

Comment 1. After reviewing the Report, the HRMB has found the Report to be technically adequate and approves the Report. However, the HRMB has determined that a Corrective Measures Study (CMS) must be submitted to determine the most effective means of reducing TPH levels in soil to under 1,000 ppm, the HRMB cleanup level for TPH. TPH was detected at the Site at up to 5,390 ppm.

Response: Comment noted. A Final RFI Report will be issued. A CMS will be submitted.

Comment 2. The CMS should address the following issues from the RFI Report. Issues regarding the extent of contamination must be resolved in the CMS in order to accurately determine how the site is to be remediated.

Response: The extent of contamination will be reviewed in the CMS.

Comment 3. The horizontal extent of contamination has not been determined.

Response: See comment above.

Comment 4. Insufficient information is provided regarding residual contamination below SWMUs 87 and 89, the former leach field and the evaporation pond, respectively. These SWMUs were constructed to discharge hazardous constituents to the vadose zone. Section 4-3 suggests that previous investigations may have either incorrect or inadequate soil and analytical information for these SWMUs. For example, B-1 (Walk, Haydel) was drilled in the vicinity of 0868 (WCC) and failed to detect the high concentrations of acetone and TPA and possibly other constituents. This information calls into question the data from B-2 through B-5 (Walk, Haydel), which were the primary boreholes associated with SWMUs 87 and 89. CAFB should identify all data gaps and fill those gaps.

Response: Available information for all SWMUs will be reviewed in the CMSs and data gaps, if any, identified.

Comment 5. Explain the discrepancy between the statement in Section 9.1, at page 9-1, line eight, that the depth of backfill is about 15 feet at its deepest point, and the statement at page 4-5, line 25, that the excavation depth was 25 feet.

FINAL RFI REPORT

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RCRA FACILITY INVESTIGATION APPENDIX I SWMUs 86-90 (IRP SITE SD-11) - PHASE III

CANNON AIR FORCE BASE NEW MEXICO

Prepared for
U.S. Army Corps of Engineers, Omaha Dis
Omaha, Nebraska
November 1997

Woodward-Clyde

101 South 108th Avenue
Omaha, Nebraska 68154

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
CFR	Code of Federal Regulations
CMP	Corrugated Metal Pipe
CMS	Corrective Measures Study
CO_2	Carbon dioxide
COC	Chemicals of concern or chain of custody
CRQL	Contract Required Quantitation Limit
DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
EPFC	Exposure Pathway Flow Chart
ES	Engineering Science
FS	Feasibility Study
HQ	Hazard Quotient
HSA	Hollow-stem auger
HSWA	Hazardous and Solid Waste Management Act
ID	Inside Diameter
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
MS	Matrix spike
MSD	Matrix spike duplicate

msl	Mean sea level
MW	Monitoring Well
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NWR	National Wildlife Refuge
OD	Outside Diameter
OERA	Old Entomology Rinse Area
OVA	Organic Vapor Analyzer
OWS	Oil/water separator
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated Biphenyls
PVC	Polyvinyl Chloride
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
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RSI	Remediation Services Incorporated
SARA	Superfund Amendments and Reauthorization Act
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

TDS	Total Dissolved Solids
T/E	Threatened/endangered
TFW	Tactical Fighter Wing
TIC	Tentatively Identified Compounds
TPH	Total petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
U.S	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USCS	Unified Soil Classification System
UST	Underground storage tank
UTL	Upper tolerance limit
VOC	Volatile organic compound
VSI	Visual Site Inspection
W-C	Woodward-Clyde
WHA	Walk-Haydel Associates

UNITARY ABBREVIATIONS

C	celsius
CFU/g	Colony Forming Units per gram
cm	centimeter
cm/sec	centimeters per second
cm/yr	centimeters per year
F	Fahrenheit
ft	feet
gal/ft	gallons per foot
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
mm	millimeter
mph	miles per hour
NTUs	Nephlometric Turbidity Unit
ppm	parts per million
%R	percent recoveries
RfD	reference dose
µg/kg	micrograms per kilogram
yr or y	year

Cannon Air Force Base (AFB) 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. This Phase III RFI is directed at Appendix I SWMUs 86-90 (Site SD-11) and is being completed as required by the terms of the permit.

Woodward-Clyde (W-C) has completed the Phase III 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, it also fulfills basic requirements under Comprehensive Environmental Response, Compensation and Liability Act (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.

Previous investigations, studies, or actions completed at Appendix I SWMUs 86-90 (Site SD-11) include the following:

- 1983 - Phase I IRP Records Search (ES 1985)
- 1984-1985 - Phase II IRP Investigation (Radian 1986)
- 1987 - RCRA Facility Assessment (A.T. Kearney 1987)
- 1989 - Remedial Investigation (WHA 1990)
- 1991 - 18 SWMUs RI (W-C 1992)
- 1994 - OWS Removal Action (RSI 1994)

The results of the above are summarized in Section 4.3. During the removal action for the oil/water separator (OWS), contaminated soil was encountered which was not expected based

on previous investigation results. This Phase III RFI was initiated to evaluate the nature and extent of contamination at these SWMUs. The Phase III RFI field investigation was completed during October 1995, and it consisted of sampling surface and subsurface soils, and sampling groundwater from a nearby Base well. Field immunoassay kits were used to determine sampling intervals and confirm completion of borings.

The Phase III sampling rationale was developed to gather information to assess the vertical and horizontal extent of site contamination at SWMUs. Phase III 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 RBCs were used to either support recommendations from earlier studies or to recommend further evaluation for the SWMUs.

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

Site	SWMU Number
Engine Test Cell	86
Overflow Pit	87
Former Leaching Field	88
Evaporation Pond	89
Oil/Water Separator	90

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:

- Target Compound List (TCL) volatile organic compounds (VOCs)
- Semivolatile organic compounds (SVOCs)
- Target Analyte List (TAL) metals
- Total petroleum hydrocarbons (TPH)
- Pesticides/PCBs (water only)
- Herbicides (water only)

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 summarizes the site description, field investigation, physical characteristics, nature and extent of contamination, results of the screening-level risk evaluation, and recommendations resulting from the evaluation.

Site Description

Appendix I SWMUs 86-90 (Site SD-11) are located the in the southeast part of Cannon AFB, near Building 2330. The concrete slab on which the former test cell rested is currently used to conduct outdoor jet engine tests. Potential contaminants from past operations include lubricating and synthetic oils, residual JP-4, and solvents.

Field Investigation

The Phase III field sampling program consisted of collecting 39 soil samples for chemical analysis from 9 borings completed in the area of the former OWS. Immunoassay testing of soil samples for petroleum hydrocarbons was conducted in the field to select intervals for chemical analysis and confirm completion of borings. Six and eight soil samples, respectively, were selected for microbiological and geotechnical analysis. A groundwater sample was also collected from Base Well No. 9 which is located about 300 feet northwest of the location of the former OWS.

Physical Characteristics

Topography is relatively flat. Jet thrusts from outdoor engine tests have eroded soil in the area of the former OWS. Backfill placed for the OWS removal action consists of primarily silty clay and has a maximum depth of about 15 feet. Shallow geology consists of silty clay with fine sand, clayey silt with fine sand, sandy silt, and/or silty sand underlain by fine-grained sand with silt. The fine-grained sand begins at depths of 15 to 20 feet and contains cemented zones or layers of caliche.

Nature and Extent of Contamination

Low to moderate levels of TPH (< 1,000 mg/kg) were detected in surface soil and/or in backfill soil. Moderate to high concentrations of TPH (> 1,000 mg/kg) were detected in soils below the zone of backfill. Some VOCs and SVOCs were also detected below the zone of backfill. Below the zone of backfill, contaminant concentrations decreased with depth to non-detect levels. Maximum depth of detected contamination was 60 feet. Only low levels of metals, each considered to be within background, were detected in soil.

Groundwater Results

Bromoform, arsenic, barium, copper, and vanadium were detected in the groundwater sample collected from Base Well No. 9. Each was detected below its respective published maximum contaminant level (MCL). Bromoform was detected below its RBC for tap water. Vanadium was the only metal detected above its background level, but was below its RBC for tap water.

Risk Evaluation

Benzo(a)pyrene was the only chemical detected in soil at a concentration that exceeded its residential RBC. No chemicals were detected in soil at concentrations exceeding industrial RBCs. Total estimated potential carcinogenic and noncarcinogenic risks are within or below acceptable levels. Potential impact to groundwater by contaminants detected in soil is low.

Recommendations

Based on the results of the Phase III RFI, no further action is recommended for Appendix I SWMUs 86-90 (Site SD-11) under the site's current use and setting.

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 SWMUs 86-90 (Site SD-11) are the subject of this Phase III RCRA Facility Investigation (RFI) report (See Table 1-1).

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 III 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 Phase III RFI is to obtain the data necessary to characterize the nature and extent of contamination to the degree necessary to:

- Support recommendations from earlier studies
- Support recommendations for further studies
- Identify corrective measures alternatives for the site
- Recommend "no further action," if warranted

The data collected during the Phase III RFI is used to evaluate human health 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 III RFI has been specified by the USACE on behalf of the USAF to require the contractor to address SWMUs 86-90 listed in Appendix I of the RCRA Permit at Cannon AFB. The field investigation has been limited mainly to soil sampling in the areas of potential releases from the SWMUs. 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 at appropriate locations and soil samples were collected for the purpose of determining the degree of contamination, if any, that existed in the soil. In addition to soil sampling, groundwater was sampled from a nearby Base well.

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

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 with investigated

SWMU site locations is shown on Figure 1-2. Figure 1-3 shows the potentiometric surface in the vicinity of the Base. 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 III RFI, investigative activities completed at Cannon AFB include the following:

- IRP Records Search - CH_2M 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 (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
- Work Plan for Phase I RFI, Appendix III SWMUs - Phase I. W-C September 1993.
- Work Plan for Phase I RFI, LF No. 5, Solid Waste Management Unit 113, IRP LF-5. July 1995.
- RFI Activities, Phase II to Appendix I SWMUs, Supplemental RFI Report - January 1995
- RFI (Phase I) - Landfills 3, 4, and 25 - Radian - 1992-1994
- RFI (Phase II) - Appendix II SWMUs (draft) - W-C - 1994-1995
- RFI (Phase II) - Appendix III SWMUs (draft) - W-C - 1994-1995

1.5 APPENDIX I SWMUs ACTIVITY UPDATE

The following subsections present an activity update for each of the Appendix I SWMUs listed in Cannon AFB's RCRA Part B Permit. A summary table of the status of the SWMUs is provided in Table 1-2.

1.5.1 SWMU No. 34 (AGE Drainage Ditch)

The AGE Drainage Ditch is a 1,200-foot-long, 12-foot-wide shallow ditch (approximately 1 foot deep at its deepest point). This SWMU originates on the flightline side of AGE Building 186 and runs parallel to Facilities Buildings Nos. 191, 192, and 193, terminating on base at a culvert inlet near Argentia Avenue. A 1991 RI (W-C 1992) included surface and subsurface soil sampling for chemical analyses, and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.2 SWMU No. 74 (Landfill No. 1)

This SWMU is an inactive landfill located in the north-central portion of Cannon AFB, south of the northern perimeter road. Landfill No. 1 is currently located beneath part of the base golf course. A 1992 RFI (W-C 1993) at the previously reported location for Landfill No. 1, northeast of the base hospital, encountered no evidence of landfill material. As a result of the 1992 RFI and with EPA Region VI concurrence, no additional investigation was done at this location for Landfill No. 1.

In 1993, Cannon AFB encountered suspected landfill material during golf course expansion activities. An approximately 10-acre area, located within the western extent of the golf course and south of the northern perimeter road, has been identified for further investigation in 1995-1996 as Landfill No. 1.

1.5.3 SWMU No. 75 (Sanitary Sewage Lift Station Overflow Pit)

This SWMU is an unlined surface impoundment located on the golf course, north of the hospital and residential area. The overflow pit is located adjacent to the Sanitary Sewage Lift Station and provides containment for overflow when the lift station pumps do not operate. Reportedly, the overflow pit is located on a section of the base sanitary sewer system that handles only domestic sewage. Sewage from domestic areas is generally not considered hazardous. The overflow pit was characterized during the IRP Phase II investigation (Radian 1986), resulting in identification of this SWMU as one of the sites requiring no further action. This area was reportedly incorrectly defined as a SWMU under USEPA's definition of a SWMU for the purpose of corrective action, and therefore was not identified as requiring further study or action (Lee Wan & Associates 1990).

1.5.4 SWMU No. 76 (Sludge Weathering Pit)

The Sludge Weathering Pit is located near Building 396 on the north part of the base and was used for weathering sludge from leaded gas tanks in the 1960s and 1970s. In 1980, the pit was filled with soil and left to revegetate. A 1991 RI (W-C 1992) included surface and subsurface soil sampling for chemical analyses and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or

investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.5 SWMU No. 78 (Fire Department Training Area No. 1)

Fire Department Training Area No. 1 is located in an open field in the northeast corner of the base, south of the railroad tracks and northeast of Perimeter Road. This SWMU was used to conduct fire department training exercises from 1959 to 1968. A 1991 RI (W-C 1992) included surface and subsurface soil sampling for chemical analyses and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.6 SWMU No. 81 (Solvent Disposal Site)

The Solvent Disposal Site is located on the northeast part of the base between Landfill No. 2 and Fire Department Training Area No. 1. The site is located in an open field covered with prairie grass. A 1991 RI (W-C 1992) included surface and subsurface soil sampling for chemical analyses and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.7 SWMU No. 82 (Landfill No. 2)

Landfill No. 2 is an unlined, inactive, cut-and-fill landfill occupying approximately 15 acres in the northeast corner of the base. It is located in an open field just beyond the end of the primary southwest-northeast runway, northeast of Perimeter Road. The landfill received wastes from 1946 to 1947 and from 1952 to 1959. Reportedly, the mode of operation at this SWMU was for wastes to be deposited in trenches, burned, and buried. A 1992 RFI (W-C 1993) included an aerial photograph review, geophysical survey, trenching one pit, surface and subsurface soil sampling for chemical analyses, and performance of a Baseline

Human Health and Environmental Risk Assessment. The 1992 RFI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.8 SWMU No. 85 (Stormwater Collection Point)

This SWMU is a naturally-occurring playa lake located in the southwestern portion of the base that has received stormwater runoff from the flightline area and POL materials from small spills which could accumulate in the lake. The Stormwater Collection Point was characterized during the IRP Phase II (Radian 1986) and remedial investigations (Walk, Haydel & Associates, Inc. 1990). The RI resulted in the finding that no adverse impact to public health or the environment was expected and that no further study or action was required. EPA, by accepting the RI report (Walk, Haydel & Associates 1990) and the RFI Work Plan prepared by Lee Wan & Associates (1990), agreed with this recommendation.

1.5.9 SWMU Nos. 86-90 Oil/Water Separator Removal (Engine Test Cell)

The five SWMUs (Nos. 86, 87, 88, 89, and 90) at the Engine Test Cell location are commonly referred to as IRP No. SD-11. The oil/water separators and an underground storage tank (UST) were removed during July and August 1994 (RSI 1994). During the removal action, contaminated soil was encountered which was not expected based on the soil boring information collected during the 18 SWMU RI in 1991. Since contaminated soil was encountered, the removal action ceased, and this Phase III RFI was initiated to evaluate the nature and extent of contaminated subsurface soil at these SWMUs.

1.5.10 Discharge Monitoring at Northeast Stormwater Drainage (SWMU No. 95)

This SWMU consists of a 42-inch corrugated metal pipe (CMP) that discharges to an open ditch near northeast Runway 4/22, and extends under a road to an open field. The drainage receives water from several oil/water separators and runoff and stormwater drains in the east-central portion of the base. The Northeast Stormwater Drainage Area is included as part of the Base-wide Stormwater and National Pollutant Discharge Elimination System (NPDES)

Permit. This permit requires Cannon AFB to determine if sampling is required in accordance with the EPA guidance document entitled "Stormwater Management for Industrial Activities" (EPA 832/R-92/006).

1.5.11 Additional RFI at SWMU No. 96 (Old Entomology Rinse Area)

A Phase II RFI at the location of the sink rinse pit within the OERA was designed to further characterize the nature and extent of contamination (if any) at this SWMU. The Phase II RFI consisted of drilling and collection of soil samples for chemical analyses from one 100-foot-deep soil boring located at the approximate location of the former OERA rinse sink pit. Based on the results of the Phase II RFI, no further action was recommended for SWMU No. 96 (W-C 1995c).

1.5.12 SWMU No. 98 (Sanitary Sewer Line)

This SWMU consists of a northeast-flowing trunk line laid along Torch Boulevard in the aircraft maintenance area, with a small south-flowing branch along Torch Boulevard near the main base entrance. A secondary southeast-flowing sewer line enters the main trunk line along Torch Boulevard at Argentia Avenue, then enters a transmission line flowing east across the runways to the sewage treatment lagoons. Only the main and south branch trunk lines, and the east-flowing transmission lines, could have received hazardous wastes. Secondary branch lines flowing northeast to join the main trunk line receive only domestic sewage. The sewer lines are constructed of 8-inch-diameter polyvinyl chloride (PVC) pipe in the housing area and 15-inch-diameter clay tile in the main base area. A 1991 RI (W-C 1992) included sewer line cleaning and video camera inspection/surveying, subsurface soil sampling for chemical analyses, and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.13 Annual Groundwater Monitoring at SWMU Nos. 101 and 102 (Wastewater Treatment Lagoons)

Groundwater samples are collected and submitted for laboratory analysis on an annual basis from four groundwater monitoring wells (101-E, 101-F, 101-G, and 101-H) at this SWMU. Cannon AFB submits analytical results to EPA Region VI within 90 calendar days following the sampling. The samples are analyzed for volatile organic compounds (VOCs), pesticides/polychlorinated biphenyls (PCB's), metals, nitrates, sulfates, and total dissolved solids (TDS). The analytical methods are specified in the USACE Work Plan.

1.5.14 SWMU No. 104 (Landfill No. 4)

This SWMU is an inactive landfill located in the east-central portion of the base, north of the Playa Lake (SWMU No. 103). After the Phase I RFI at Landfill No. 4 in 1992, EPA Region VI requested a Phase II RFI be designed to ascertain if a corrective measures program is required. The Phase II RFI for Landfill No. 4, consisting of the installation, sampling, and analysis at one downgradient groundwater monitoring well, was completed and the results of the investigation submitted to EPA Region VI in April 1995.

1.5.15 SWMU No. 105 (Landfill No. 3)

This SWMU is an inactive landfill located in the east-central portion of the base, south of the Playa Lake (SWMU No. 103). After the Phase I RFI in 1992, EPA Region VI requested a Phase II RFI be designed to ascertain if a corrective measures program is required. The Phase II RFI for Landfill No. 3, consisting of the installation, sampling and analysis at one downgradient groundwater monitoring well, was completed and the results of the investigation were submitted to EPA Region VI in April 1995.

1.5.16 SWMU No. 106 (Fire Department Training Area No. 2)

Fire Department Training Area No. 2 is located in an open, grass-covered field in the southeast corner of the base, bounded on the north by an east-west paved road and west of an old abandoned north-south runway. This SWMU was used from 1968 to 1974 to provide fire extinguishing experience for base personnel. A 1991 RI (W-C 1992) included surface and

subsurface soil sampling for chemical analyses and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.17 SWMU No. 107 (Fire Department Training Area No. 3)

Fire Department Training Area No. 3 was an unlined surface area, partially covered with gravel, located in the southern part of the base. It is immediately adjacent to an abandoned north-south runway. This SWMU was used for fire department training activities from 1968 to 1974. Recently, it has been used for activities associated with an adjacent explosive ordnance training site. A 1991 RI (W-C 1992) included surface and subsurface soil sampling for chemical analyses and performance of a Baseline Human Health and Environmental Risk Assessment. The 1991 RI report recommended no further action or investigation was required at this time. To complete the RFI/CMS process for this SWMU, Cannon AFB will need to apply for a Class III RCRA Part B Permit modification under 40 CFR 270.42(c).

1.5.18 Additional RFI at SWMU Nos. 109, 110, 111, and 112 (Fire Training Area No. 4)

The full nature and extent of contamination at Fire Training Area No. 4 (SWMU No. 109) was not evaluated by the 1991 RI since this SWMU was an active facility. An additional investigation is scheduled for 1996. The Phase II RFI planned for Fire Training Area No. 4 includes investigation of SWMU Nos. 110 (underground waste oil tank No. 2336), 111 (unlined pit), and 112 (oil/water separator No. 2336), that are collocated with SWMU No. 109. The unlined pit (SWMU No. 111) was replaced by oil/water separator No. 2336 in 1985. Previous investigations of the unlined pit area have resulted in no further action recommendations (Radian 1986; A.T. Kearney 1987; Walk, Haydel & Associates 1990). However, since SWMU No. 111 is collocated within the boundaries of Fire Training Area No. 4, it will be included in the Phase II RFI for Fire Training Area No. 4.

1.5.19 SWMU No. 113 (Landfill No. 5)

This SWMU is an inactive landfill located in the southeastern area of the base and occupies about 70 acres. Cell No. 3, which is closed, is RCRA-regulated because this cell received hazardous waste until mid-1981. No additional hazardous wastes were placed in this cell from 1981 until its closure in 1983. Landfill closure consisted of placing an impermeable cap over Cell No. 3, in accordance with NMED and EPA requirements. During the 18-SWMU RI (W-C 1992), groundwater samples were collected and analyzed for Appendix IX constituents (40 CFR 264) from five previously installed groundwater monitoring wells at Landfill No. 5. Evaluation of the chemical data collected during this investigation indicated that the quality of groundwater has not been affected by past activities at Landfill No. 5. Additional groundwater monitoring wells were also installed in 1992 by USACE to meet RCRA release detection monitoring requirements.

Landfill No. 5 is currently being investigated using a phased RFI approach, under NMED lead. The Phase I RFI Work Plans have been finalized, and the Phase I investigation and report are scheduled to be complete in early 1997. A Draft Post-Closure Plan (ES 1994) for Cell 3 requires installation of a new upgradient well and water quality sampling for one year to determine baseline water quality beneath Landfill No. 5. However, groundwater monitoring plans for the landfill will be finalized after completion of the RFI and the first year of post-closure groundwater sampling and analysis.

TABLE 1-1

APPENDIX I SWMUS ADDRESSED IN THIS WORK EFFORT

SWMU Number	Site Description
86	Engine Test Cell
87	Overflow Pit
88	Former Leaching Field
89	Evaporation Pond
90	Oil/Water Separator

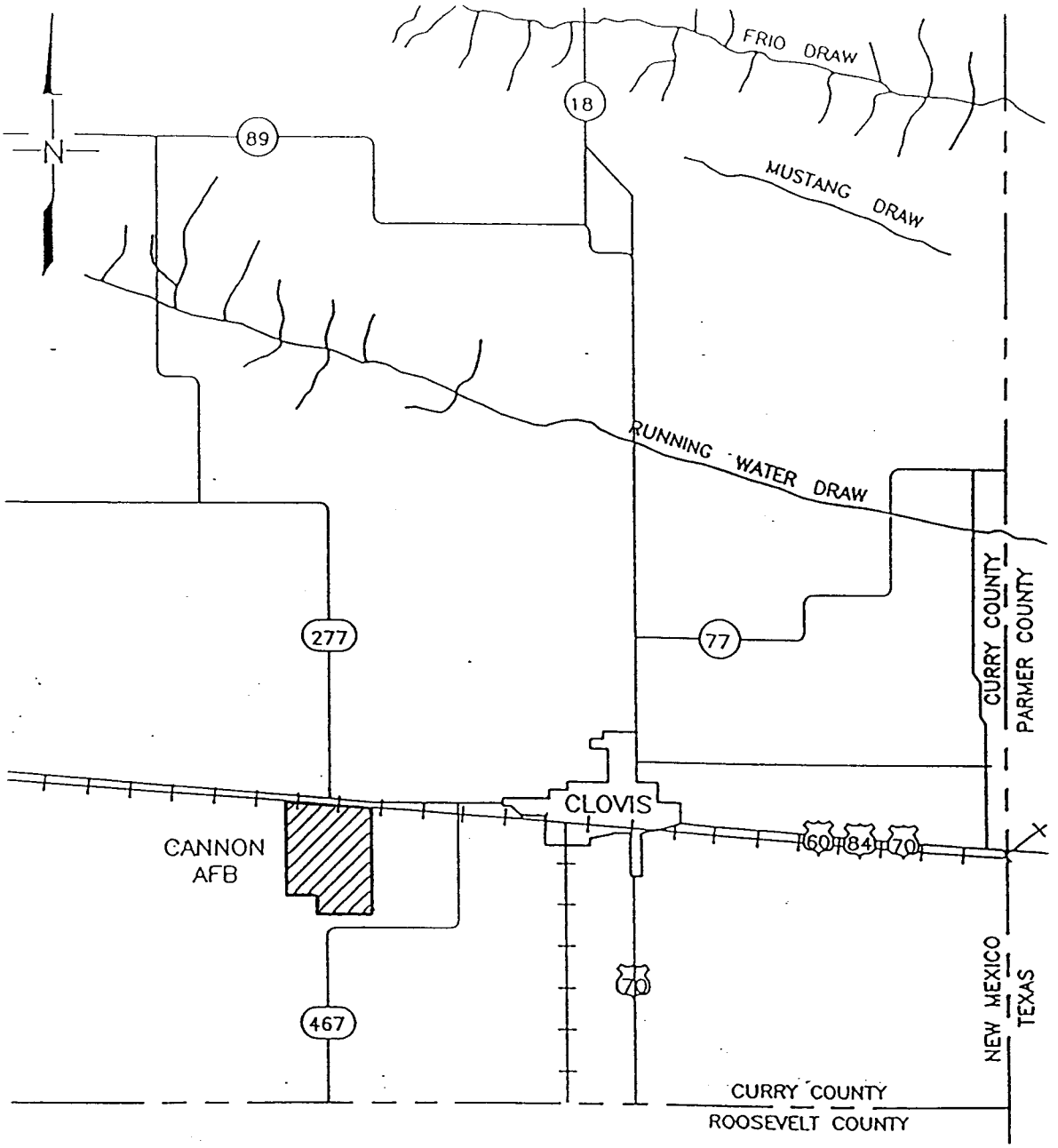
TABLE 1-2

CANNON AIR FORCE BASE, CLOVIS, NEW MEXICO
APPENDIX I SWMUS ADDRESSED IN OTHER WORK EFFORTS

SWMU NO.	SWMU DESCRIPTION	STATUS		
		PHASE I	PHASE II	PHASE III
34	AGE Drainage Ditch (IRP No. SD-11)	YES	YES	NFA
74	Landfill No. 1 (IRP No. LF-1)[1]	YES	F.Y. 95	TBD
75	Sanitary Sewage Lift Station Overflow Pit (IRP No. SD-13)	NFA	NFA	NFA
76	Sludge Weathering Pit (IRP No. WP-14)	YES	YES	NFA
78	Fire Training Area No. 1 (IRP No. FT-6)	YES	YES	NFA
81	Solvent Disposal Area (IRP No. DP-16)	YES	YES	NFA
82	Landfill No. 2 (IRP No. LF-2)	YES	YES	NFA
85	Stormwater Collection Point (IRP No. SD-12)	NFA	NFA	NFA
95	NE Stormwater Drainage Area (IRP No. SD-20)	YES	YES	TBD
96	Old Entomology Rinse Area (IRP No. SD-17)	YES	YES	TBD
98	Sanitary Sewer Line	YES	YES	NFA
101	Wastewater Treatment System Lagoons (IRP No. WP-21)	YES	YES	Groundwater Monitoring
102	Wastewater Treatment Effluent Discharge (IRP No. WP-21)	YES	YES	Groundwater Monitoring
104	Landfill No. 4 (IRP No. LF-4)	YES	YES	TBD
105	Landfill No. 3 (IRP No. LF-3)	YES	YES	TBD
106	Fire Training Area No. 2 (IRP No. FT-7)	YES	YES	NFA
107	Fire Training Area No. 3 (IRP No. FT-8)	YES	YES	NFA
109	Fire Training Area No. 4 (IRP No. FT-9) **(To be investigated in C.Y. 95 after new one is built) (Investigated with SWMU No. 109)**	YES	C.Y. 95	TBD
110	Underground Waste Oil Tank No. 2336[3]	YES	C.Y. 95	TBD
111	Unlined Pit	YES	NFA	NFA
112	Oil/Water Separator No. 2336[2]	YES	C.Y. 95	TBD
113	Landfill No. 5 (IRP No. LF-5)[4]	YES	State Lead	TBD

Notes:
C.Y.95 = Calendar Year 1995
F.Y.95 = Fiscal Year 1995
NFA = No Further Action
TBD = To be Determined

[1] Initially No Further Action, recent discovery requires investigation.
[2] Included in Appendix III, being investigated with SD-11.
[3] Included in Appendix II, being investigated with FT-9.
[4] NMED has primacy, with EPA Region VI review and concurrence.



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SCALE IN MILES

DRN BY SCR	DATE 06/21/94	REGIONAL MAP CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3MIIMM	1-1

REPORT PHASE: PI. ... RFI SITE SD-11

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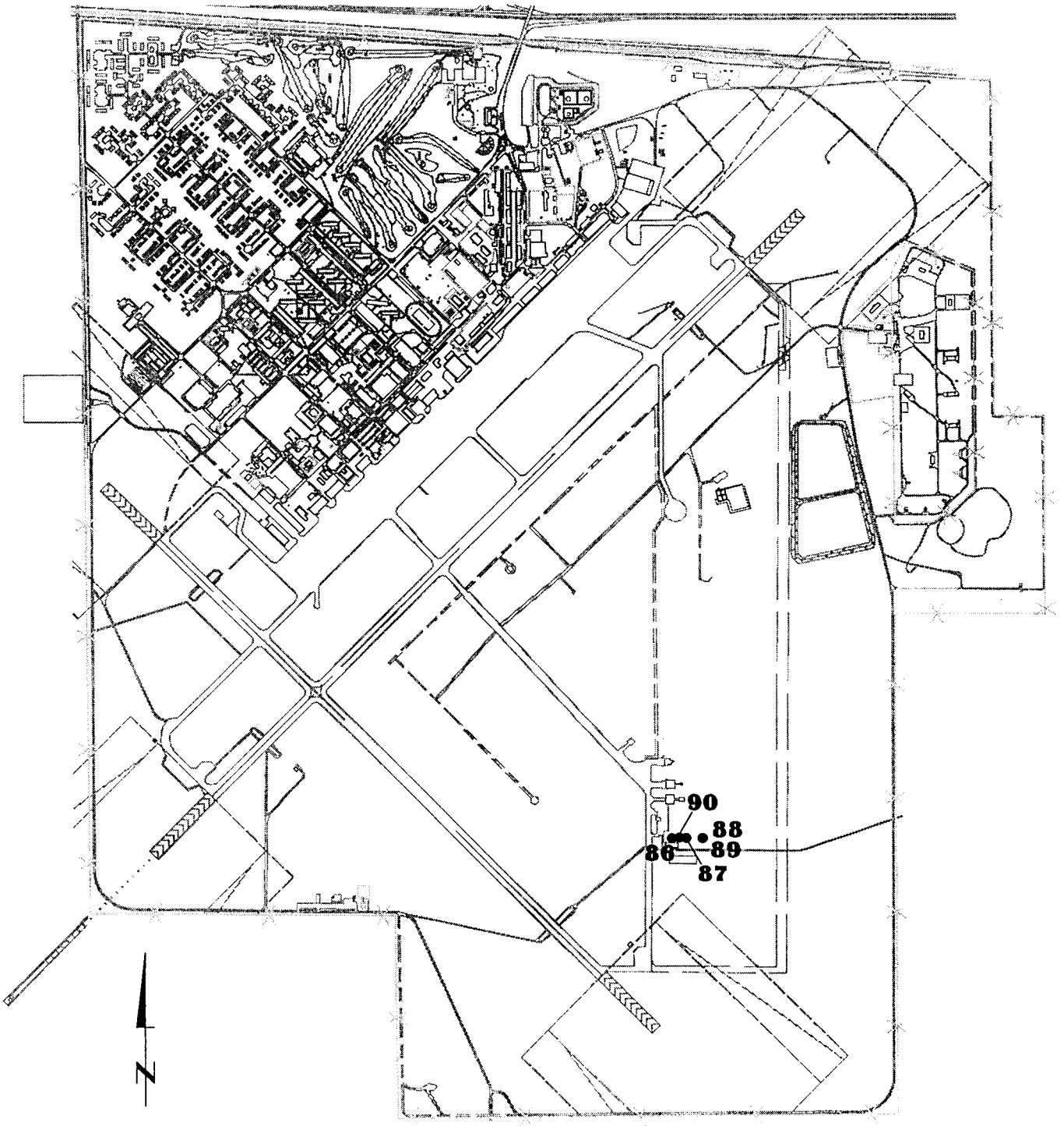
LEGEND

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

SWMU No.	DESIGNATED AREA
86	SD-11 ENGINE TEST CELL
87	SD-11 FORMER OVERFLOW PIT
88	SD-11 FORMER LEACHING FIELD
89	SD-11 EVAPORATION POND
90	SD-11 OIL/WATER SEPARATOR No. 5114



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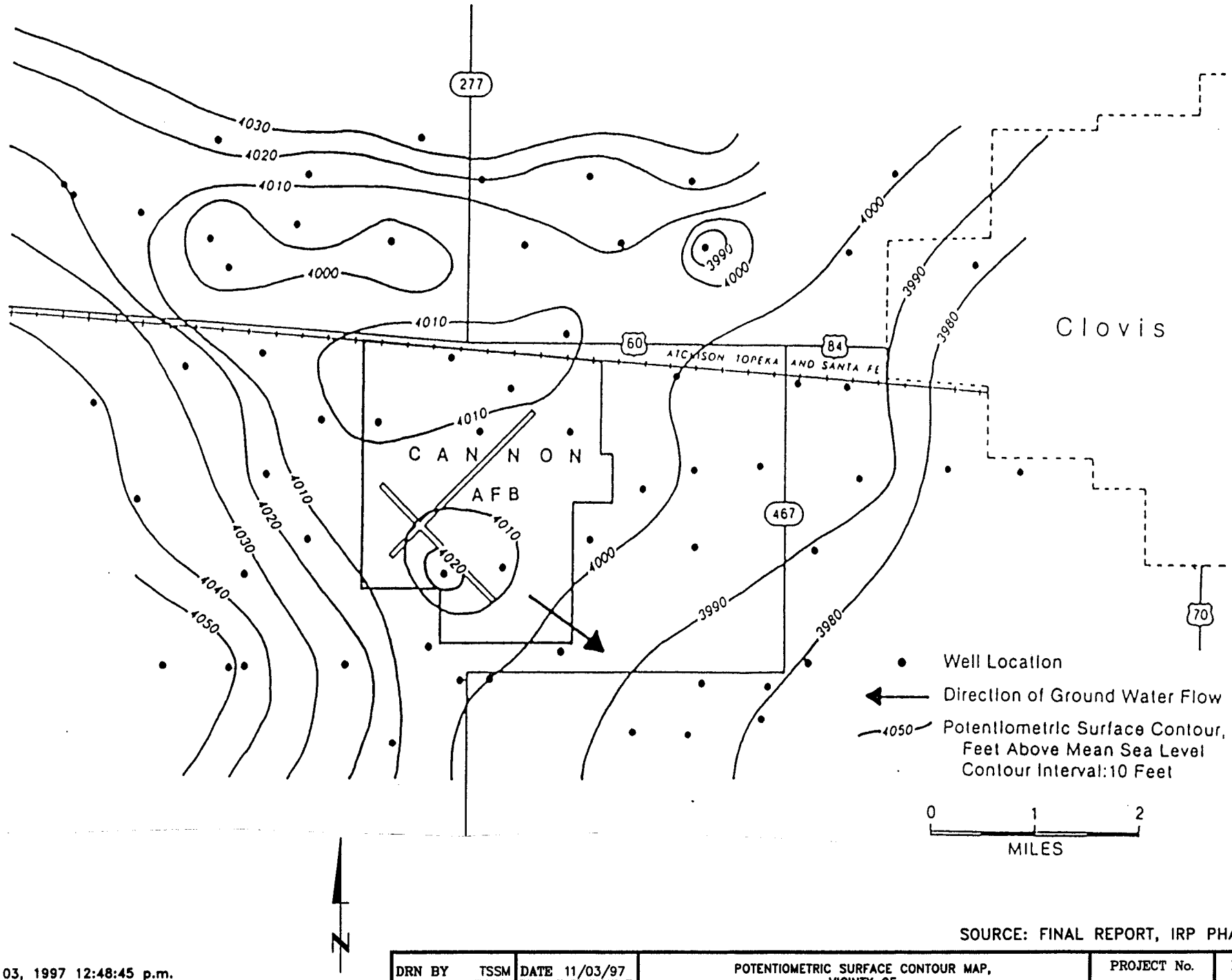
SCALE IN FEET

DRN. BY: JWB	DATE: 04/10/95	APPENDIX 1 SWMUs 86-90 (SITE SD-11) LOCATION PLAN CANNON AIR FORCE BASE CLOVIS, NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0		C3M11MM	1-2



SOURCE: FINAL REPORT, IRP PHASE II

November 03, 1997 12:48:45 p.m.
Drawing: T:\TITLES\DY11X8.DWG (TSSM)

DRN BY TSSM	DATE 11/03/97	POTENTIOMETRIC SURFACE CONTOUR MAP, VICINTY OF CANNON AIR FORCE BASE NEW MEXICO	PROJECT No.	FIG. No.
CHK'D BY	REVISIONS: 0		C3M11MM	1-3

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. 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 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. Paleo 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 yr. Before Present (B.P.) to -42,000 yr. 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 feet 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 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 depth to groundwater is greater than 200 feet, and 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/ft) to 0.35 m^3/m (27.9 gal/ft) (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 resulted 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 1995a). 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 ft/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 was 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 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 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 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 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 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 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 witmanii*), 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 (x)	Standard Deviation (SD)	95% Tolerance Limits of Background Concentrations[4] (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 ()
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 (:mhos)
5) Exceed U.S. Environmental Protection Agency Regulations (1976, 1977)

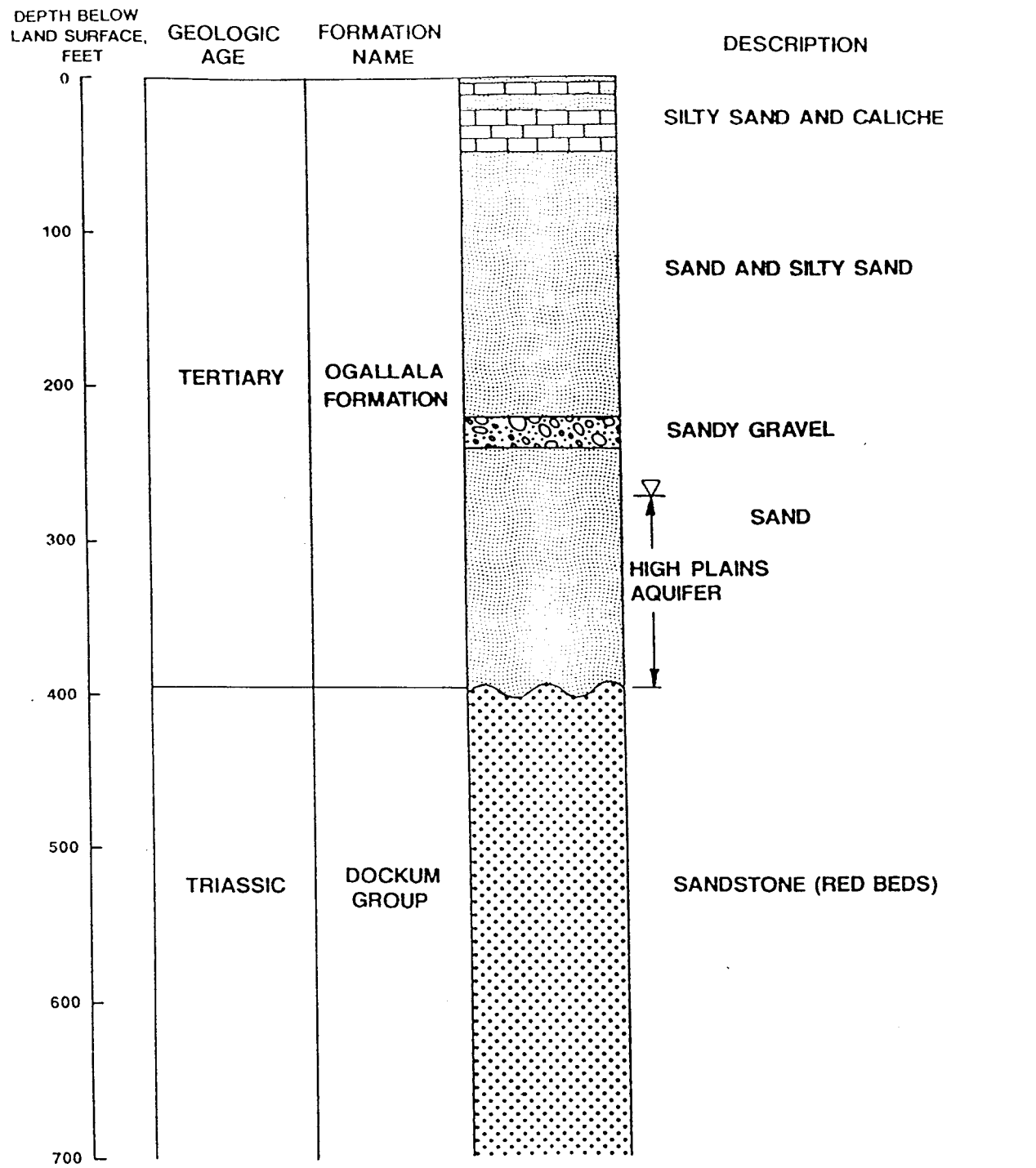
TABLE 2-4

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

SITE SD-11

REPORT PHASE: PHASE

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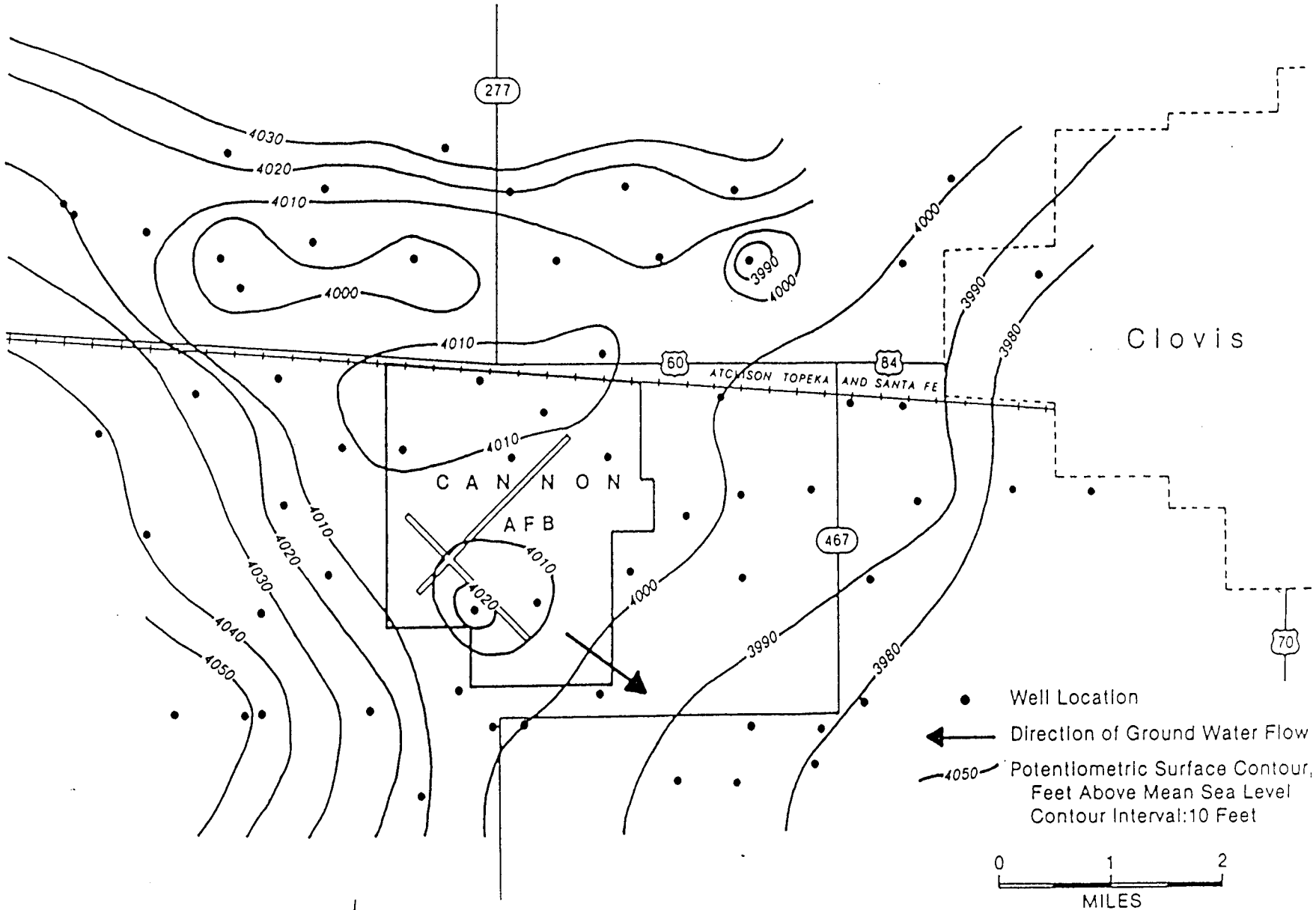
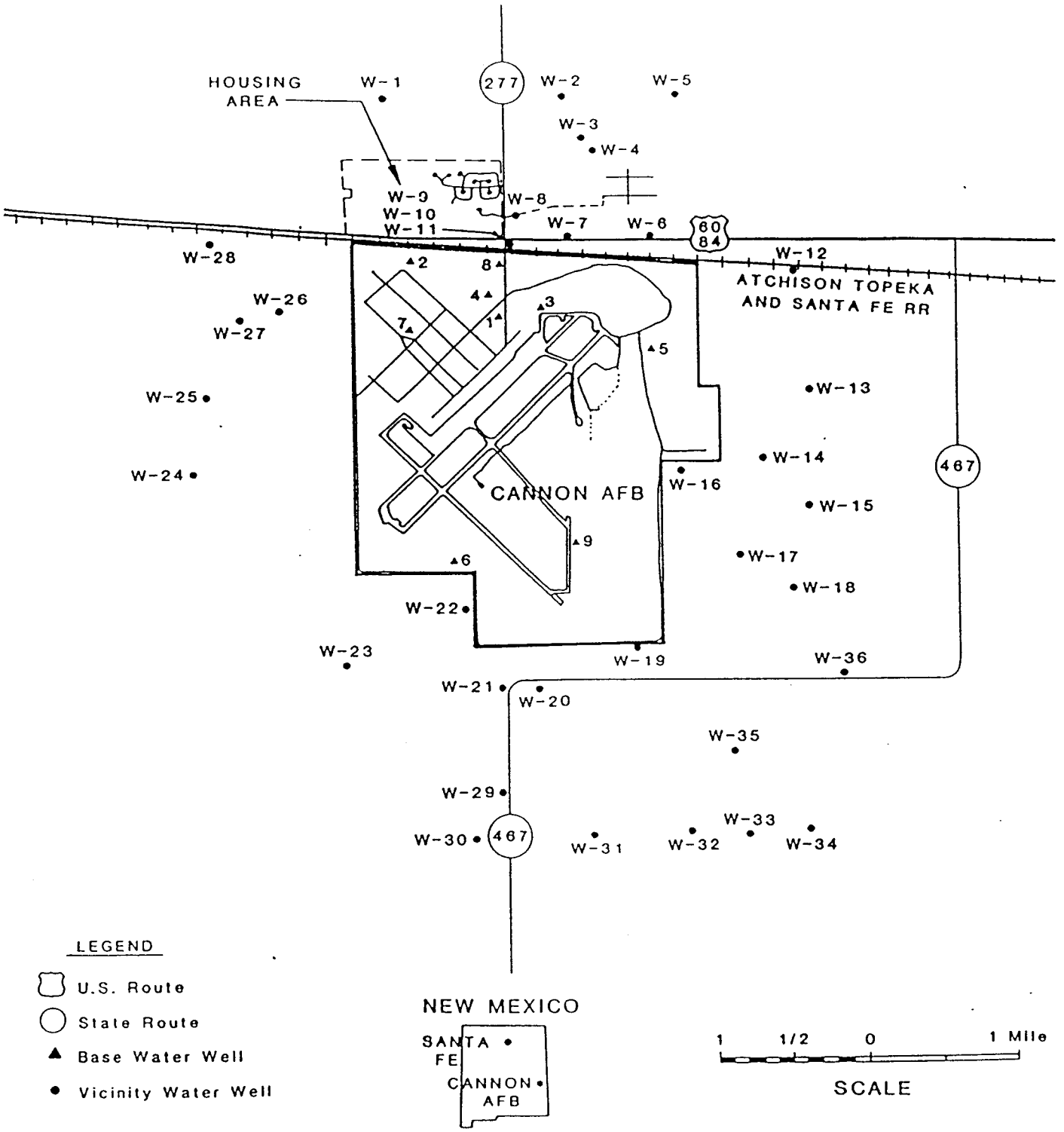


SOURCE: FINAL REPORT, IRP PHASE II

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: PHA . SITE SD-11

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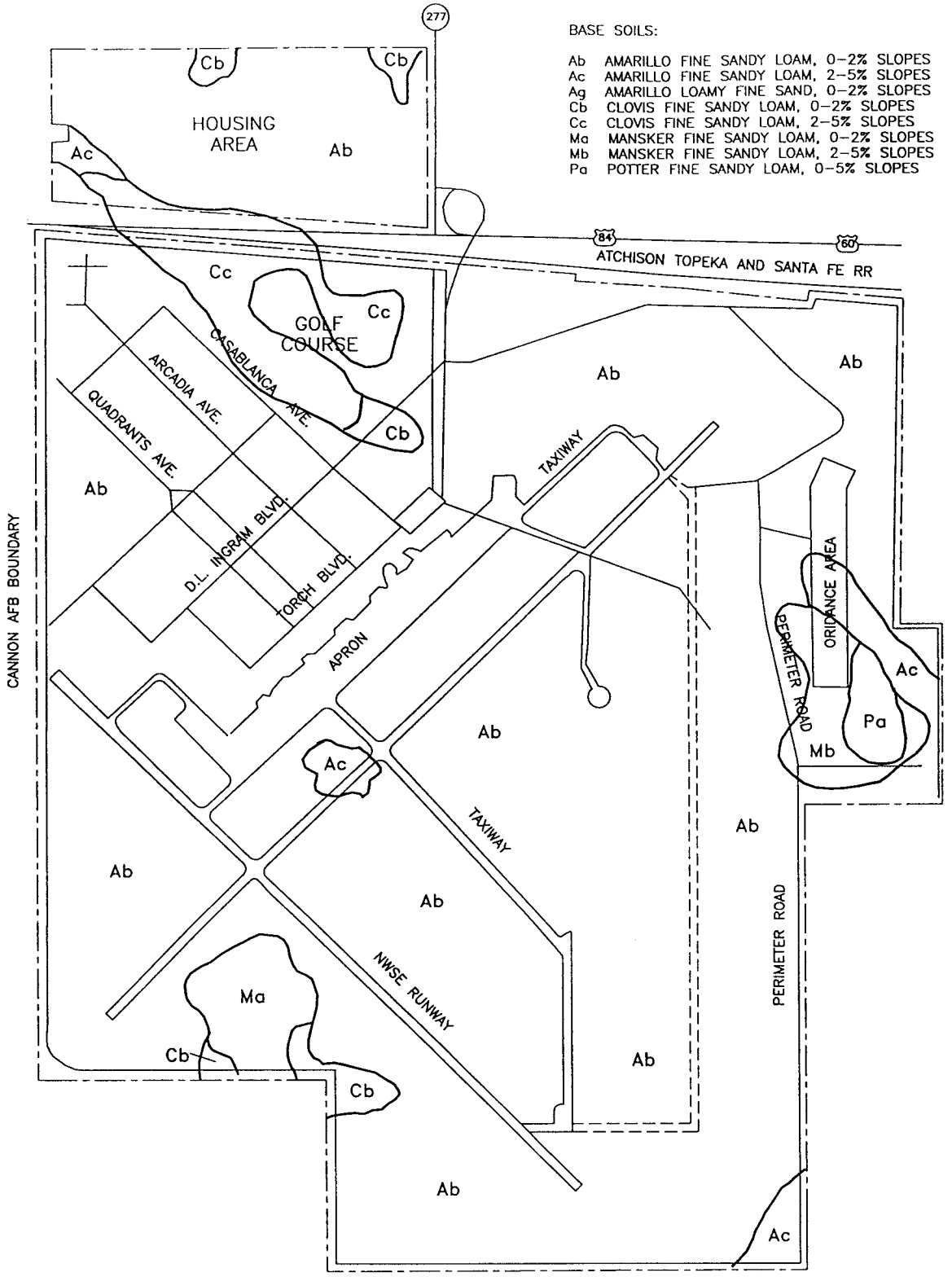

SOURCE: USDA-S.C.S., SOIL SURVEY
OF CURRY COUNTY N.M., 1958

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			

3.1 RFI OBJECTIVES AND APPROACH

The overall objective of this investigation is to evaluate whether or not a release of site-related chemicals has occurred which could pose a significant risk to human health or the environment. The focus of the Phase III RFI is the investigation of the potential vertical extent and lateral extent of soil contamination that may have resulted from current or historical activities at Appendix I SWMUs 86-90 (Site SD-11) located on Cannon AFB. The specific objectives of the Phase III RFI Appendix I SWMUs 86-90 at Cannon AFB are to:

- Characterize the physical setting and nature and extent of potential contamination associated with the SWMU
- Perform a screening-level risk evaluation to evaluate human health risks associated with chemicals found at the SWMUs
- Develop recommendations for the SWMUs regarding further evaluations or no further action

The Phase III 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 Phase III 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 following DQOs were developed for the Phase II RFI and are applicable to the continuation of this investigation during Phase III:

- Collect environmental data of sufficient quality and quantity to characterize the nature and extent of contamination resulting from a release of SWMU-related chemicals to the degree that the potential for significant risk to human health or the environment can be determined.

- Collect environmental data of sufficient quality and quantity to evaluate the potential for releases to migrate toward receptors in all significant pathways as determined from conceptual modeling.

- Collect environmental data of sufficient quality to be used in a Health and Environmental Assessment, and collect data of sufficient quantity to address all appropriate exposure pathways.

- Collect environmental data of sufficient quality and quantity to support a recommendation of "no further action," if warranted, following the evaluation of the findings of the investigation.

- Collect data of a quality that can be used as part of any required follow-on study including a Corrective Measures Study.

The program approach for the Phase III RFI for the Appendix I SWMUs 86-90 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 the SWMUs, identify data needs, and formulate a sampling plan to collect the necessary data for the SWMUs. 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 Section 5.0.

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).

3.3 DESCRIPTION OF THE DECISION PROCESS

The following decision process has been used to assess the data needs and investigative approach for SWMUs 86-90 (Site SD-11). The DQO evaluation process is designed to provide data of sufficient quality and quantity to evaluate whether a release has occurred 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. The procedures to assess the data needs and investigative approach include:

- Collect soil data to characterize the nature and extent of contamination that has been released, 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.

- 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 site-related chemicals of concern exceed RBCs, the potential for adverse health effects (including potential cumulative risks based on RBCs) will be evaluated, and further evaluation may be required, which may include a BRA.

- If the vertical extent and lateral extent has been defined and concentrations of site-related chemicals of concern do not exceed RBCs, the concentration of

contaminants will be considered insignificant and, therefore, no further investigation will be recommended.

A decision diagram (Figure 3-2) was developed for the Cannon AFB RFI SWMU 86-90 (Site SD-11) to present a logical decision process that will be used to evaluate the data resulting from the investigation to assure that project objectives are met.

3.3.1 Decision Process

The RFI soils investigation decision process is designed to identify appropriate actions based on three alternative actions: no further action, interim action, and further investigation or evaluation. The recommendation for the selection of alternative action will depend upon whether chemicals of concern are 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 will be used.

The decision process will be implemented by first evaluating and summarizing existing historical information and analytical data collected. Historical information will be used to identify potential chemicals of concern and to identify potential sites of chemical release.

Environmental media will be sampled and analyzed for potential chemicals of concern. The analyte lists from which chemicals of concern will be selected are discussed in the QAPP and QAPP Addendums (W-C 1994c, 1995b). Site-related chemicals of concern will be 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, will not be included as chemicals of concern. Organic chemicals that do not have EPA-established toxicity factors will not be evaluated quantitatively, but their potential contribution to site risks will be evaluated qualitatively.

The potential for site-related contaminants to impact groundwater will be 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 will be

considered to be insignificant. If the concentrations do not decrease with depth, further investigation of the groundwater pathway will be recommended. If the concentrations are at levels that could potentially migrate to groundwater at concentrations of concern, fate and transport modeling will be done to evaluate the potential for contaminant transport to groundwater.

Concentrations of chemicals of concern detected will be 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 sites 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 sites 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 will be used to make recommendations regarding the three alternatives stated above. The recommendations will be made on the following basis:

- If the vertical extent and lateral 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 will be 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 will be recommended.

- If there is a potential significant threat to human health or the environment, further investigation will be recommended for the site. Further investigation may include additional field investigation and/or a risk assessment.

Figure 3-2 presents the decision diagram that will be followed for this investigation. The steps of the decision process are described below.

Step 1. Evaluate analytical results to identify chemicals of concern (COCs). COCs are defined as chemicals whose concentrations exceed background levels, that are potentially site-related, and that are not attributable to field or laboratory contamination.

Step 2. Evaluate the potential impact to groundwater by assessing the vertical distribution of contamination. If concentrations of chemicals of concern do not decrease significantly with depth, the impact to groundwater cannot be assessed, so further investigation of the groundwater pathway will be recommended. Consult with project managers to develop investigation approach to evaluate the potential for contaminants to be transported to groundwater. If the concentrations of COCs are at a level that could potentially be transported to groundwater at concentrations of concern, fate and transport modeling will be used to estimate groundwater concentrations. Go to Step 3. If the concentrations of chemicals of concern decrease significantly with depth and the concentrations are below levels that could be transported to groundwater at concentrations of concern, further investigation of the groundwater pathway will not be recommended. Go to Step 4.

Step 3. Compare the estimated groundwater concentrations to groundwater RBCs. If they do not exceed RBCs, the groundwater pathway will be concluded to be insignificant.

Step 4. Compare the maximum soil concentrations detected at the site with RBCs. If no concentrations of COCs exceed RBCs, then no further investigation of site soils will be recommended. If any COCs are detected at concentrations that exceed RBCs, proceed to Step 5.

Step 5. Evaluate potential cumulative risks at the site based on the RBC comparisons. If the potential cumulative risks are within acceptable ranges, no further investigation of the site will be recommended. If a potential for unacceptable risks is indicated, proceed to Step 6.

Step 6. Complete a baseline risk assessment for all complete pathways. If there is not an unacceptable risk calculated, no further evaluation of the site will be recommended. If there is an unacceptable risk at the site, a RCRA Corrective Action Plan will be implemented.

3.4 EXPOSURE PATHWAY FLOW CHARTS

An Exposure Pathway Flow Chart (EPFC) was developed to provide a framework for problem definition, identify exposure pathways that may result in human health risks, identify potential data needed to evaluate those pathways, and identify potential measures that could be used to reduce exposure and risk.

Figure 3-3 shows the EPFC for Site SD-11 with chemical sources and potential human exposure pathways typical of the site. The EPFC presents chemical release sources and transport media, potential human receptors, and intake mechanisms for each potential exposure pathway. An exposure pathway describes the means by which release, transport, and intake by receptor populations of site-related chemicals of concern occurs. An exposure pathway consists of four necessary elements:

- A source and mechanism of chemical release to the environment
- An environmental transport medium for the released chemical (e.g., air, groundwater, or surface water)
- A point of potential human exposure to transported chemicals (e.g., a domestic drinking water well)
- A human intake mechanism (e.g., inhalation or ingestion) at the point of exposure

All four elements must be present for an exposure pathway to be complete and for chemical exposure to occur. In the EPFC, potentially significant pathways are denoted with solid lines, and pathways that are considered to be insignificant relative to other pathways are denoted with dashed lines.

Potential exposure pathways are evaluated with respect to potential chemical sources at the site. Exposure pathways are considered to be potentially complete if there are chemical release and transport mechanisms and identified exposure points and receptors for that exposure pathway. Incomplete exposure pathways do not result in actual exposure to human or environmental receptors and, therefore, do not pose a potential risk. Incomplete exposure pathways are not shown on the EPFC. Insignificant pathways are those that could conceivably be complete and result in an exposure, but the resulting exposure would undoubtedly be at levels that would not pose a significant risk.

The potential sources of chemical emissions from the site are presented in Figure 3-3. This site includes an engine test cell, oil/water separator, and leach field which are potential sources for petroleum hydrocarbons and solvents. The primary source is generally waste (e.g., fuels, oils, and solvents) that has leaked into subsurface soils or has been discharged or spilled on surface soil.

Chemicals from the primary source may be transported away from the primary source area, affecting other media that may in turn act as secondary sources. Percolation and leaching of the wastes to the subsurface soil are shown as primary chemical release mechanisms. Subsurface soils are an important secondary source of potential chemical release. Site-related chemicals in soils may infiltrate/percolate through the soil and be released to groundwater.

Other release mechanisms, such as direct contact (soil ingestion and dermal contact), surface runoff, wind erosion, or volatilization to the atmosphere, are also depicted in the EPFC. A portion of the site may be covered with clean soil or pavement; therefore, surface transport of chemicals by storm water runoff would be limited. Transport by storm runoff is not considered a significant pathway for human exposure at underground oil/water separators or underground storage tanks because the contamination at these areas is primarily in the subsurface. Where the site is covered by pavement, soil exposures will only be considered potentially significant for future-use scenarios (i.e., if the pavement is removed).

3.5 CRITICAL DATA

Critical data are data that are crucial for decision-making (e.g., whether a site requires no further investigation or should be carried into a CMS). Critical data may be from special

sampling locations or from a selected subset of samples from locations of roughly equal importance. Data from a specific field sample such as a sediment sample immediately downstream of a discharge point, may be designated as critical if it is necessary to know contaminant concentrations at that specific location for source or exposure pathway characterization. In other cases, data from a selected number of any of several field samples (e.g., a subset of all the surface soil samples taken at a site), may be designated as critical when the objective is to estimate mean contaminant concentrations over the area.

Following EPA guidelines (EPA 1990c), critical data must be from environmental media representing each major exposure pathway and must be 100 percent complete, that is, valid results must be obtained for all data deemed critical. A complete set of critical data may be taken from more than one sample (i.e., if one sample has missing or rejected analytes, data from another comparable sample can be used to complete the critical data set). If the missing or rejected data do not affect the decision-making process (e.g., they are not potential chemicals of concern), they are not considered to be critical data, and the critical data set is still 100 percent complete. If decisions cannot be made because of missing or rejected data, a recommendation will be made that the project managers determine what corrective action should be taken. Potential chemicals of concern are defined as chemicals that are site-related (i.e., they are derived from the site and are at concentrations that exceed background levels); and that have EPA-derived toxicity factors (i.e., carcinogenic slope factors or noncarcinogenic RfDs) or that have potential toxicity that can be addressed qualitatively (e.g., lead and TPH). Potential chemicals of concern will be derived from the analyte list described in the QAPP and QAPP Addendums (W-C 1994c, 1995b). This procedure permits retaining valid data from the original data set and compiling a complete, representative, and valid set of critical data without unnecessary resampling. A discussion of the selection of critical data is provided below.

3.5.1 Critical Data at SWMUs 86-90 (Site SD-11)

The following data are determined to be critical at SWMUs 86-90 (Site SD-11). That is, complete, representative, and valid sets of data are to be collected as indicated below.

- One complete set of data from the surface/near-surface soil
- Two complete sets of data below the area of highest contamination such that the vertical extent and lateral extent of contamination can be defined

3.6 DETECTION LIMITS

Risk-based decisions often require sample quantitation limits at or below levels of toxicological concern. The sample quantitation limits vary according to sample medium. The quantitation limits for chemicals in water samples are often far lower than for the same chemicals in soils, because of interferences caused by co-extractable components in the soil. These interferences are most problematic when chemicals are at concentrations near the detection limit. Analytical methods have been selected which will provide the required detection limits. The methods used and their detection limits are discussed in the QAPP Addendum (W-C 1995b).

To select appropriate analytical methods, method detection limits have been compared with analyte-specific concentrations of concern such as RBCs. RBCs are concentrations that under given exposure assumptions, will produce a specified risk. For this discussion, RBCs are concentrations which are estimated to cause a carcinogenic risk of 1×10^{-6} or a hazard quotient of 1 using assumptions explained in Appendix D.

3.7 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 1995). All detected organic compounds with EPA-established toxicity factors were compared to RBCs. 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 was 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 baseline risk assessment or correcitve measures study). EPA Region III RBCs (EPA 1995) 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 and are likely to remain industrial, 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 1991c). 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.

In addition to the RBC comparison, an estimation of the potential risks at the SWMUs were calculated using the RBCs as a starting point. As stated above, the RBCs for noncarcinogens were assumed to be equal to a hazard index of 1.0. The detected SWMU concentrations were divided by the RBC to get an estimate of the Hazard Quotient for each noncarcinogen. If the sum of all the potential risks for the noncarcinogens was below 1.0, then no unacceptable health effects were likely from the detected concentrations. If the HI (the sum of the Hazard Quotients) exceeded 1.0, then the concentration may pose an unacceptable health risk.

Similarly, the RBCs for carcinogens were assumed to be equal to 1×10^{-6}. The detected SWMU concentrations were divided by the RBC and multiplied by 1×10^{-6} to get an estimation of the potential cancer risk for each carcinogen. If the sum of all the potential risks for each carcinogen is less than 1×10^{-6}, then no unacceptable cancer risks are likely from the detected concentrations. If the total potential cancer risk is greater than 1×10^{-6}, then the potential for unacceptable health risks may be present at the site.

The results of the screening-level risk evaluations are presented in Section 8.0 of this report.

3.8 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 I SWMUs 86-90 will be addressed in the investigation 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 ARASs is required, and potential remediation alternatives should be considered at the initiation of a RI/FS (EPA 1988a, 1989a).

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 including 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.

3.8.1 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 exist, or where ARASs are not sufficiently protective of human health and the environment. In these circumstances, TBC values are used to establish cleanup targets.

3.8.2 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 I SWMUs 86-90 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.

3.8.3 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).

3.8.4 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 I SWMUs 86-90

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 I SWMUs 86-90

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 I SWMUs 86-90

		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

TABLE 3-2

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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							
Titanium	Metal							
Tungsten	Metal							
Vanadium	Metal							
Zinc	Metal	5,000 :µg/l*					10,000 :µg/l	10,000 :µg/l

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASS/TBCS GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX I SWMUs 86-90

		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 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
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							

TABLE 3-2

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		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
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							
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)					

TABLE 3-2

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		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
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	1:µg/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							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASS/TBCS GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX I SWMUs 86-90

		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-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							
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)							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASS/TBCS GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX I SWMUs 86-90

		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
Aniline	Semivolatile							
Anthracene	Semivolatile							
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)							

TABLE 3-2

POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASS/TBCS GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX I SWMUs 86-90

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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
DDT metabolite (DDD)	Semivolatile (P)							
Dalapon	Semivolatile (P)	200 :µg/l(d)	200 :µg/l(d)					
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)							

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Endosulfan Sulfate	Semivolatile (P)							
Endothall	Semivolatile (P)	100 :µg/l	100 :µg/l					
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			

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Naphthalene	Semivolatile							
Nitrobenzene	Semivolatile							
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					

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POTENTIAL SITE-WIDE CHEMICAL-SPECIFIC ARASS/TBCS GROUNDWATER QUALITY STANDARDS CANNON AFB - APPENDIX I SWMUs 86-90

		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)	

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	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

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(To Be Considered)
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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

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(To Be Considered)
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	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	-	-	-	

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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	-	-	-	

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	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	-	-	-	

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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

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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)

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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 3-3

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 1989); 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.
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(m) New Mexico Department of Environmental Improvement New Mexico UST Regulations, amended through July 18, 1991.
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(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 I SWMUs 86-90

Compound	RFI Guidance TBCs[a] (mg/kg)	Proposed RCRA Action 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

TABLE 3-4

POTENTIAL SCREENING CONCENTRATIONS FOR INORGANIC COMPOUNDS IN SOIL (TO BE CONSIDERED) CANNON AFB - APPENDIX I SWMUs 86-90

Compound	RFI Guidance TBCs[a] (mg/kg)	Proposed RCRA Action 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)
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
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 I SWMUs 86-90

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.
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.

*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 I SWMUs 86-90

Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
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.
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

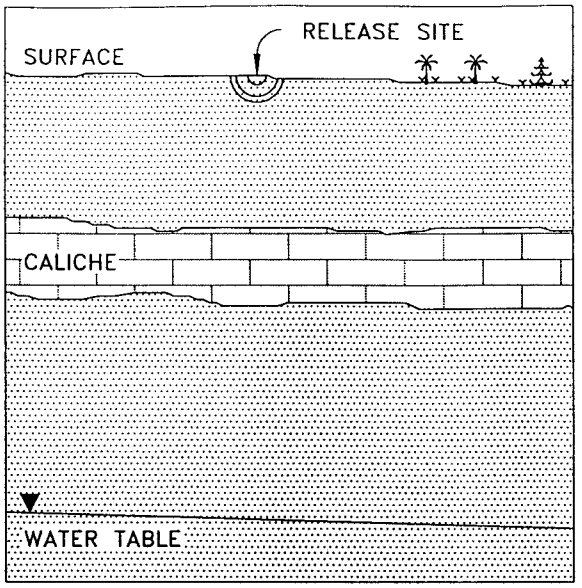
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX I SWMUs 86-90

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.
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.

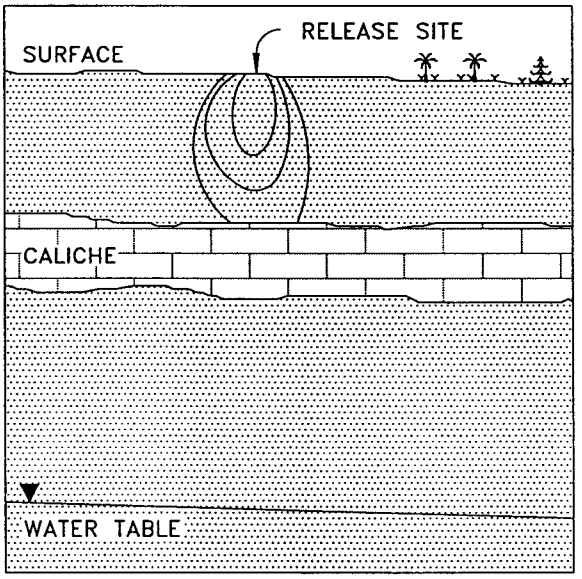
TABLE 3-5

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARASs
CANNON AFB - APPENDIX I SWMUs 86-90

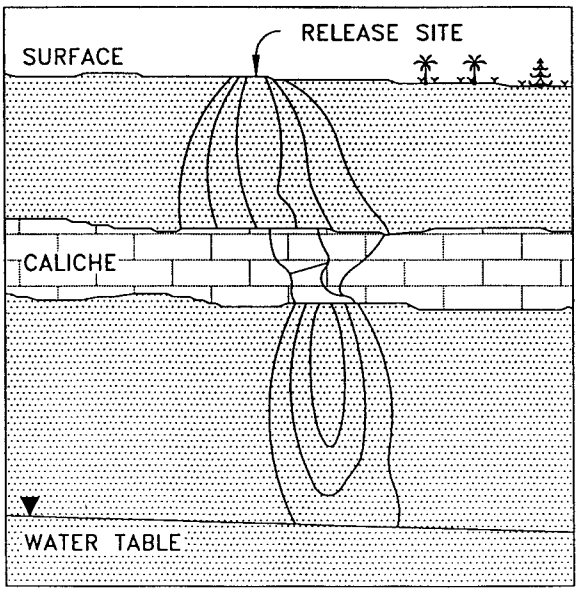
Requirement	Potentially Applicable?	Potentially Relevant and Appropriate?	Comments
The Archaeological Resource Protection Act of 1979			
17. Requires a permit for any excavation or removal of archaeological resources form public or Indian lands (16 USC 470aa-47011)	Yes	---	May be applicable if any remedial activity involves removal of archaeological resources; substantive requirements need to be met.
Coastal Zone Management Act			
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.



B. SINGLE EVENT RELEASE OF A LARGE QUANTITY.



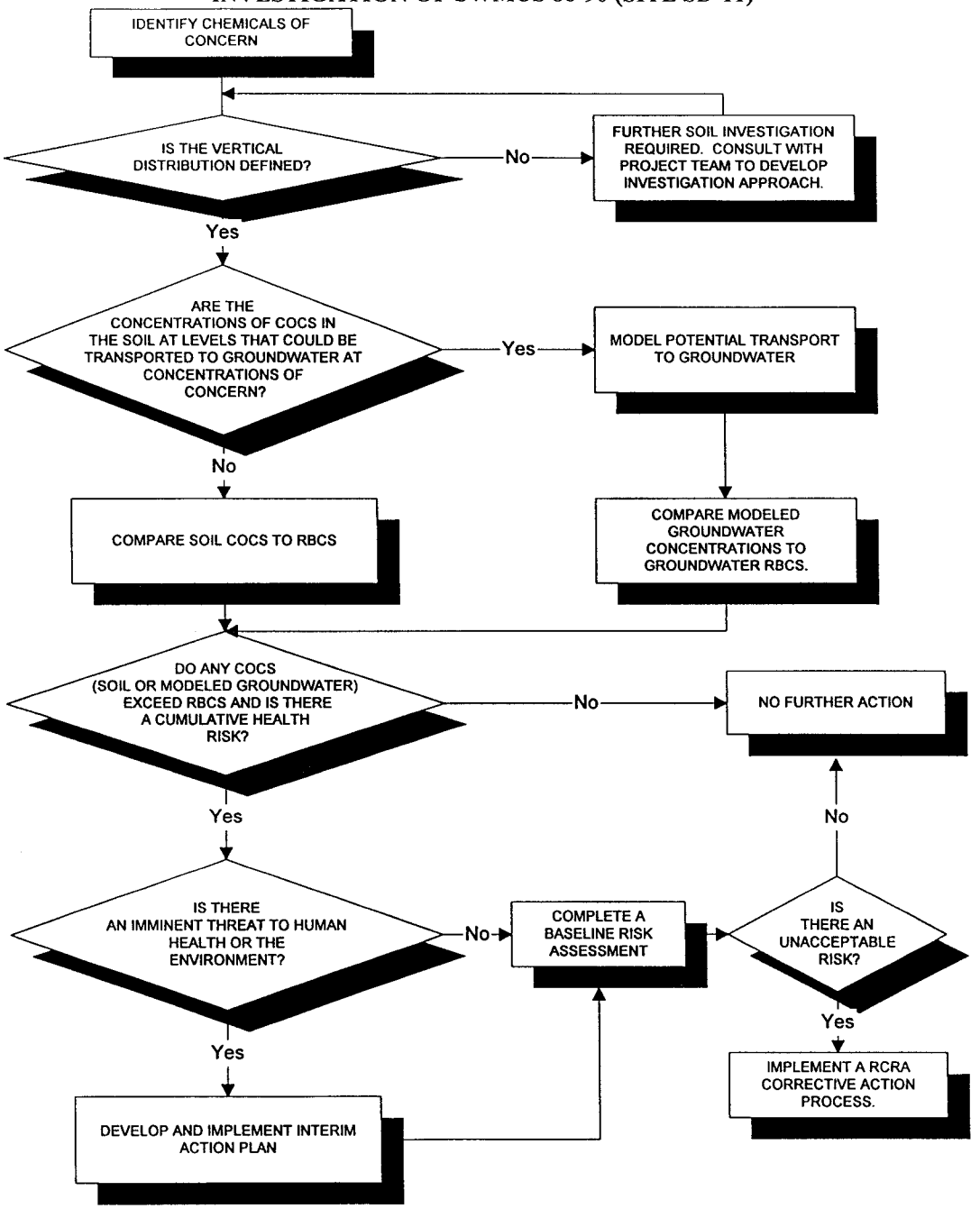
C. CONTINUOUS RELEASE OF CONTAMINANTS. NOTE MIGRATION OF LIQUIDS THROUGH FRACTURES IN THE CALICHE.

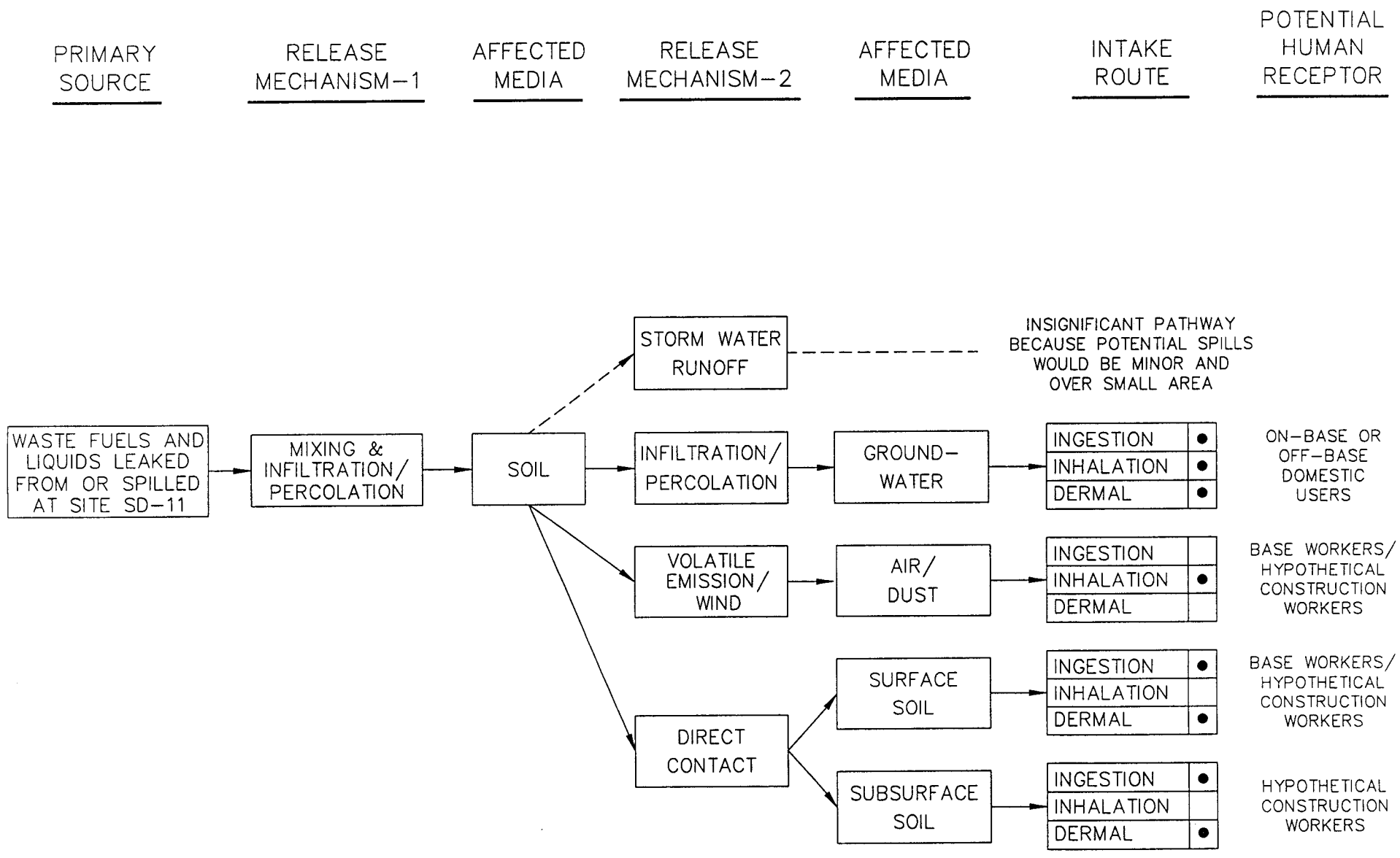
NO SCALE

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

FIGURE 3-2

CANNON AFB
DECISION DIAGRAM FOR PHASE III
INVESTIGATION OF SWMUS 86-90 (SITE SD-11)





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 SCR	DATE 01/09/95	EXPOSURE PATHWAY FLOW CHART SITE SD-11 CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D BY .	REVISIONS: 0		C3M11MM	3-3

4.1 SITE DESCRIPTION

Appendix I SWMUs 86-90 (Site SD-11) are located in the sparsely-populated southeast part of Cannon AFB, about 5,000 feet east and 2,000 feet south of the intersection of the two main runways (see Figure 1-2). The site consists of a former engine test cell (SWMU 86), former overflow pit (SWMU 87), former leach field (SWMU 88) which was later converted to an evaporation pond (SWMU 89), and former oil/water separator with associated 100-gallon collection tank (SWMU 90). A site plan of these SWMUs and surrounding area is shown in Figure 4-1.

The former test cell was enclosed by a 50-foot by 10-foot building resting on a concrete slab. In addition to the test cell structure, a small pumphouse building has been removed, leaving only a bare concrete slab. The oil/water separator system has also been removed. At the time of the Phase III RFI field activities, the concrete slab was being used periodically to conduct outdoor engine tests with portable equipment. Nearby buildings at the site include Building 2330 to the northwest, which is a support building for engine test activities, and a storage building directly south. Other site features include a wellhouse (Base Well No. 9), storage shed, water tank, construction contractor's trailer directly north of the site, and large sound suppressor buildings further to the north.

Most of the area around the former test cell is covered by asphalt. Topography is generally flat, near an elevation of 4268 ± 1 feet above mean sea level. Minimal vegetation exists in the area of SWMUs 86-90. Wind from engine tests currently being conducted at the concrete slab appears to have created a depression, about 1 foot deep, directly east of the slab in the area of the former oil/water separator system. Sheepsfoot compactor marks are visible in the depression where backfill was placed for the removal of the oil/water separator vaults.

4.2 SITE HISTORY

Appendix I SWMUs 86-90 were active from 1965 to 1988. The separate areas at the site received potential contaminants from a single operation, the steam cleaning and testing of jet

aircraft engines. It has also been reported that jet engines had water injected into the exhaust during testing to help muffle noise. Contaminants that may have been released at the site include lubricating and synthetic oils, residual JP-4 fuel, and possibly solvents.

During the life span of the facility, effluent was handled in several ways. Initially it was discharged only to an overflow pit (SWMU No. 87). Then the oil/water separator system (SWMU No. 90) was installed with discharge to a leach field (SWMU No. 88). Finally, the effluent was routed through the oil/water separator to an evaporation pond (SWMU No. 89). The evaporation pond was constructed in the area of the former leach field (SWMU 88).

4.3 PREVIOUS INVESTIGATIONS

A Phase I IRP Records Search was performed in 1983 by CH_2M Hill to identify and fully evaluate suspected problems associated with past hazardous material disposal sites and spill sites at Cannon AFB (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants was evaluated at the Engine Test Cell Area (SWMUs 86-90) by reviewing the existing information and conducting an analysis of installation records. Results of the Phase I IRP Records Search recommended that potable well 9 be analyzed for priority pollutants to determine if the groundwater had been impacted by activities at the site.

During 1984-1985, a Phase II IRP investigation was conducted by Radian Corporation at the site. Two boreholes were drilled to depths of 35 and 50 feet, respectively (see Figure 4-2). One borehole (11B) was located within the leachfield, and another (11A) was located in a depression which had collected overflow from the oil/water separator. Five soil samples taken from the boreholes were analyzed for purgeable halocarbons and aromatics, oil and grease, and lead. Results of the samples collected during the Radian investigation indicated no soil contamination at the IRP/SWMU (Radian 1986). Based on the results of the Phase II (Stage I) investigation, additional soil sampling was recommended due to the limited number of borings drilled in the area.

In 1987, a Preliminary Review/Visual Site Inspection, RCRA Facility Assessment was conducted for the USEPA at Cannon AFB by A.T. Kearney, Inc. (A.T. Kearney 1987). The purpose of this investigation was to identify and evaluate Solid Waste Management Units to

assess the potential for releases to the environment of hazardous wastes or constituents. Results of this investigation identified the site as a potential SWMU. The RCRA Facility Assessment also indicated that the potential for releases to the soil was high due to the past disposal of hazardous wastes and the unlined nature of the IRP/SWMU site. The potential for releases to groundwater was considered to be lower due to the presence of caliche layers possibly inhibiting downward migration of hazardous constituents. Suggested further action was to conduct soil sampling to determine if contaminants had been released from the unit.

In December 1989, five soil borings (Borings B1 through B5), shown in Figure 4-2, were drilled by Walk, Haydel and Associates and analyzed for volatile organic compounds (VOCs), xylene, base/neutral organics, and total metals (WHA 1990). Borehole 1 was drilled to a depth of 30 feet in the vicinity of the oil/water separator overflow pit. Boreholes 2, 3 and 4 were drilled to depths of 30 feet each immediately adjacent to the west, north, and east, respectively, of the existing evaporation pond. Borehole 5 was drilled to a depth of 60 feet immediately south. Analytical results indicated very low levels of phenol, 2,2'-methylene bis[6-1,1-(dimethylethyl)-4-ethyl-] (known as antioxidant 425) in boreholes B-1 and B-4. Silver was the only metal detected at levels exceeding background. However, the distribution of silver was considered by Lee Wan and Associates (1990) to be naturally occurring.

In September 1991, Woodward-Clyde (W-C) investigated the site as part of the RI for 18 IRP/SWMU sites at Cannon AFB. The objective for sampling at the site during the investigation by W-C was to further evaluate the nature and extent of potential hazardous contaminants. Six original soil borings (Borings 0861 through 0866) were drilled and surface and subsurface samples collected for chemical and geotechnical analysis. Some of the borings were redrilled and resampled, due to missed holding times. The soil borings were located near the Engine Test Pad and the old oil/water separator (see Figure 4-2). Surface samples were collected from 0 to 0.5 feet bgs at locations near each of the soil borings. Subsurface soil samples were collected at depths ranging from 2 to 23 feet bgs. All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) and target analyte list (TAL) metals.

None of the target analyte list of volatile organic compounds, except acetone and toluene, were detected above the contract required quantitation limit (CRQL) in surface and

subsurface soil samples at the SWMUs. The concentrations for acetone and toluene are summarized in Table 4-1. Toluene was present in surface sample 0865, at a concentration of 100 µg/kg. Acetone was detected above the CRQL in only one surface sample (i.e., sample 0864 at 17 µg/kg). Acetone was detected in nearly all subsurface samples at all five boring locations with concentrations ranging from 68 µg/kg to 5,700 µg/kg.

The reporting limits for TCL volatile organic analyses were raised in sample 0862 (1 to 3 feet bgs and 8 to 10 feet bgs), 0864 (4 to 6 feet bgs), and 0865 (1 to 2 feet bgs) because of the sample dilution necessitated due to high concentrations of target compounds, particularly acetone. The concentrations of acetone usually exceeded the calibration range and therefore, the samples were reanalyzed at dilution. In samples 0861 (8 to 10 feet bgs and 18 to 20 feet bgs), the reporting limits were raised due to the presence of nontarget compounds. Tentatively identified compounds (TICs) from VOC analyses indicated that a variety of saturated and polynuclear aromatic hydrocarbons may be present. The presence of hydrocarbons is supported by the OVA readings and observed staining obtained from samples in this boring during the field sampling event.

A variety of metals were detected in soil borings 0861 through 0865. Vanadium was detected at concentrations of 18-25 mg/kg, slightly higher than background levels. However, the distribution of vanadium was uniform throughout surface and subsurface samples and therefore, could be considered to be naturally occurring. Heavy metals detected at elevated levels are antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, and zinc. The reported concentrations are summarized in Table 4-2. Other metals, including iron, aluminum, potassium, and mercury were detected infrequently and at concentrations near or below site background or regional levels.

In summary, acetone and toluene were the only volatile organic compounds detected above the CRQL at this SWMU. It should be noted that toluene was detected at 100 µg/kg in the background 0865 located west of the SWMU, and all other detections at the SWMU were significantly less than this concentration. With raised detection limits for certain samples, toluene may be present up to the detection limits shown on Table 4-1 for samples 0861-0018, 0861-0008, 0863-0004, 0864-0004, and 0865-0002. For example toluene may be present in sample 0861-0018 up to a concentration of 2,800 µg/kg. It does not appear that toluene is present below 20 feet in boring 0861, 6 feet in boring 0863, and 4 feet in boring 0865.

Toluene may be present below 10 feet (i.e., depth of boring) at location 0862. Similarly, acetone does not appear to be present at an arbitrary cutoff of 100 µg/kg below 20 feet at boring 0861; 6 feet at boring 0863; 6 feet at boring 0864; and 6 feet at boring 0865. Acetone in concentrations greater than 100 µg/kg may extend deeper than 10 feet (i.e., total depth of boring) at location 0862.

Petroleum hydrocarbons appear to be present from 10 to 20 feet bgs in boring 0861, drilled near the oil/water separator. The lateral extent of petroleum hydrocarbons is not known to a great degree of certainty, but is probably limited to the boring 0861 area around the northern side of the oil/water separator. No petroleum staining was noted in boring 0863, located southeast of the oil/water separator.

Metals concentrations above background were detected in the upper four feet in all borings at this SWMU, with the higher concentrations generally being present in surface soil. Borings 0861 and 0863, located near the oil/water separator, showed lower concentrations of heavy metals in surface samples compared to borings 0862 and 0864, located near the concrete pad of the former engine test cell. Boring 0865, located west of the entrance road to the engine test cell area, indicates lower levels of metal concentrations compared to the other borings.

The analytical results of the present investigation do not compare well with the analytical results of boring B1 of the previous Phase IV IRP investigation in 1989 (see Figure 4-2). A low concentration of Antioxidant 425 (2,2'-methylenebis{6-t-butyl-4-ethylphenol}) was reported by Walk, Haydel and Associates (1990) as a tentatively identified compound in the base treated organic analysis. Silver was the only metal detected above background levels, which was considered by Walk, Haydel and Associates (1990) to be naturally occurring.

In August 1994, Remediation Services Incorporated (RSI) removed the oil/water separator system and excavated the petroleum contaminated soil surrounding the oil/water separator. An area originally estimated at 60 feet long by 30 feet wide by 25 feet deep was excavated (see Figure 4-2). Soil samples were taken from the excavated and stockpiled soil periodically and analyzed for TPH, volatiles, semivolatiles, and target analyte metals. Based on this sampling, approximately 186 tons of excavated soil was transported to an off-site facility. Because of concerns about residual contamination in the remaining stockpiled soil, the

remaining soil was mixed with clean off-site soil and used to backfill the excavation. The RSI Report is included as Appendix E.

RSI reported that the oil/water separator did not appear to be sealed along the bottom and at the edges and that petroleum contamination in site soils was visible after removing approximately 1 foot of soil.

4.4 PHASE III OBJECTIVES

During the removal actions associated with Appendix I SWMUs 86-90 (Site SD-11), visible staining was reported at depths of approximately 20 feet bgs. The most recent investigation (W-C 1992) only included soil borings to depths of 25 feet bgs.

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

TABLE 4-1

ACETONE AND TOLUENE CONCENTRATIONS IN SOIL SAMPLES COLLECTED BY WCC AT ENGINE TEST CELL AREA (1991)

SWMU NOS. 86-90/IRP NO. SD-11
CANNON AFB, NEW MEXICO

Boring Number (Redrill Boring Number)	Sample Depth (Ft-BGS)	Acetone (Fg/kg)	Toluene (Fg/kg)
0861	0-0.5	(11U)	(2J)
[0866]	2-4	10J	12U
(0867)	4-6	21J	11U
	8-10	(270U)	(6J)
	13-15	[13U]	[11U]
	18-20	[5700]	[2800U]
	23-25	[13J]	[2J]
0862	0-0.5	(35U)	(4J)
(0868)	2-4	(660)	(33J)
	4-6	(220)	(11U)
	8-10	1300	1100U
0863	0-0.5	(3J)	(2J)
(8669)	2-4	(1100J)	(55U)
	4-6	(2100J)	(1400U)
	8-10	(390UJ)	(8J)
0864	0-0.5	(17J)	(2J)
(8610)	2-4	(68)	(1J)
	4-6	(290)	(3J)
	8-10	98	26U
0865	0-0.5	8J	100
	2-4	7700U	1400U
	4-6	330J	12U
	8-10	91	11U

Ft-BGS = Feet below ground surface
µg/kg = Micrograms per kilogram
U = Not detected
J = Estimated value
UJ = Estimated as non-detect at the CRQL

[ ] = The values in brackets are results from samples collected from the deeper redrill borings.
( ) = The values in parentheses are results from samples collected form the redrill borings due to laboratory missed holding times.

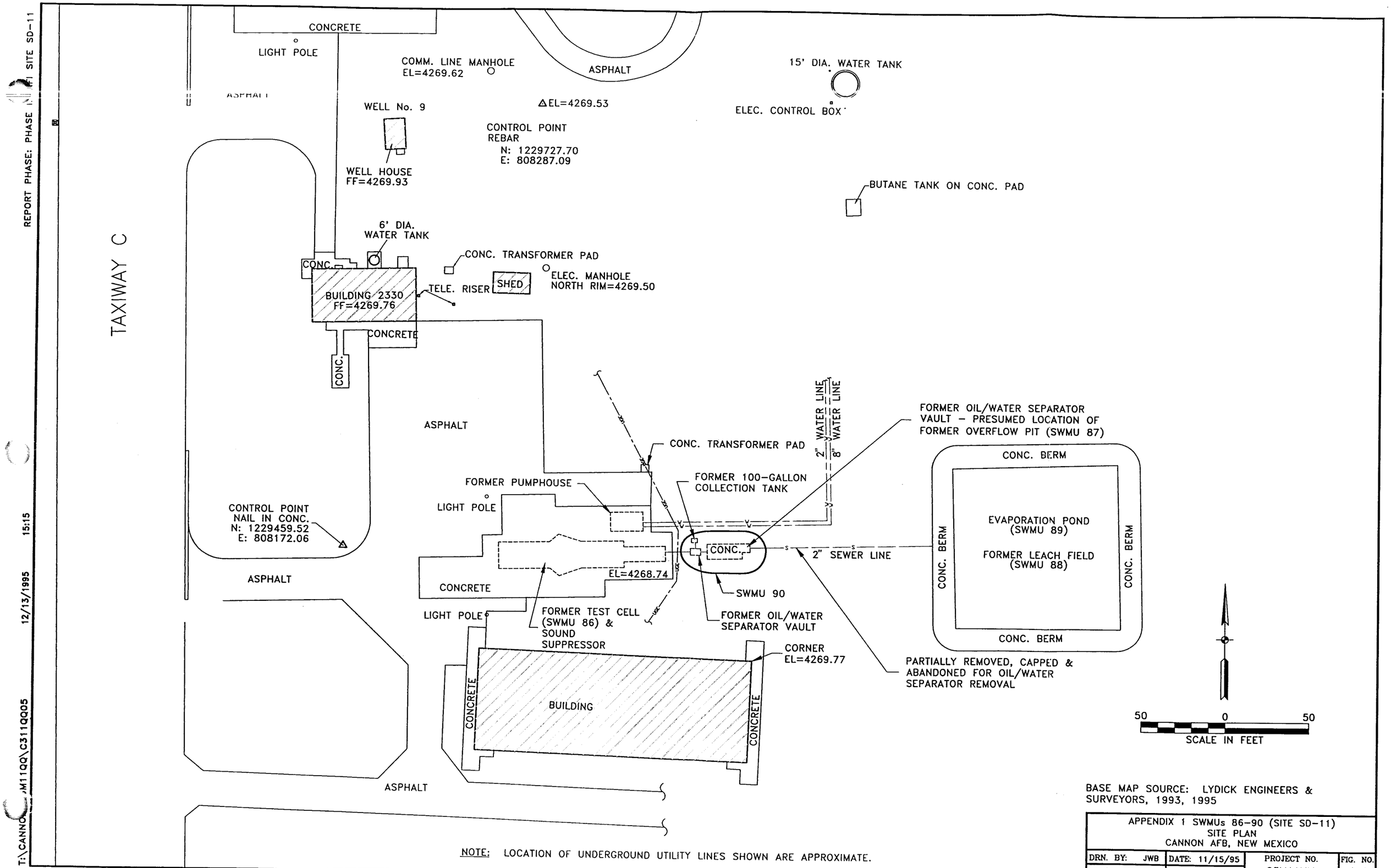
TABLE 4-2

HEAVY METAL CONCENTRATIONS[1] IN SOIL SAMPLES COLLECTED BY WCC AT ENGINE TEST CELL AREA (1991)

SWMU NOS. 86-90/IRP NO. SD-11
CANNON AFB, NEW MEXICO

Boring Number	Sample Depth(Ft-BGS)	Antimony	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc
0861	0-0.	5.4UJ	1,950	2.3	11.1	4.1J	9.8	48.1J	752	7.7J	1,320
	2-	5.1UJ	147	1.9J	9.8	3.9J	46.8	32.7	152	7.8J	41.1
	4-	5.4UJ	154	0.94UJ	11.7	5.0J	10.4	12.9	132	11.4	25.6
	8-1	5.2UJ	298	0.9UJ	5.3	2.4J	3U	5.1	64.5	6.5J	11.1U
0862	0-0.	2.3J	390	4.9	67.8	18.7	56.4	236J	383	103	3,000
	2-	5.2UJ	128	0.9U	10	5.1J	10	8.5	293	9.5	51.9
	4-	5UJ	78.1	0.88UJ	9.7	4.1J	7.5	5.3	86.3	9	19U
0863	0-0.	4.7UJ	207	1.6	14.6	4.4J	14.5	13.5J	187	10.5	249J
	2-	5.7UJ	80.6	0.99U	11.4	5.1J	8.5	7.9	219	9.7J	26.2
	4-	5.1UJ	49.9	0.88U	8.9	3.9J	7	6.3	131	8.2J	17.6U
	8-1	5.2UJ	96.1	0.9U	6.9	3.3J	6.9	4.2	97.5	5.4J	14.7
0864	0-0.	87.4J	503	8.8	113	15.2J	470J	224	229	54.4J	2,900J
	2-	5.3UJ	82.8	0.92U	12	5.6J	8.7	9.8	219	10.1	37.8
	4-	5.2UJ	88	0.91U	10.1	3.8J	7.9	4.3	110	8.8J	19.9U
	8-1	5.4UJ	65.4	0.94UJ	8.3	3.5J	7.4	6.5	123	8.8J	18.6
0865	0-0.	4.9UJ	126	0.85U	12	2.8J	8.9J	13.2J	210	6.9J	49.4J
	2-	5.3UJ	214	0.93UJ	8.8	3.8J	7.4U	7.3	148	8.5J	20.9
	4-	5.4UJ	71.7	0.93UJ	11.5	3.5J	8.2U	7.1	111	11.2	23.7
	8-1	5.4UJ	87	0.95UJ	7.7	3.4J	6.5U	6	86.7	7.7J	16.5
	Background x + 2	4.88-5.44	0-903	0.81-1.01	2.67-9.31	1.38-4.06	0.00-15.44	1.76-8.64	10.89-167	3.57-8.49	4.58-21.82

Ft-BGS = Feet below ground surface
UJ = Estimated as nondetect at the instrument detection limit
J = Estimated value
U = Not detected
[1] All concentrations are in milligrams per kilogram (mg/kg)
[2] Background range calculated from values in Table 2-7



BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995

NOTE: LOCATION OF UNDERGROUND UTILITY LINES SHOWN ARE APPROXIMATE.

APPENDIX 1 SWMUs 86–90 (SITE SD–11) SITE PLAN CANNON AFB, NEW MEXICO			
DRN. BY: JWB	DATE: 11/15/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	4–1

REPORT PHASE: PHASE II SITE SD-11

12/13/1995 15:15

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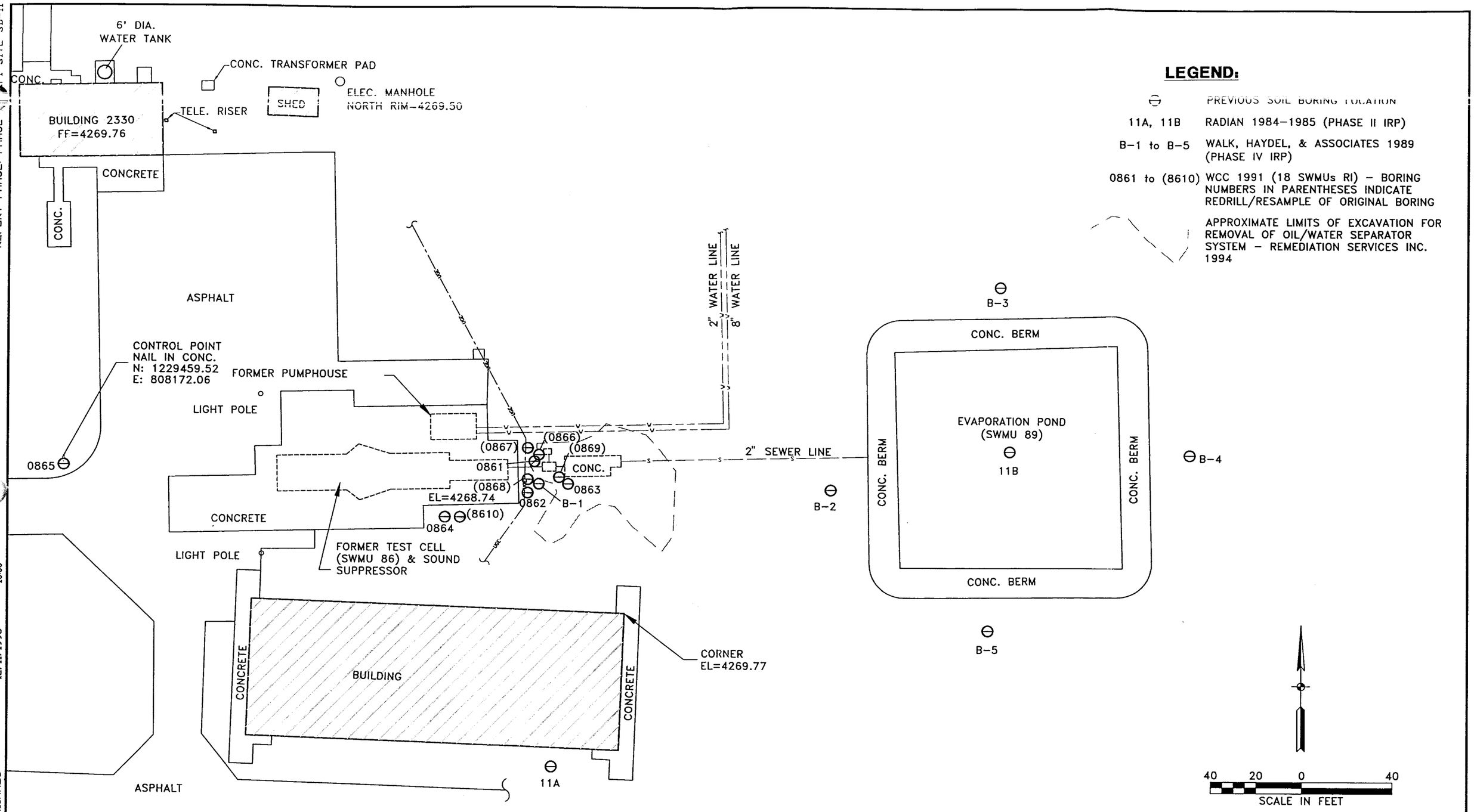


LEGEND:

⊖	PREVIOUS SOIL BORING LOCATION
11A, 11B	RADIAN 1984–1985 (PHASE II IRP)
B-1 to B-5	WALK, HAYDEL, & ASSOCIATES 1989 (PHASE IV IRP)
0861 to (8610)	WCC 1991 (18 SWMUs RI) – BORING NUMBERS IN PARENTHESES INDICATE REDRILL/RESAMPLE OF ORIGINAL BORING
	APPROXIMATE LIMITS OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM – REMEDIATION SERVICES INC. 1994

BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995

NOTE: LOCATION OF UNDERGROUND UTILITY LINES SHOWN ARE APPROXIMATE.

APPENDIX 1 SWMUs 86–90 (SITE SD-11)
PREVIOUS SAMPLING LOCATION PLAN
CANNON AFB, NEW MEXICO

DRN. BY: JWB	DATE: 12/06/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	4-2

REPORT PHASE: PHASE I SITE SD-11
12/11/1995 10:00
T:\CANNON\C3M11MM\3M11MM26

5.0
FIELD INVESTIGATION AND DATA COLLECTION

Field activities at the Appendix I SWMUs 86-90 (Site SD-11) included soil borings and sampling, immunoassay testing, groundwater sampling from a nearby base production well, and sample location survey.

The Phase III RFI field program consisted of the following:

- Drilling 9 soil borings and sampling soil for chemical, microbiological, and geotechnical analysis
- Field screening soil samples using immunoassay techniques to determine sample intervals for chemical analysis
- Sampling groundwater from Base Well No. 9 for chemical analysis
- Determining horizontal and vertical control at sampling locations

The planned activities and investigative techniques for the Appendix I SWMUs 86-90 are described in the Phase III RFI Work Plan (W-C 1995b), which contains the Quality Assurance Project Plan (QAPP) Addendum and Standard Operating Procedures (SOPs). All field activities were completed in accordance with the above-referenced documents. Locations of sampling points are shown on Figure 5-1.

5.1 SURFACE SOIL SAMPLING

Surface soil samples were collected at soil boring locations to help evaluate the potential risk to human health and the environment and to assess the presence of site-related contaminants in surface soil. Surface soil samples were collected for analysis of the following parameters:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organic compounds (SVOCs) by EPA Method 8270
- Total petroleum hydrocarbons (TPH) by EPA Method 418.1

- Target Analyte List (TAL) metals by EPA Methods 6010 and 7000

Surface soil samples were generally collected from the 0- to 2-foot interval, except at boring 8615, where the sample was collected from 1 to 3 feet due to the presence of asphalt at that location. At borings 8612 and 8611, the sample interval was 0 to 3 feet and 0 to 3.5 feet, respectively, due to the lack of recovery for QA/QC samples. At each of these locations the soil volume for analysis of VOCs was collected from the 0.5- to 2-foot interval. Samples were collected with a 3-inch outside diameter (OD) stainless-steel split spoon according to the procedures described below for soil boring drilling and sampling. Surface soil sampling activities followed the applicable SOPs included in the Work Plan (W-C 1995b). A summary of soil sampling for chemical analysis is provided in Table 5-1.

5.2 SOIL BORING DRILLING AND SAMPLING

A total of 9 soil borings (8611 through 8619) were drilled for the Phase III RFI at Appendix I SWMUs 86-90 (Site SD-11). Each boring was drilled using 4-1/4-inch inside diameter (ID), 8-inch nominal OD hollow-stem augers (HSA). These drilling methods allowed for the collection of soil samples.

Soil borings were sampled generally every 5 feet to a depth of 40 feet below ground surface (bgs) and every 10 feet at depths greater than 40 feet bgs. Samples were collected for headspace analysis, immunoassay analysis, chemical analysis, microbiological analysis, geotechnical analysis, and description of subsurface materials. Soil samples were collected mainly with a 3-inch OD stainless-steel split spoon. Occasionally a 2-inch OD stainless-steel split spoon was used to obtain additional sample volume at intervals where recovery was low for chemical analysis. Samples for microbiological analysis were collected using a 2-inch ID California sampler with stainless-steel liners. Liners were autoclaved, or sterilized, prior to use in the field. All soil samples were placed in appropriate containers and labeled. Soil samples for chemical and microbiological analysis were placed in a cooler for shipment to the designated laboratory, with samples for chemical analysis pending results of immunoassay tests. A W-C geotechnical engineer classified each recovered sample in the field using the Unified Soil Classification System (USCS) and prepared a detailed boring log which included the boring identification, drilling, equipment, sample intervals, sample recovery, field screening results, and general observations. Boring logs from all borings are

presented in Appendix B. Auger cuttings and excess or unused soil sample material were containerized in 55-gallon, labeled drums for future disposal. These drums were transported to the base drum storage area. Soil borings were abandoned with cement-bentonite grout. All applicable SOPs from the Work Plan (W-C 1995b) were followed.

Subsurface soil samples for chemical analysis were collected to assess the presence and extent of site-related contaminants in soil. Analytical parameters were the same as that for surface soil sampling (see Section 5.1). Sample intervals for chemical analysis were selected using field screening results, primarily immunoassay (see Section 5.3) and also headspace analysis. A summary of field screening results for soil is provided in Table 5-2. The minimum boring depth was 35 feet (borings 8612, 8614, 8615, 8616, 8617, 8618, and 8619). Borings 8611 and 8613 were completed to depths of 70 feet and 65 feet, respectively. At soil borings where immunoassay results were non-detect (borings 8614 through 8619), a minimum of three samples was collected for chemical analysis at the 0-, 30-, and 35-foot intervals. At borings 8611, 8612, 8613, and 8614, the number of samples collected for chemical analysis was 8, 6, 6, and 4, respectively. A summary of soil sampling for chemical analysis is provided in Table 5-1.

Soil samples for microbiological analysis were collected to assess the potential for bioremediation of petroleum hydrocarbon-contaminated soil at the site. Six soil samples were collected for analysis of microbial plate count, including heterotrophic bacteria, petroleum hydrocarbon-degrading bacteria, and *pseudomonas*. All six samples were collected from boring 8611 at various intervals. A summary of soil sampling for microbiological analysis is provided in Table 5-3.

In additional to chemical and microbiological analysis, 8 soil samples were collected for geotechnical analysis from 5 borings (8611, 8612, 8613, 8615, and 8617). Sample intervals were chosen to obtain a representative sample from each general soil type encountered at the site. Samples were collected for analysis of particle size and natural water content. Four of 8 samples were also designated for analysis of plastic and liquid limits (i.e., Atterberg limits). A summary of soil sampling for geotechnical analysis is provided in Table 5-4.

5.3 IMMUNOASSAY TESTING

Soil samples were analyzed in the field for petroleum hydrocarbons using the Petro Risc® soil test developed by Ensys, Inc. This test conforms to SW-846 Immunoassay Method 4030. Two detection levels were used for each test. These were a minimum detection level of 10 parts per million (ppm) for gasoline, or 15 ppm for other petroleum fuels, and a detection level of 100 ppm or equivalent to 10 times the minimum detection level. Petroleum fuels and other compounds which can be detected by the Petro Risc® soil test and their minimum detection levels are listed in the table below:

Compound	Level (ppm)
Gasoline	10
Diesel	15
#2 Fuel Oil	15
Kerosene	15
Jet Fuel A	15
Jet Fuel JP-4	15
#6 Fuel Oil	25
Mineral Spirits	40

Results of immunoassay tests were reported as being less than or greater than the detection levels for gasoline (10 and 100 ppm), although actual detection levels are dependent on the compound or compounds present. Immunoassay testing activities followed the applicable SOPs included in the Work Plan (W-C 1995b). Immunoassay test results are provided in Table 5-2. Field data sheets are provided in Appendix B.

5.4 GROUNDWATER SAMPLING

Groundwater was sampled for chemical analysis from Base Well No. 9 located about 300 feet northwest of the location of the former oil/water separator at Appendix I SWMUs 86-90 (Site SD-11) (see Figure 4-1). The static water level and well depth were estimated from information taken from driller's logs and well registration records (see Appendix B). A quantity of water equal to more than three times the submerged volume of the casing was removed by activating the well pump, which discharged at approximately 300 gallons per minute. Water was discharged into storage tanks, which overflowed near the end of sampling. Field parameters, including pH, temperature, specific conductance, and turbidity were measured and recorded periodically during purging. Purging continued until

parameters, except turbidity, had stabilized within 10 percent for three consecutive readings. All turbidity readings during purging were less than 5 NTUs.

Groundwater samples were collected using a sample port at the wellhead which allowed for direct transfer and flow rate control into sample containers. Groundwater samples were placed in appropriately labeled sample containers and placed in a cooler with ice for shipment to the designated laboratory. Groundwater samples were collected for analysis of the following parameters:

- Volatile organic compounds (VOCs) by EPA Method 8240
- Semivolatile organic compounds (SVOCs) by EPA Method 8270
- Pesticides/Polychorinated Biphenyls (Pest/PCBs) by EPA Method 8080
- Herbicides by EPA Method 8150
- Total petroleum hydrocarbons (TPH) by EPA Method 418.1
- Target Analyte List (TAL) metals by EPA Methods 6010 and 7000

Groundwater sampling activities followed the applicable SOPs included in the Work Plan (W-C 1995b). Some exceptions were made (e.g., air monitoring, purged water disposal, etc.) due to the nature of the well being sampled. A summary of groundwater sampling for chemical analysis is provided in Table 5-5.

5.5 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Certified, commercially-cleaned sample containers were obtained from the contract analytical laboratory, Quanterra. Sample bottles for quality assurance/quality control samples (trip blanks, duplicates, and USACE splits) were also provided by Quanterra. Required preservatives were prepared and placed in the bottles at the laboratory prior to shipment to the site. The bottles were labeled by the laboratory to indicate the type of sample to be collected for each type of bottle. The liners used to collect the biological soil samples (microbial plate count) were autoclaved (i.e., sterilized) by the W-C laboratory in Franklin, Tennessee prior to use in the field.

Sample preservation efforts commenced at the end of sample collection and continued until analyses were done. Samples were stored on ice at 4°C immediately following collection.

5.6 SURVEYING

Lydick Engineers and Surveyors provided professional surveying services to establish the locations of soil borings and other appropriate data points. Surveying included horizontal and vertical coordinates.

5.7 SUBCONTRACTORS

The following subcontractors were used for the Phase III RFI at Appendix I SWMUs 86-90 (Site SD-11):

- Southwest Engineering, Inc. (Drilling)
  475 Archuleta Road
  Las Cruces, New Mexico 88005

- Quanterra (Chemical Analysis of Samples)
  4955 Yarrow Street
  Arvada, Colorado 80002

- BBC Laboratory (Biological Analysis of Samples)
  3220 South Fair Lane, Suite 18
  Tempe, Arizona 85282

- W-C Geotechnical Laboratory (Geotechnical Analysis of Samples)
  45H Commerce Way
  Totowa, New Jersey 07512

- Lydick Engineers and Surveyors (Surveying)
  205 East 2nd Street
  Clovis, New Mexico 88102

TABLE 5-1

SUMMARY OF SOIL SAMPLING FOR CHEMICAL ANALYSIS
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Identification	Sample Depth (ft)	Sample Date	Parameters				Comments
				VOCs[1]	SVOCs[2]	TPH[3]	TAL Metals[4]	
8611	CAN086-8611-0000	0-3.5	10/18/95	X	X	X	X	
	CAN086-8611-8661	0-3.5	10/18/95	X	X	X	X	Field duplicate
	CAN086-8611-0004	4-6	10/18/95	X	X	X	X	
	CAN086-8611-8662	4-6	10/18/95	X	X	X	X	Field duplicate
	CAN086-8611-0009	9-11	10/18/95	X	X	X	X	
	CAN086-8611-8602	9-11	10/18/95	X	X	X	X	USACE-MRD field split
	CAN086-8611-0014	14-15.3	10/18/95	X	X	X	X	
	CAN086-8611-0039	39-40	10/19/95	X	X	X	X	
	CAN086-8611-0049	49-50.5	10/19/95	X	X	X	X	
	CAN086-8611-0059	50-60.1	10/19/95	X	X	X	X	
	CAN086-8611-0069	69-70.3	10/19/95	X	X	X	X	
8612	CAN086-8612-0000	0-3	10/18/95	X	X	X	X	
	CAN086-8612-8601	0-3	10/18/95	X	X	X	X	USACE-MRD field split
	CAN086-8612-0009	9-11	10/18/95	X	X	X	X	
	CAN086-8612-0014	14-16	10/18/95	X	X	X	X	
	CAN086-8612-0019	19-20	10/18/95	X	X	X	X	
	CAN086-8612-0029	29-30.4	10/18/95	X	X	X	X	
	CAN086-8612-0034	34-35.3	10/18/95	X	X	X	X	
8613	CAN086-8613-0000	0-2	10/18/95	X	X	X	X	MS/MSD
	CAN086-8613-6000	0-2	10/18/95	X	X	X	X	MS/MSD volume for 8613-0000
	CAN086-8613-0014	14-16	10/19/95	X	X	X	X	
	CAN086-8613-8663	14-16	10/19/95	X	X	X	X	Field duplicate
	CAN086-8613-0024	24-26	10/19/95	X	X	X	X	
	CAN086-8613-0034	34-35.4	10/19/95	X	X	X	X	
	CAN086-8613-0049	49-50.3	10/20/95	X	X	X	X	
	CAN086-8613-0064	64-64.8	10/20/95	X	X	X	X	
8614	CAN086-8614-0000	0-2	10/17/95	X	X	X	X	
	CAN086-8614-0009	9-11	10/17/95	X	X	X	X	
	CAN086-8614-0029	29-31	10/17/95	X	X	X	X	
	CAN086-8614-0034	34-36	10/17/95	X	X	X	X	

TABLE 5-1

SUMMARY OF SOIL SAMPLING FOR CHEMICAL ANALYSIS
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Identification	Sample Depth (ft)	Sample Date	Parameters				Comments
				VOCs[1]	SVOCs[2]	TPH[3]	TAL Metals[4]	
8615	CAN086-8615-0001	1-3	10/20/95	X	X	X	X	
	CAN086-8615-0029	29-31	10/20/95	X	X	X	X	
	CAN086-8615-0034	34-34.9	10/20/95	X	X	X	X	
8616	CAN086-8616-0000	0-2	10/21/95	X	X	X	X	
	CAN086-8616-0029	29-29.8	10/21/95	X	X	X	X	
	CAN086-8616-0034	34-34.9	10/21/95	X	X	X	X	
8617	CAN086-8617-0000	0-2	10/21/95	X	X	X	X	
	CAN086-8617-0029	29-30.3	10/21/95	X	X	X	X	
	CAN086-8617-0034	34-35	10/21/95	X	X	X	X	
8618	CAN086-8618-0000	0-2	10/23/95	X	X	X	X	
	CAN086-8618-8664	0-2	10/23/95	X	X	X	X	Field duplicate
	CAN086-8618-0029	29-29.9	10/23/95	X	X	X	X	
	CAN086-8618-8604	29-29.9	10/23/95	X	X	X	X	USACE-MRD field split
	CAN086-8618-0034	34-36	10/23/95	X	X	X	X	
8619	CAN086-8619-0000	0-2	10/24/95	X	X	X	X	
	CAN086-8619-8605	0-2	10/24/95	X	X	X	X	USACE-MRD field split
	CAN086-8619-0029	29-30	10/24/95	X	X	X	X	
	CAN086-8619-0034	34-35	10/24/95	X	X	X	X	

[1] Volatile Organic Compounds (Method 8240)
[2] Semivolatile Organic Compounds (Method 8270)
[3] Total Petroleum Hydrocarbons (Method 418.1)
[4] Target Analyte List Metals (Method 6010 + 7060 (arsenic), 7740 (selenium), 7471 (mercury), 7421 (lead), 7841 (thellium))
ft = feet
MS/MSD = Matrix Spike / Matrix Spike Duplicate
USACE-MRD - United States Army Corps of Engineers- Missouri River Division Laboratory

TABLE 5-2

SUMMARY OF FIELD SCREENING RESULTS FOR SOIL
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Depth (ft)	Date	Headspace[1] Sample Time	Headspace[1] Measure Time	Headspace[1] Result (ppm)	Immunoassay[2,3] DL = 10 ppm	Immunoassay[2,3] DL = 100 ppm	Petroleum Odor	Comments
8611	0-3.5	10/18/95	1530	1658	34	-	-	Yes, > 2.5'	
	4-6	10/18/95	1600	1659	61	> 10	> 100	Yes	
	9-11	10/18/95	1625	1700	18	> 10	> 100	Yes	HNu result may be underestimated[4]
	14-15.3	10/18/95	1650	1724	430	> 10	> 100	Yes	
	19-20.3	10/18/95	1710	1746	440	> 10	> 100	Yes	
	24-25.3	10/18/95	1735	-	-	> 10	> 100	Yes	
	29-31	10/19/95	0920	0953	152	> 10	> 100	Yes	
	34-35.2	10/19/95	0945	1043	220	> 10	> 100	Yes	
	39-40	10/19/95	1010	1154	350	> 10	> 100	Yes	
	44-45.4	10/19/95	1040	1155	320	> 10	> 100	Yes	
	49-50.5	10/19/95	1100	1157	200	> 10	ND	No	
	50-60.1	10/19/95	1145	-	-	ND	ND	No	
	69-70.3	10/19/95	1220	1307	26	ND	ND	No	
8612	0-3	10/18/95	0820	0930	ND	-	-	No	
	4-6	10/18/95	0830	0912	20	ND	ND	Yes, > 6'	HNu result may be overestimated[5]
	9-11	10/18/95	0840	0915	93	> 10	> 100	Yes	HNu result may be overestimated[5]
	14-16	10/18/95	0850	0942	150	> 10	> 100	Yes	HNu result may be overestimated[5]
	19-20	10/18/95	0910	-	-	> 10	> 100	Yes	
	24-25.3	10/18/95	1345	1445	22	ND	ND	No	
	29-30.4	10/18/95	1410	1447	4.8	ND	ND	No	
	34-35.3	10/18/95	1430	1510	1.2	ND	ND	No	
8613	0-2	10/18/95	1250	-	-	-	-	No	
	4-6	10/19/95	1515	1609	58	> 10	~ 100	Yes, > 6'	Photometer = 0.00 at 100 ppm DL
	9-11	10/19/95	1525	-	-	-	-	Yes	Not enough recovery
	11-13	10/19/95	1530	1625	51	> 10	> 100	Yes	
	14-16	10/19/95	1545	1627	240	> 10	> 100	Yes	
	19-21	10/19/95	1600	1636	340	> 10	> 100	Yes	
	24-26	10/19/95	1615	1645	310	> 10	> 100	Yes	
	29-30	10/19/95	1635	1712	350	> 10	> 100	Yes	
	34-35.4	10/19/95	1655	1726	290	> 10	> 100	Yes	
	39-40.2	10/19/95	1715	1751	200	> 10	> 100	Yes	
	49-50.3	10/20/95	0900	0942	1.6	ND	ND	No	
	59-59.8	10/20/95	0940	-	-	-	-	No	Not enough recovery

TABLE 5-2

SUMMARY OF FIELD SCREENING RESULTS FOR SOIL
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Depth (ft)	Date	Headspace[1]			Immunoassay[2,3]		Petroleum Odor	Comments
			Sample Time	Measure Time	Result (ppm)	DL = 10 ppm	DL = 100 ppm		
	64-64.8	10/20/95	1010	1055	ND	ND	ND	No	
8614	0-2	10/17/95	1255	1337	ND	-	-	No	
	4-6	10/17/95	1310	1350	130	ND	ND	No	HNu result may be overestimated[5]
	9-11	10/17/95	1320	1355	62	ND	ND	No	HNu result may be overestimated[5]
	14-16	10/17/95	1330	1410	44	ND	ND	No	HNu result may be overestimated[5]
	19-21	10/17/95	1345	1525	20	ND	ND	No	HNu result may be overestimated[5]
	24-26	10/17/95	1400	1440	38	ND	ND	No	HNu result may be overestimated[5]
	29-31	10/17/95	1415	1445	26	ND	ND	No	HNu result may be overestimated[5]
	34-36	10/17/95	1435	1525	28	ND	ND	No	HNu result may be overestimated[5]
8615	1-3	10/20/95	1115	1215	ND	-	-	No	
	4-6	10/20/95	1125	1217	ND	ND	ND	No	
	9-11	10/20/95	1140	1218	ND	-	-	No	
	14-16	10/20/95	1155	1229	ND	-	-	No	
	19-21	10/20/95	1210	1241	ND	-	-	No	
	24-26	10/20/95	1230	1300	ND	ND	ND	No	
	29-31	10/20/95	1240	1313	ND	ND	ND	No	
	34-34.9	10/20/95	1255	-	-	ND	ND	No	
8616	0-2	10/21/95	0830	0928	ND	-	-	No	
	4-6	10/21/95	0840	0929	ND	-	-	No	
	9-11	10/21/95	0850	0930	ND	-	-	No	
	14-16	10/21/95	0905	0941	ND	-	-	No	
	19-20.8	10/21/95	0915	0942	ND	ND	ND	No	
	24-24.9	10/21/95	0925	0957	ND	-	-	No	
	29-29.8	10/21/95	0940	1019	ND	ND	ND	No	
	34-34.9	10/21/95	0950	1020	ND	ND	ND	No	
8617	0-2	10/21/95	1040	1117	ND	-	-	No	
	4-6	10/21/95	1050	1120	ND	-	-	No	
	9-11	10/21/95	1105	1204	ND	-	-	No	
	14-16	10/21/95	1115	1205	ND	-	-	No	
	19-21	10/21/95	1130	1206	ND	-	-	No	
	24-24.7	10/21/95	1140	1210	ND	-	-	No	
	29-30.3	10/21/95	1155	-	-	ND	ND	No	

TABLE 5-2

SUMMARY OF FIELD SCREENING RESULTS FOR SOIL
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Depth (ft)	Date	Headspace[1]			Immunoassay[2,3]		Petroleum Odor	Comments
			Sample Time	Measure Time	Result (ppm)	DL = 10 ppm	DL = 100 ppm		
	34-35	10/21/95	1220	1251	ND	ND	ND	No	
8618	0-2	10/23/95	1525	1721	ND	-	-	No	
	4-6	10/23/95	1540	1722	ND	ND	ND	No	
	9-11	10/23/95	1550	1723	ND	-	-	No	
	14-16	10/23/95	1600	1724	ND	ND	ND	No	
	19-20.5	10/23/95	1615	1728	ND	-	-	No	
	24-24.8	10/23/95	1630	-	-	ND	ND	No	
	29-29.9	10/23/95	1645	-	-	ND	ND	No	
	34-36	10/23/95	1700	-	-	ND	ND	No	
8619	0-2	10/24/95	0805	0901	ND	-	-	No	
	4-6	10/24/95	0815	0902	ND	ND	ND	No	
	9-11	10/24/95	0825	0911	ND	-	-	No	
	14-16	10/24/95	0840	0912	ND	ND	ND	No	
	19-21	10/24/95	0855	0955	ND	-	-	No	
	24-24.8	10/24/95	0910	-	-	-	-	No	
	29-30	10/24/95	0920	1008	ND	ND	ND	No	
	34-35	10/24/95	0940	-	-	ND	ND	No	

[1] Headspace was measured using an HNu with 10.2 eV probe calibrated to read concentration as benzene.

[2] Immunoassay was measured using Petro Ris© soil test by Ensys, Inc.

[3] Minimum detection level for Petro Ris© soil test is 10 ppm gasoline and 15 ppm for other petroleum fuels.

[4] Foil came off while unscrewing lid of headspace jar and before HNu probe could be inserted through foil.

[5] HNu needle response was erratic after slower than normal rise to reading noted. At boring 8614, readings were obtained where no other signs of contamination were observed.

"_" = No sample was field screened due to:
(1) low recovery and/or lack of available volume after sample collection (headspace), or
(2) headspace results and visual observations did not indicate contamination at additional borings where the number of test kits were limited (immunoassay)

ft = feet

ppm = parts contaminant per million parts air (headspace) or soil (immunoassay)

DL = detection level

ND = non detect above background (headspace) or detection level (immunoassay)

TABLE 5-3

SUMMARY OF SOIL SAMPLING FOR MICROBIOLOGICAL ANALYSIS
APPENDIX I SWMUs 86-90 (SD-11)

Sample Location	Sample Identification	Sample Depth (ft)	Sample Date	Microbial Plate Count[1]
8611	CAN086-8611-0007	7-8	10/18/95	X
	CAN086-8611-0011	11-12	10/18/95	X
	CAN086-8611-0016	15.3-16.3	10/18/95	X
	CAN086-8611-0040	40-41	10/19/95	X
	CAN086-8611-0051	50.5-51.5	10/19/95	X
	CAN086-8611-0071	70.3-71.3	10/19/95	X

[1] Including heterotrophic bacteria, *pseudomonas*, and petroleum hydrocarbon-degrading bacteri
ft = feet

TABLE 5-4

SUMMARY OF SOIL SAMPLING FOR GEOTECHNICAL ANALYSIS
APPENDIX I SWMUs 86-90 (SD-11)

Sample Location	Sample Identification	Sample Depth (ft)	Sample Date	Parameters		
				Particle Size Analysis[1]	Natural Water Content[2]	Plastic and Liquid Limits[3]
8611	CAN086-8611-0000	0-3.5	10/18/95	X	X	X
	CAN086-8611-0044	44-45.4	10/19/95	X	X	
	CAN086-8611-0069	69-70.3	10/19/95	X	X	
8612	CAN086-8612-0029	29-30.4	10/18/95	X	X	
8613	CAN086-8613-0024	24-26	10/19/95	X	X	
8615	CAN086-8615-0001	2-3	10/20/95	X	X	X
	CAN086-8615-0004	5-6	10/20/95	X	X	X
8617	CAN086-8617-0009	9-11	10/21/95	X	X	X

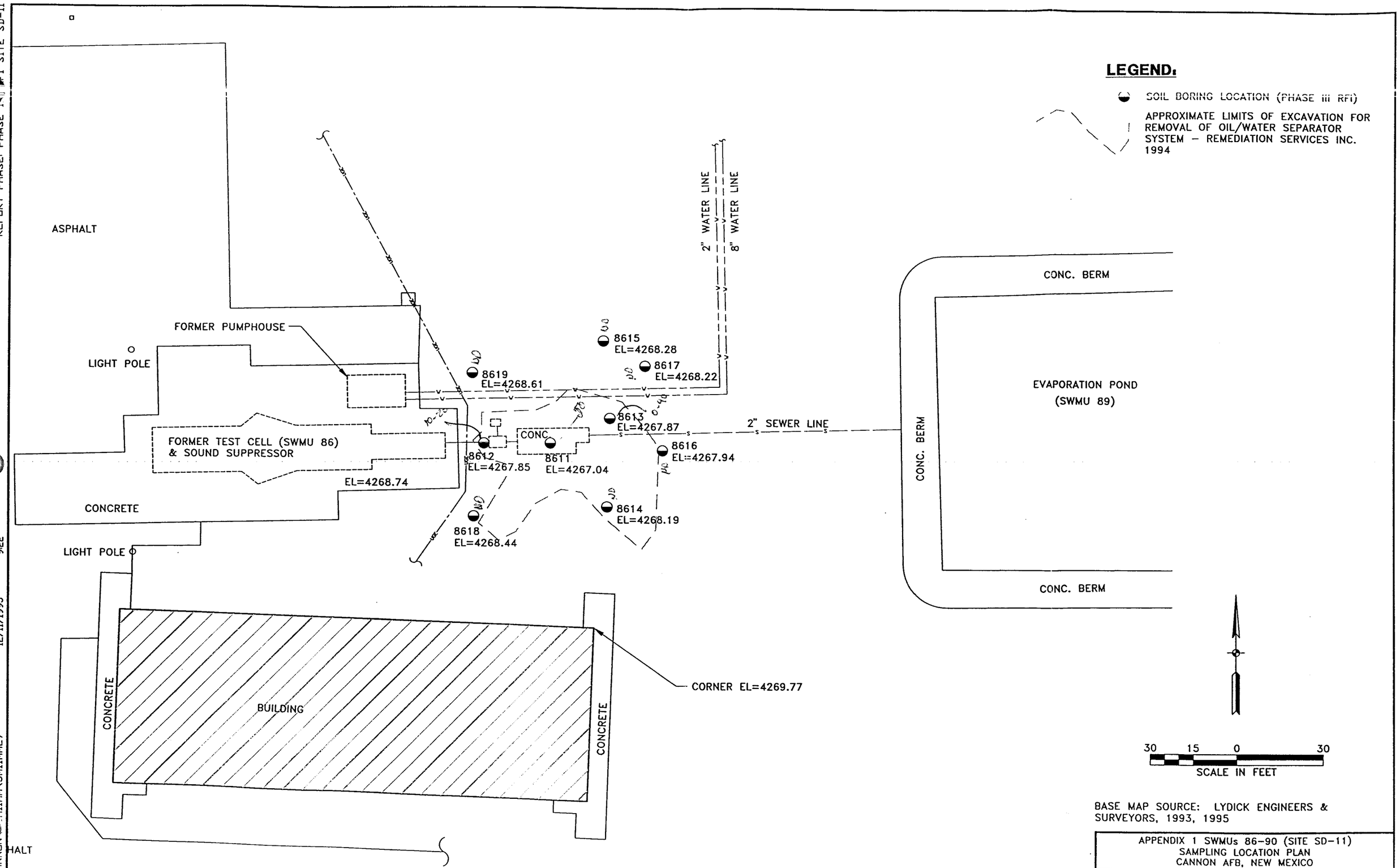
[1] ASTM D422 "Method for Particle-Size Analysis of Soils"; prepared by ASTM D421
[2] ASTM D2216 "Test Method for Lab Determination of Water (Moisture) Content of Soil and Rock"
[3] ASTM D4318 "Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils"
ft = feet

TABLE 5-5

SUMMARY OF GROUNDWATER SAMPLING FOR CHEMICAL ANALYSIS
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Identification	Sample Date	Parameters						Comments
			VOCs[1]	SVOCs[2]	Pest/PCBs	Herbicides	TPH[5]	AL Metal	
Well No. 9	CAN086-86W9-2001	10/24/95	X	X	X	X	X	X	
	CAN086-86W9-7001	10/24/95	X	X	X	X	X	X	MS/MSD volume
	CAN086-86W9-8691	10/24/95	X						Trip blank
	CAN086-86W9-8601	10/24/95	X	X	X	X	X	X	USACE-MRD field split
	CAN086-86W9-8692	10/24/95	X						USACE-MRD Trip blank

[1] Volatile Organic Compounds (Method 8240)
[2] Semivolatile Organic Compounds (Method 8270)
[3] Pesticides/Polychlorinated Biphenyls (Method 8080)
[4] Herbicides (Method 8150)
[5] Total Petroleum Hydrocarbons (Method 418.1)
[6] Target Analyte List Metals (Methods 6010, 7060 (arsenic), 7740 (selenuim), 7471 (mercury), 7421 (lead), and 7841 (thellium))
MS/MSD = Matrix Spike / Matrix Spike Duplicate
USACE-MRD - United States Army Corps of Engineers-Missouri River Division Laboratory



BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995

APPENDIX 1 SWMUs 86-90 (SITE SD-11) SAMPLING LOCATION PLAN CANNON AFB, NEW MEXICO			
DRN. BY: JWB	DATE: 12/06/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	5-1

REPORT PHASE I PHASE II RFI SITE SD-11
12/11/1995 9:22
T:\CANNON\M11MM\3M11MM27

6.0
DATA REVIEW, QUALITY ASSURANCE AND ASSESSMENT

6.1 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 1991b) and the Laboratory Data Validation Functional Guidelines for Evaluation of Inorganic Analyses (EPA 1988b). The data was assessed, which involved a consideration of the major data uses, the decision types, the identification of data which were qualified or otherwise did not meet QAPP Addendum (1994c) requirements, and limitations on data, in order to evaluate the appropriate usage of the data in supporting decisions to be made.

6.2 DATA REVIEW PROCESS

Analytical laboratory results were reviewed following the procedures described below utilizing the quality control (QC) data specified in the QAPP Addendum (1994c) 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 of analytes in method blanks and trip 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 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. The data, including all W-C qualifiers, are presented in the data summary tables in Section 7.0.

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 QAPP Addendum (1994c) with guidance from the

National Functional Guidelines for Organic Data Review (EPA 1991b) and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988b). 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 Section 7.0. The QC reviews detail quality control issues associated with the analysis of the sample, describes if qualification of data was required, and describes how professional judgment was used.

6.2.1 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 methods.

6.2.2 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 QAPP Addendum (1994c). 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.

6.2.3 Blanks

The same guidelines were applied to the results of method blanks, preparation 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.

6.2.4 Surrogates

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 QAPP Addendum (1994c). 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 petroleum hydrocarbons (TPH) or metals analyses.

6.2.5 Duplicate Control Samples (DCS)

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 of the analytical process independently of matrix effects. Evaluation criteria for DCS are provided in Table 4-2a through Table 4-2e of the QAPP Addendum (1994c). 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.

6.2.6 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed for organic analyses and matrix spike/duplicate (MS/D) samples were analyzed for inorganic analyses. 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 QAPP Addendum (1994c).

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.

6.2.7 Field Duplicate Samples

Precision evaluation criteria of 50 percent RPD for soil samples were considered if the analyte concentrations were greater than 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).

6.3 MEASUREMENT OF QUALITY ASSURANCE OBJECTIVES

6.3.1 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 7.0.

6.3.2 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 7.0.

6.3.3 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.

6.3.4 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 contains a qualitative assessment of data representativeness as defined by the QAPP Addendum (1994c).

6.3.5 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.

6.4 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, reporting limits for organics were equal to the practical quantitation limit. Reporting Limits were provided in Table 8-2 through Table 8-5 and Table 8-7 of the QAPP Addendum (1994c). For the Cannon AFB project, data was reported 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 instrument detection limits. 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 QAPP Addendum (1994c) 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. 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.

6.5 DATA ASSESSMENT

The assessment of data involved a consideration of the major data uses, the potential decisions, the identification of data which were qualified or otherwise deviated from QAPP Addendum (1994c) requirements, and limitations associated with the evaluation of data use in supporting decisions to be made.

6.5.1 Uses of Data

The major uses for data collected in the RFI were:

- Characterization of the physical setting and nature and extent of contamination
- 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 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.

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 Site SD-11 and EPA Region III RBCs.

6.5.2 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. 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. Additionally, 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, and use as indicators: precision, accuracy, completeness, comparability, and representativeness.

6.5.3 Sampling Issues

Daily Quality Control Reports (DQCRs) were completed during the field activities. DQCRs summarized the weather conditions, work completed, 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.

6.5.4 Data Usability Assessment

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 address items such as elevated reporting limits, analytes

suspected as laboratory contaminants, potential bias in results, and professional judgment utilized in the data review.

7.1 PHYSICAL RESULTS

7.1.1 Topography

Land in the vicinity of Appendix I SWMUs 86-90 (Site SD-11) is relatively flat, with slopes of less than 1 percent. Engine testing on the concrete slab has created a depression, about 1 foot deep, in the middle of the area where backfill was placed for the removal of the oil/water separator system. Sheepsfoot compactor marks are visible in this depression. No vegetation exists in the immediate area of the investigation. Some cobblestones and other rocks are present at the surface. Asphalt, underneath a layer of soil less than 1 inch thick, was encountered in one boring along the north edge of the area investigated. No drainage channels are present in the vicinity of the site. Surface water that collects in the area generally infiltrates or evaporates.

7.1.2 Geology

The subsurface conditions at Site SD-11 are illustrated in two geologic cross sections (Figure 7-2, Section A-A'; Figure 7-3, Section B-B'). The section lines are shown on Figure 7-1. The cross sections were constructed with data obtained from the soil borings drilled at the site for the Phase III RFI (boring logs in Appendix B). Soil types were described in the field using the USCS. Geotechnical test results, presented in Table 7-1, were used to confirm classifications and assist in geological interpretations (grain-size distribution curves in Appendix B). Sections A-A' and B-B' show the general shallow stratigraphy across the area investigated in an east to west and south to north direction, respectively.

Section A-A' (Figure 7-2) illustrates data from soil borings 8612, 8611, 8613, and 8616. Section B-B' (Figure 7-3) was constructed from data collected at soil borings 8614, 8613, and 8615. Both cross sections bisect the zone of backfill completed for the removal of the oil/water separator system. The approximate limits of the excavation and the location of the former oil/water separators are also shown on the cross sections.

All nine borings encountered reddish-brown, silty clay fill material containing some fine-grained sand and occasional gravel. Depth of this material was to about one foot below ground surface at borings located outside the zone of backfill. Depths at borings located within the zone of backfill ranged from 5 feet (boring 8614) to 15 feet (boring 8613). At boring 8615, about 4 inches of asphalt was encountered at the ground surface.

The shallow stratigraphy at the site consists of varying layers of alluvial sediments of the Ogallala Formation. The upper layer is typically red, silty clay with fine-grained sand. Thicknesses of this material ranged from 2.5 to 4 feet at depths up to 5 feet bgs at borings located outside the zone of backfill. No borings within the backfill zone encountered this material. Below this layer exists a transitional layer of light red, clayey silt with fine-grained sand, sandy silt, or silty sand. Thickness of this layer ranged from about 10 to 15 feet at depths up to 20 feet bgs at borings located outside the zone of backfill. At boring 8614, about 4 feet of this layer was encountered below backfill. No other borings encountered this layer.

Underlying these materials is light red to pink or red, fine-grained sand with silt with cemented zones or caliche layers. Silt content generally decreases with depth. All borings were terminated in this material.

Petroleum staining of soils was observed at borings 8611 (2.5 to 18 feet bgs), 8612 (6 to 9 feet bgs), and 8613 (6 to 32 feet bgs). Petroleum odors were also observed in soils within and generally below the zone of staining at these borings. Petroleum staining with the zone of backfill at these borings was generally mottled.

7.2 CHEMICAL RESULTS

7.2.1 General

Soil samples were collected from nine borings (8611, 8612, 8613, 8614, 8615, 8616, 8617, 8618, and 8619) and analyzed for VOCs, SVOCs, TPH, and TAL metals. Additionally, a groundwater sample was collected from Production Well No. 9 and analyzed for VOCs, SVOCs, herbicides, pesticide/PCBs, Appendix IX metals, and TPH. Tables 5-1 and 5-5 summarize the samples collected and the analyses. Analytical results for the Phase III RFI

soil samples and groundwater sample are summarized on Tables 7-2 and 7-3, respectively. The tables provide results for analytes which were detected at least once in the samples. A complete set of analytical results are provided in Appendix A.

7.2.2 Organic Results for Near-Surface Soil Samples

Near-surface soil samples were collected at nine locations at Site SD-11 (CAN086-8611-0000, CAN086-8612-0000, CAN086-8613-0000, CAN086-8614-0000, CAN086-8615-0001, CAN086-8616-0000, CAN086-8617-0000, CAN086-8618-0000, and CAN086-8619-0000). Table 7-2 summarizes the chemicals detected in the soil samples.

VOCs were reported as nondetect except toluene and total xylenes. Toluene was detected in sample CAN086-8613-0000 at 3 µg/kg, and total xylenes were reported at 1.1 µg/kg in sample CAN086-8619-0000. SVOCs were reported as nondetect except several PAHs were detected in the samples from locations 8611, 8612, 8613, and 8614. Total PAHs concentrations were reported at 320 µg/kg in sample CAN086-8611-0000, 38 µg/kg in sample CAN086-8612-0000, 758 µg/kg in sample CAN086-8613-0000, and 1,895 µg/kg in sample CAN086-8614-0000. SVOCs were reported as nondetect for the samples collected at locations 8615, 8616, 8617, 8618, and 8619. TPH were detected in samples from locations 8611, 8612, 8613, 8614, 8618, and 8619 with concentrations ranging from 81.2 mg/kg to 553 mg/kg. TPH were reported as nondetect for the samples collected from locations 8615, 8616, and 8617.

7.2.3 Organic Results for Subsurface Soil Samples

Subsurface soil samples were collected from nine borings at Site SD-11. Table 7-2 summarizes the chemicals detected in the soil samples. VOCs and SVOCs were reported as nondetect in the subsurface soil samples from borings 8612, 8614, 8617, 8618, and 8619. In the samples from borings 8615 and 8616 from 29 feet, toluene was detected at 4.6 µg/kg and 1.6 µg/kg, respectively. VOCs and SVOCs were reported as nondetect for the other samples collected from borings 8615 and 8616. TPH were reported as nondetect also for the subsurface soil samples collected from borings 8614, 8615, 8616, 8617, 8618, and 8619. TPH were detected in boring 8612 samples with a concentration range of 889 mg/kg and 5,390 mg/kg in the samples collected from 9 feet to 30 feet bgs.

In the samples from boring 8611, VOCs, PAHs, and TPH were detected in the samples collected from 4 feet to 60 feet bgs. 2-Butanone, ethylbenzene, toluene, and total xylenes were detected in the boring 8611 samples. Ethylbenzene and total xylenes were reported at 18,000 µg/kg and 33,000 µg/kg, respectively, in the sample collected from the depth of 14 feet to 15.3 feet, and ethylbenzene, toluene, and total xylenes were detected at 7,200 µg/kg, 300 µg/kg, 22,000 µg/kg, respectively. PAHs and TPH were reported in the boring 8611 samples at with a concentration ranging from 205 µg/kg to 29,000 µg/kg and 166 mg/kg to 5,010 mg/kg, respectively.

In samples from boring 8613, VOCs, PAHs, and TPH were detected in the samples collected from 14 feet to 35 feet bgs. Ethylbenzene, total xylenes, and common laboratory contaminants (acetone, 2-butanone, and methylene chloride) were detected in the samples. Ethylbenzene and total xylenes were reported at concentrations ranging from 150 µg/kg to 480 µg/kg and 200 µg/kg to 540 µg/kg, respectively. PAHs were detected at concentrations of 2,630 µg/kg, 3,570 µg/kg, and 6,450 µg/kg at the three different depths. Total PAH concentrations increased with the depth. TPH were detected with concentrations ranging from 497 mg/kg to 5,270 mg/kg.

7.2.4 Inorganic Results for Soil Samples

Metals analyses were performed on the samples collected from this site as indicated in Table 5-1 for the Phase III RFI. The range of results for the metals reported in the soil samples are summarized in the following table with the frequency which the analyte was detected.

Analyte	Lowest Concentration (mg/kg)	Highest Concentration (mg/kg)	Frequency
Aluminum	1700	12,500	39/39
Arsenic	0.54	3.0	37/39
Barium	20.4	1,260	39/39
Beryllium	0.14	0.71	33/39
Calcium	899	246,000	39/39
Chromium	2.9	13.6	35/39
Cobalt	1.2	4.9	28/39
Copper	1.1	9.6	37/39

Analyte	Lowest Concentration (mg/kg)	Highest Concentration (mg/kg)	Frequency
Iron	2,370	11,800	39/39
Lead	1.9	9	39/39
Magnesium	1,430	13,400	39/39
Manganese	18	214	39/39
Nickel	2.4	10.5	39/39
Potassium	421	2,030	39/39
Sodium	149	204	3/39
Thallium	0.11	0.18	7/39
Vanadium	6.5	24.2	39/39
Zinc	4.2	38.3	39/39

Antimony, cadmium, mercury, selenium, and silver were reported as nondetect in all of the soil samples. All detected metals were reported below the background concentrations.

7.2.5 Groundwater Results

A groundwater sample was collected from Base Well No. 9 and analyzed for VOCs, SVOCs, herbicides, pesticide/PCBs, Appendix IX metals, and TPH (see Table 7-3). All organics were reported as nondetect except bromoform which was detected at a concentration of 1.3 µg/L. Arsenic, barium, copper, and vanadium were also detected in the groundwater sample at concentrations of 5.5 µg/L, 32 µg/L, 9.1 µg/L, and 37 µg/L, respectively.

7.3 DATA ASSESSMENT

An assessment of the Site SD-11 data was done to identify quality issues that could potentially affect the use of the data for the decision making process. In general, the objective of the RFI was to determine nature and extent of contamination, to use the data for a human health risk screening, and to determine if further investigation of the site is warranted.

7.3.1 Sampling Issues

A review of the data contained in the DQCRs indicated that there were no sampling issues that would impact significantly the data usability. Specific issues about the field activities are included in Section 5.0.

7.3.2 Data Review Issues

For laboratory analytical data, the QA objectives were specified in the QAPP Addendum (1994c). The QA objectives were used as indicators of the quality necessary to support identification and quantitation of potential chemicals of concern. As presented in Section 5.0, various samples and analytes were qualified as estimated based on MS/MSD recoveries, surrogate spike recoveries, DCS recoveries, and field duplicate precision. Additionally, common laboratory contaminants were qualified as nondetect in various samples based on blank contamination or professional judgment. These qualifications did not impact the decision made for Site SD-11. Additionally, chromium data for boring 8614 samples were rejected **R** and are not usable in the decision making process based on MS/MSD recoveries. The rejected chromium data was judged not to impact the project decisions because chromium was below the background concentrations for Cannon AFB.

Ten percent of the soil data was also fully validated. The full validation of the data did not indicate any problems associated with the analysis of the samples.

7.3.3 Appropriateness

Analytical methodologies specific for the determination of VOCs, SVOCs, herbicides, pesticide/PCBs, metals, and TPH were utilized to help determine the presence of any chemicals of concern. With respect to the site description, the analytical methods utilized are appropriate to reasonably assess all chemicals of concern.

7.3.4 Limitations

Analytical data generated were found to be of known quality and were usable except the rejected chromium data. Reporting limits were raised for analysis of VOCs, SVOCs, TPH,

and various metals. The elevated reporting limits for the SVOC data could impact the data usability because low level analytes could have been diluted to below the elevated reporting limits and the reporting limits were greater than the RBC for benzo(a)pyrene. However, for SVOC analyses, the laboratory will report concentrations for Method 8270 to one tenth of the reporting limit. Overall, the data generated could be used to determine the nature and extent of contamination and for the human health risk screening.

7.4 MICROBIOLOGICAL RESULTS

7.4.1 Analytical Methodology

The general procedure used to enumerate microbial populations in soil is the spread plate technique. Using this procedure, soil microorganisms utilizing a specific substrate are enumerated by extracting organisms into a liquid phase and aseptically spreading the aliquot onto a solid agar plate containing the substrate of choice. Based on the volumes used in the extraction and spreading steps, the original density of microorganisms selectively utilizing the chosen substrate can be calculated. This technique is based on the concept that organisms can be uniformly diluted and spread onto agar plates resulting in the development of distinct microbial colonies. The numbers of organisms are expressed in terms of colony-forming units (CFU) per gram of soil.

The heterotrophs and *pseudomonas* were enumerated using Tryptic Soy Agar (Difco) and Pseudomonas Isolation Agar (Difco), respectively. The petroleum hydrocarbon degraders were enumerated on freshly prepared non-carbon containing minimal medium amended with gasoline and diesel fuel (equal volumes) at a final concentration of 2,500 mg/L.

7.4.2 Microbial Plate Counts

The results of the microbiological analysis of soil samples is summarized in Table 7-4. Microbial plate count results were within the following ranges:

- Heterotrophic bacteria: <1 x 10^3 CFU/g to 2.0 x 10^7 CFU/g
- Petroleum hydrocarbon degrading bacteria: <1 x 10^3 CFU/g to 1.3 x 10^6 CFU/g
- *Pseudomonas*: <1 x 10^2 CFU/g to 7.7 x 10^2 CFU/g

TABLE 7-1

GEOTECHNICAL TEST RESULTS
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Identification	Sample Depth (feet)	Sample Date	USC	Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Passing #200 Sieve (%)	Boring Log Description
8611	CAN086-8611-0000	0-3.5	10/18/95	SC	11.4	29	15	46	silty clay w/ fine sand (fill)
	CAN086-8611-0044	44-45.4	10/19/95	SM	9.3	-	-	15	fine sand w/ silt
	CAN086-8611-0069	69-70.3	10/19/95	SP-SM	3.7	-	-	6	fine sand w/ some silt
8612	CAN086-8612-0029	29-30.4	10/18/95	GP-GM	11.0	-	-	12	fine sand - cemented (caliche)
8613	CAN086-8613-0024	24-26	10/19/95	SM	7.7	-	-	20	fine sand w/ silt
8615	CAN086-8615-0001	2-3	10/20/95	CL	13.2	32	15	55	silty clay
	CAN086-8615-0004	5-6	10/20/95	CL	11.4	26	13	54	silty clay w/ fine sand
8617	CAN086-8617-0009	9-11	10/21/95	SM	10.3	NP	NP	49	clayey silt w/ fine sand

% = percent
Natural water content = (weight of water) / (weight of solids) * 100
NP = non-plastic (limits were not run)

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER	0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
	Result	RL	Qual	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	<	90	U	<	240	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
2-Butanone (MEK)	<	11	U	12	11		33	28		<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Ethylbenzene	<	5.6	U	1.4	5.5	U	<	14	U	18000	570		7200	540		1.5	5.8	U	<	5.5	U	<	5.2	U
Methylene chloride	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Toluene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	300	540	J	<	5.8	U	<	5.5	U	<	5.2	U
Xylenes (total)	<	5.6	U	1.2	5.5	J	3	14	J	33000	570		22000	540		6.3	5.8		<	5.5	U	<	5.2	U
Semivolatile Organics (µg/kg)																								
Benzo(a)anthracene	41	370	J	44	360	J	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(a)pyrene	40	370	J	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(b)fluoranthene	64	370	J	75	360	J	50	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(g,h,i)perylene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
bis(2-Ethylhexyl)phthal	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Chrysene	44	370	J	40	360	J	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Di-n-octyl phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Dibenzofuran	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Fluoranthene	70	370	J	90	360	J	56	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Isophorone	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2-Methylnaphthalene	<	370	U	190	360	J	110	370	J	18000	3800		3900	350		120	380	J	140	360	J	<	340	U
Naphthalene	<	370	U	79	360	J	<	370	U	11000	3800		2200	350		85	380	J	83	360	J	<	340	U
Phenanthrene	<	370	U	55	360	J	38	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Pyrene	61	370	J	69	360	J	48	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U

Results presented here are only those chemicals which were detected at least once at this site 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.

QUAL = Qualification
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR		CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER		0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE		10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
		Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)		6330																							
N Aluminum	76,000	12500	11.2		11600	11		10600	11.1		6640	57		4500	10.7		3450	11.5		3880	10.9		1770	10.4	
C Arsenic	3.9	2.2/1.3	1.1		2.3	1.1		2.8	0.56		1.4	1.1		0.9	0.54		0.54	0.58	J	0.78	0.55		0.56	0.52	
N Barium	5,400	213450	1.1	J	230	1.1	J	273	1.1	J	326	5.7	J	83	1.1	J	26.5	1.2	J	43.4	1.1	J	20.4	1	J
N Beryllium	150	0.62/0.5	0.22		0.67	0.22		0.63	0.22		0.71	1.1	J	0.26	0.21		0.22	0.23	J	0.27	0.22		0.14	0.21	J
Calcium		49900	22.5		74200	22.1		64900	22.2		246000	114		82600	21.5		22400	23		73900	21.8		899	20.9	
C Chromium	2100	13.6	1.1		13.4	1.1		11.1	1.1		4.7	5.7	J	5.4	1.1		4	1.2		10.5	1.1		2.9	1	
N Cobalt	3400	4.1/2.5	1.1		4.3	1.1		3.8	1.1		<	5.7	U	1.6	1.1		1.4	1.2		2.1	1.1		<	1	U
N Copper	2900	7.5/2.2	2.2		7.7	2.2		6.4	2.2		2.3	11.4	J	2.6	2.1		1.5	2.3	J	9.5	2.2		1.3	2.1	J
N Iron	23000	10600/190	11.2		10100	11		9420	11.1		4660	57		3850	10.7		3740	11.5		3980	10.9		2370	10.4	
Lead	400	7.6	0.56		7.5	0.55		9	1.1		2.6	0.57		2	0.54		2	0.58		5.5	0.55		1.3	0.52	
Magnesium		2880	22.5		2820	22.1		2770	22.2		6050	114		4110	21.5		3730	23		5680	21.8		1430	20.9	
N Manganese	3200	173/286	1.1		204	1.1		143	1.1		105	5.7		37.1	1.1		42.9	1.2		48.7	1.1		18	1	
N Mercury	21	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U	<	0.11	U	<	0.1	U
N Nickel	1600	10.5/33	4.5		10.3	4.4		8.3	4.4		6.2	22.8	J	3.9	4.3	J	3.1	4.6	J	5.3	4.4		2.6	4.2	J
Potassium		2020	562		1900	552		1800	556		1970	2850	J	919	536		669	575		668	545		421	521	J
C Sodium	1.8	<	562	U	204	552	J	<	556	U	<	2850	U	149	536	J	<	575	U	<	545	U	172	521	J
n Thallium	6.1	< 0.5	0.56	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	0.58	UJ	<	1.1	UJ	<	0.52	UJ
N Vanadium	530	24.2/44	1.1		22.9	1.1		22.2	1.1		12.4	5.7		9.6	1.1		10.8	1.2		13.9	1.1		6.5	1	
N Zinc	23000	33.6/200	2.2		29.5	2.2		27.6	2.2		12.1	11.4		7.7	2.1		7.1	2.3		14.4	2.2		4.2	2.1	
TPH (mg/kg)																									
Total Petroleum Hydroc		523	44.9	J	551	44.2	J	866	44.5	J	5010	456	J	626	42.9	J	166	46	J	533	43.6	J	<	41.7	U

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

J = Estimated value.
R = Rejected value.
U = Nondetected value.

QUAL = Qualification
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	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	<	55	U	<	110	U	<	63	U	<	11	U	<	11	U	<	11	U	590	57	J
2-Butanone (MEK)	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	36	57	J
Ethylbenzene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	480	29	J
Methylene chloride	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Toluene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	3	5.5	J	<	29	U
Xylenes (total)	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	540	29	J
Semivolatile Organics (µg/																								
Benzo(a)anthracene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	94	360	J	<	3800	U
Benzo(a)pyrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	98	360	J	<	3800	U
Benzo(b)fluoranthene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	160	360	J	<	3800	U
Benzo(g,h,i)perylene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	49	360	J	<	3800	U
bis(2-Ethylhexyl)phthal	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Chrysene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	110	360	J	<	3800	U
Di-n-octyl phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Dibenzofuran	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Fluoranthene	38	380	J	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	150	360	J	<	3800	U
Indeno(1,2,3-cd)pyrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	40	360	J	<	3800	U
Isophorone	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	930	3800	J
2-Methylnaphthalene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	940	3800	J
Naphthalene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	760	3800	J
Phenanthrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	57	360	J	<	3800	U
Pyrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	110	360	J	<	3800	U

Results presented here are only those chemicals which were detected at least once at this site 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.

QUAL = Qualification
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	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	11300	11.5		7080	22.1		6060	22.5		6540	22.3		5240	22.4		8020	11		10100	10.9		8080	22.8	
Arsenic	3	0.57		1.7	0.55		1.6	0.56		0.89	0.56		0.95	0.56		0.71	0.55		2	0.55		1.5	0.57	
Barium	215	1.1	J	327	2.2	J	189	2.3	J	129	2.2	J	685	2.2	J	40.9	1.1	J	410	1.1	J	297	2.3	J
Beryllium	0.47	0.23		0.59	0.44		0.49	0.45		0.39	0.45	J	0.24	0.45	J	0.31	0.22		0.58	0.22		0.45	0.46	J
Calcium	75100	22.9		126000	44.2		218000	45.1		159000	44.6		147000	44.7		65300	22.1		71400	21.8		199000	45.6	
Chromium	9.5	1.1		5.3	2.2		4.3	2.3		6	2.2		4.9	2.2		6.5	1.1		13.3	1.1		8.1	2.3	
Cobalt	3.6	1.1		2.7	2.2		<	2.3	U	<	2.2	U	<	2.2	U	1.3	1.1		3.7	1.1		2.4	2.3	
Copper	6.6	2.3		2.5	4.4	J	1.6	4.5	J	1.2	4.5	J	1.9	4.5	J	1.7	2.2	J	7.5	2.2		4.3	4.6	J
Iron	19009250	11.5		4940	22.1		4330	22.5		4430	22.3		3470	22.4		5260	11		9520	10.9		5800	22.8	
Lead	8.5	2.9		5.1	0.55		3.5	0.56		2.8	0.56		1.9	0.56		2.9	0.55		8	1.1	J	3.7	0.57	
Magnesium	2770	22.9		3580	44.2		4000	45.1		5230	44.6		13200	44.7		8250	22.1		2590	21.8	J	4900	45.6	
Manganese	26 205	1.1		60.7	2.2		39.2	2.3		32.8	2.2		27.7	2.2		35.6	1.1		175	1.1		160	2.3	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	9	4.6		5.3	8.8	J	3.8	9	J	3.6	8.9	J	6.1	8.9	J	5.1	4.4		9.8	4.4		8.4	9.1	J
Potassium	1950	573		1450	1100		1400	1130		1390	1120		1000	1120	J	1320	552		1740	545		1810	1140	
Sodium	<	573	U	<	1100	U	<	1130	U	<	1120	U	<	1120	U	<	552	U	<	545	U	<	1140	U
Thallium	0.13	0.57	J	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	19.6	1.1		12.2	2.2		12.3	2.3		12.8	2.2		15.9	2.2		15.5	1.1		21.8	1.1		19.1	2.3	
Zinc	26.1	2.3		13.7	4.4		11.8	4.5		10.9	4.5		7.4	4.5		10.7	2.2		38.3	2.2		16.2	4.6	
TPH (mg/kg)																								
Total Petroleum Hydroc	280	45.9		5390	442	J	3230	225	J	889	44.6	J	<	44.7	U	<	44.2	U	553	43.6	J	5270	456	

Results presented here are only those chemicals which were detected at least once at this site 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.

QUAL = Qualification
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	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	130	27		240	58		<	11	U	<	11	U	<	14	U	<	14	U	<	17	U	<	11	U
2-Butanone (MEK)	20	27	J	51	58	J	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Ethylbenzene	150	14		180	29		<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Methylene chloride	3.2	14	J	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Toluene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Xylenes (total)	200	14		400	29		<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/																								
Benzo(a)anthracene	<	720	U	<	760	U	<	360	U	<	360	U	200	360	J	<	360	U	<	360	U	<	360	U
Benzo(a)pyrene	<	720	U	<	760	U	<	360	U	<	360	U	270	360	J	<	360	U	<	360	U	<	360	U
Benzo(b)fluoranthene	<	720	U	<	760	U	<	360	U	<	360	U	440	360		<	360	U	<	360	U	<	360	U
Benzo(g,h,i)perylene	<	720	U	<	760	U	<	360	U	<	360	U	110	360	J	<	360	U	<	360	U	<	360	U
bis(2-Ethylhexyl)phthal	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Chrysene	<	720	U	<	760	U	<	360	U	<	360	U	260	360	J	<	360	U	<	360	U	<	360	U
Di-n-octyl phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Dibenzofuran	<	720	U	150	760	J	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Fluoranthene	<	720	U	<	760	U	<	360	U	<	360	U	210	360	J	<	360	U	<	360	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	720	U	<	760	U	<	360	U	<	360	U	89	360	J	<	360	U	<	360	U	<	360	U
Isophorone	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2-Methylnaphthalene	2600	720		4800	760		<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Naphthalene	970	720		1500	760		<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Phenanthrene	<	720	U	<	760	U	<	360	U	<	360	U	56	360	J	<	360	U	<	360	U	<	360	U
Pyrene	<	720	U	<	760	U	<	360	U	<	360	U	260	360	J	<	360	U	<	360	U	<	360	U

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

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

J = Estimated value. QUAL = Qualification

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

U = Nondetected value. RL = Reporting Limit. RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	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	6830	11		6880	11.5		3690	10.9		3440	10.9		11700	11		8840	11		3760	22.1		6150	11	
Arsenic	1	0.55		1	0.58		<	3.3	U	<	3.3	U	2.8	0.55	J	2	0.55	J	1.2	0.55	J	1.1	0.55	J
Barium	176	1.1	J	193	1.2	J	58.7	1.1	J	24.5	1.1	J	253	1.1	J	463	1.1	J	67.4	2.2	J	1260	1.1	J
Beryllium	0.26	0.22		0.19	0.23	J	0.14	0.22	J	0.14	0.22	J	0.53	0.22		0.5	0.22		0.22	0.44	J	0.2	0.22	J
Calcium	34400	21.9		115000	23		55600	21.7		7600	21.8		56400	22		1E+05	22.1		168000	44.2		39100	22	
Chromium	4.9	1.1		6	1.2		3.5	1.1		3.6	1.1				R			R			R			R
Cobalt	1.4	1.1		1.5	1.2		<	1.1	U	1.2	1.1		4.1	1.1		2.6	1.1		<	2.2	U	<	1.1	U
Copper	1.9	2.2	J	2.4	2.3		1.1	2.2	J	1.5	2.2	J	7.3	2.2		4.2	2.2		<	4.4	U	1.9	2.2	J
Iron	5240	11		4020	11.5		3510	10.9		4280	10.9		10200	11		5980	11		2690	22.1		5030	11	
Lead	3.1	0.55		2.5	0.58		2	0.54		2	0.55		4.6	1.1		3.3	0.55		1.4	0.55		2.3	1.1	
Magnesium	3120	21.9		12700	23		5540	21.7		2970	21.8		2680	22		3120	22.1		5930	44.2		3650	22	
Manganese	34.2	1.1		30.5	1.2		44.6	1.1		57.8	1.1		191	1.1	J	95.3	1.1	J	23.8	2.2	J	48	1.1	J
Mercury	<	0.11	U	<	0.12	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	4.2	4.4	J	4.3	4.6	J	2.6	4.3	J	2.4	4.4	J	9.3	4.4		6	4.4		2.8	8.8	J	4.5	4.4	
Potassium	1490	548		1390	576		715	543		675	545		2030	550		1600	552		672	1110	J	1550	550	
Sodium	<	548	U	<	576	U	<	543	U	<	545	U	<	550	U	<	552	U	<	1110	U	<	550	U
Thallium	<	0.55	UJ	<	1.2	UJ	<	0.54	UJ	<	0.55	UJ	0.18	1.1	J	0.17	1.1	J	0.12	1.1	J	0.11	1.1	J
Vanadium	12.6	1.1		15	1.2		11	1.1		12.7	1.1		21.1	1.1		14.4	1.1		14.7	2.2		13.1	1.1	
Zinc	10.9	2.2		7	2.3		6.3	2.2		6.7	2.2		29.3	2.2		15.2	2.2		7.7	4.4		10.9	2.2	
TPH (mg/kg)																								
Total Petroleum Hydroc	497	43.8		786	46.1		<	43.4	U	<	43.6	U	363	44		<	44.2	U	<	44.2	U	<	44	U

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

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R = Rejected value.
U = Nondetected value.

QUAL = Qualification
D = Sample was diluted for
RL = Reporting Limit.

D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	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	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Ethylbenzene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Methylene chloride	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Toluene	<	5.7	U	4.6	5.5	J	<	5.4	U	<	5.7	U	1.6	5.6	J	<	5.7	U	<	5.6	U	<	5.5	U
Xylenes (total)	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Semivolatile Organics (µg/																								
Benzo(a)anthracene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(a)pyrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(b)fluoranthene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(g,h,i)perylene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Ethylhexyl)phthal	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Chrysene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Di-n-octyl phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Dibenzofuran	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Fluoranthene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Isophorone	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Methylnaphthalene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Naphthalene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Phenanthrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Pyrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U

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

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

J = Estimated value. QUAL = Qualification

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

U = Nondetected value. RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	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	12000	11.5		6280	11		5990	10.9		8770	11.3		4430	22.5		5420	11.3		10700	11.1		3730	22	
Arsenic	2.5	0.57		1.4	0.55		1	0.54		2.4	0.57		0.78	0.56		0.69	0.57		2.6	1.1		0.89	0.55	
Barium	78.6	1.1	J	260	1.1	J	110	1.1	J	86.1	1.1	J	931	2.2	J	63.6	1.1	J	145	1.1	J	90.9	2.2	J
Beryllium	0.58	0.23		0.23	0.22		0.19	0.22	J	0.53	0.23		<	0.45	U	0.19	0.23	J	0.55	0.22		<	0.44	U
Calcium	1940	23		80300	22.1		83000	21.7		6370	22.6	J	153000	45	J	108000	22.7	J	20900	22.3		167000	44	
Chromium	11.2	1.1		4.8	1.1		4.3	1.1		8.8	1.1		3.6	2.2		5.7	1.1		9.7	1.1		7.1	2.2	
Cobalt	4.4	1.1		2.4	1.1		<	1.1	U	4.5	1.1		<	2.2	U	1.7	1.1		4.9	1.1		1.8	2.2	J
Copper	8.2	2.3		2	2.2	J	1.4	2.2	J	6.9	2.3		1.6	4.5	J	1.6	2.3	J	9.2	2.2		9.6	4.4	
Iron	11800	11.5		4670	11		4120	10.9		9400	11.3		2800	22.5		3260	11.3		10400	11.1		2620	22	
Lead	8.3	0.57		3	0.55		2.4	0.54		5.7	0.57		1.7	0.56		2	0.57		8.7	0.56		1.8	0.55	
Magnesium	1780	23		5070	22.1		6480	21.7		1650	22.6		9970	45		9670	22.7		2100	22.3		8610	44	
Manganese	183	1.1		47.7	1.1		27.3	1.1		199	1.1		25	2.2		30.3	1.1		214	1.1		37.9	2.2	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	9.2	4.6		4.7	4.4		3.8	4.3	J	9.5	4.5		4.5	9	J	5.2	4.5		9.4	4.5		6.1	8.8	J
Potassium	1950	575		1520	551		1190	543		1630	566		667	1120	J	959	567		1820	557		629	1100	J
Sodium	<	575	U	<	551	U	<	543	U	<	566	U	<	1120	U	<	567	U	<	557	U	<	1100	U
Thallium	0.18	0.57	J	<	1.1	UJ	<	0.54	UJ	<	0.57	UJ	<	2.2	UJ	<	1.1	UJ	0.14	0.56	J	<	2.2	UJ
Vanadium	24.1	1.1		11.8	1.1		10.1	1.1		21.1	1.1		14.8	2.2		13.5	1.1		21.6	1.1		10.2	2.2	
Zinc	24.8	2.3		10.5	2.2		8	2.2		20.6	2.3		8.3	4.5		6.5	2.3		22.1	2.2		6.3	4.4	
TPH (mg/kg)																								
Total Petroleum Hydroc	<	46	U	<	44.1	U	<	43.4	U	<	45.3	U	<	45	U	<	45.3	U	<	44.6	U	<	44	U

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

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

J = Estimated value. QUAL = Qualification

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

U = Nondetected value. RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	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	<	12	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Ethylbenzene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Methylene chloride	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Toluene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Xylenes (total)	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	1.1	5.3	J	<	5.8	U	<	5.5	U
Semivolatile Organics (µg/																					
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
bis(2-Ethylhexyl)phthal	<	370	U	<	370	UJ	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Chrysene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Di-n-octyl phthalate	<	370	U	<	370	UJ	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Dibenzofuran	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Isophorone	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2-Methylnaphthalene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Naphthalene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Phenanthrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U

Results presented here are only those chemicals which were detected at least once at this site 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.
QUAL = Qualification
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-2

SUMMARY OF CHEMICALS DETECTED IN THE SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	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	5090	11.2		10200	11.3		4100	22.6		5820	11.1		7790	10.6		4090	23.1		5500	22	
Arsenic	0.78	1.1	J	2.5	0.57		0.78	0.56		0.77	0.56		2.2	0.53		0.69	0.58		0.84	1.1	J
Barium	53.7	1.1	J	177	1.1	J	129	2.3	J	131	1.1	J	129	1.1	J	289	2.3	J	124	2.2	J
Beryllium	<	0.22	U	0.56	0.23		<	0.45	U	0.26	0.22		0.42	0.21		<	0.46	U	<	0.44	U
Calcium	103000	22.4		64100	22.6		206000	45.2		68900	22.2		32700	21.3		205000	46.3		140000	44.1	
Chromium	3.7	1.1		8.8	1.1		9.7	2.3		4.1	1.1		8	1.1		3.4	2.3		3.5	2.2	
Cobalt	1.4	1.1		3.6	1.1		<	2.3	U	1.4	1.1		2.9	1.1		1.7	2.3	J	2	2.2	J
Copper	<	2.2	U	6.6	2.3		2.4	4.5	J	1.6	2.2	J	5.4	2.1		2	4.6	J	1.4	4.4	J
Iron	3330	11.2		8960	11.3		3010	22.6		4160	11.1		7500	10.6		2420	23.1		3370	22	
Lead	2.2	0.56		5.5	1.1		1.5	0.56		2.6	0.56		10.1	1.1		1.4	0.58		1.8	0.55	
Magnesium	8140	22.4		2900	22.6		6240	45.2		5040	22.2		1760	21.3		13400	46.3		9000	44.1	
Manganese	30.1	1.1		109	1.1		28.1	2.3		34.2	1.1		130	1.1		22.6	2.3		41.6	2.2	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U	<	0.11	U
Nickel	4.5	4.5		9.9	4.5		4.9	9	J	4.7	4.4		7.3	4.3		4.8	9.3	J	4.6	8.8	J
Potassium	879	559		1700	565		690	1130	J	1290	555		1430	532		634	1160	J	962	1100	J
Sodium	<	559	U	<	565	U	<	1130	U	<	555	U	<	532	U	<	1160	U	<	1100	U
Thallium	<	2.2	UJ	<	1.1	UJ	<	2.3	UJ	<	1.1	UJ	<	0.53	UJ	<	2.3	UJ	<	2.2	UJ
Vanadium	13.7	1.1		19.4	1.1		13.7	2.3		10.4	1.1		16.2	1.1		14.5	2.3		11.7	2.2	
Zinc	6.6	2.2		19.1	2.3		10	4.5		8.1	2.2		23.9	2.1		9.8	4.6		7.5	4.4	
TPH (mg/kg)																					
Total Petroleum Hydroc	<	44.7	U	81.2	45.2		<	45.2	U	<	44.4	U	83.9	42.6		<	46.3	U	<	44.1	U

Results presented here are only those chemicals which were detected at least once at this site 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.

QUAL = Qualification
D = Sample was diluted for analysis.
RL = Reporting Limit.

TABLE 7-3

SUMMARY OF CHEMICALS DETECTED IN THE GROUNDWATER SAMPLE AT SITE SD-11

LOCATOR	CAN086-86W9-2001		
LAB SAMPLE NUMBER	0453690001SA		
COLLECT DATE	10/24/95		
	Result	RL	Qual
Volatile Organics (µg/L)			
Bromoform	1.3	5	J
Metals (µg/L)			
Arsenic	5.5	5	
Barium	32	10	
Copper	9.1	20	J
Vanadium	37	5	

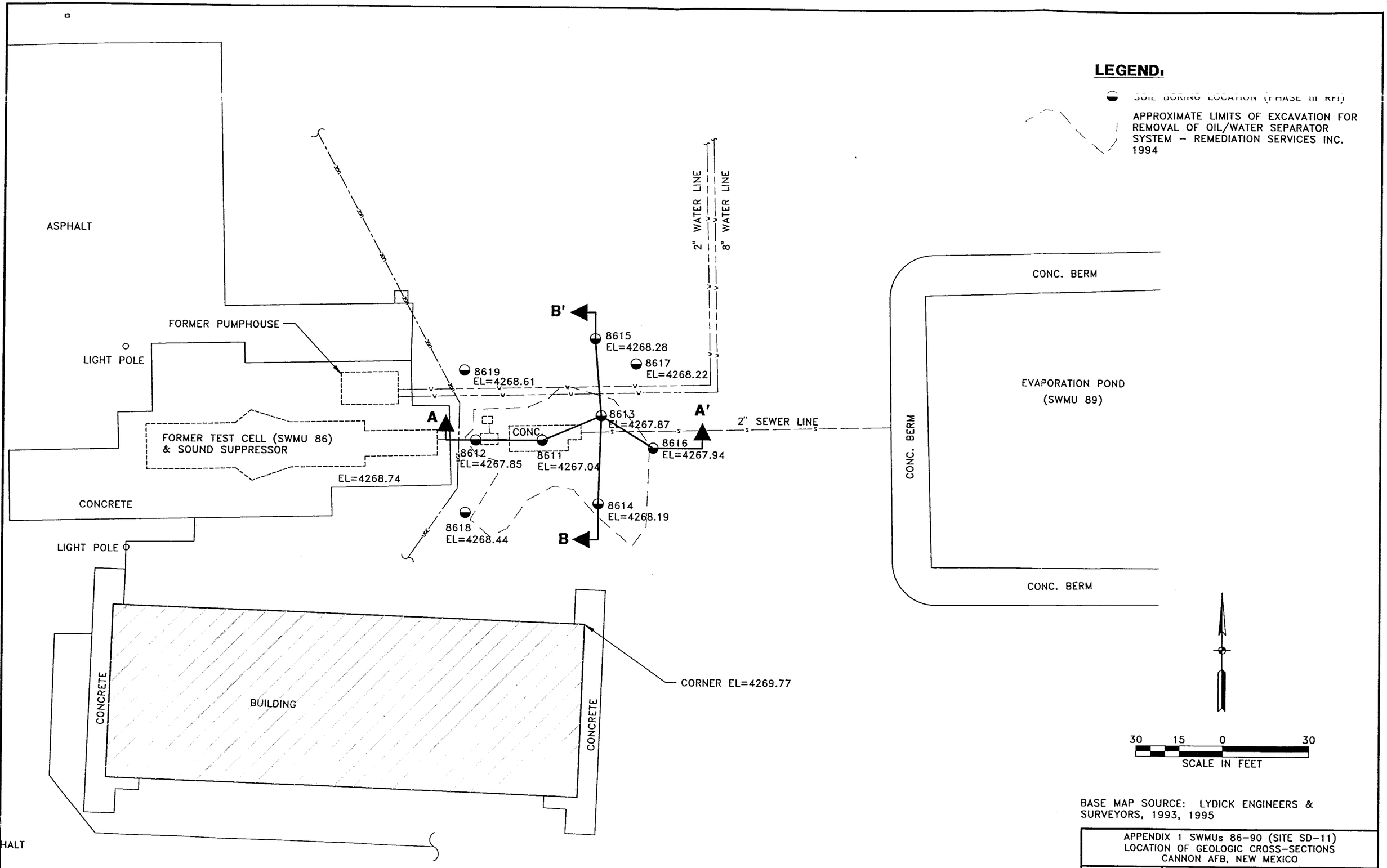
Results presented here are only those chemicals which were detected at least once at this site and have passed data review.
A complete summary of chemical results are presented in Appendix A.
J = Estimated value
RL = Reporting Limit
Qual = Qualification

TABLE 7-4

RESULTS OF MICROBIOLOGICAL ANALYSIS
APPENDIX I SWMUs 86-90 (SITE SD-11)

Sample Location	Sample Identification	Sample Depth (ft)	Sample Date	Microbial Plate Count: Heterotrophic Bacteria[1] (CFU/g)	Microbial Plate Count: Petroleum Hydrocarbon Degrading Bacteria[2] (CFU/g)	Microbial Plate Count: *Pseudomonas*[3] (CFU/g)	Moisture Content[4] (percent)
8611	CAN086-8611-0007	7-8	10/18/95	2.0×10^7	1.1×10^6 *	7.7×10^2	12
	CAN086-8611-0011	11-12	10/18/95	3.9×10^6	1.2×10^6**	$<1 \times 10^2$	11
	CAN086-8611-0016	15.3-16.3	10/18/95	$<1 \times 10^3$	$<1 \times 10^3$	$<1 \times 10^2$	16
	CAN086-8611-0040	40-41	10/19/95	$<1 \times 10^3$	$<1 \times 10^3$	$<1 \times 10^2$	7
	CAN086-8611-0051	50.5-51.5	10/19/95	3.4×10^6	1.3×10^6	$<1 \times 10^2$	14
	CAN086-8611-0071	70.3-71.3	10/19/95	$<1 \times 10^3$	$<1 \times 10^3$	$<1 \times 10^2$	5

[1] Determined according to "Methods of Soil Analysis" 37-5.2 and 37-8.1.1
[2] Enumerated on mineral medium with gasoline and diesel fuel (2500 mg/L) as the only carbon sources
[3] Determined according to "Methods of Soil Analysis" 37-5.2 and 37-8.3.5 (modified)
[4] Determined gravimetrically using Standard Method 2540B
ft = feet
CFU/g = Colony Forming Units per gram of dry weight of soil
* Over 15% were actinomycetes.
** Approximately 10% were actinomycetes.

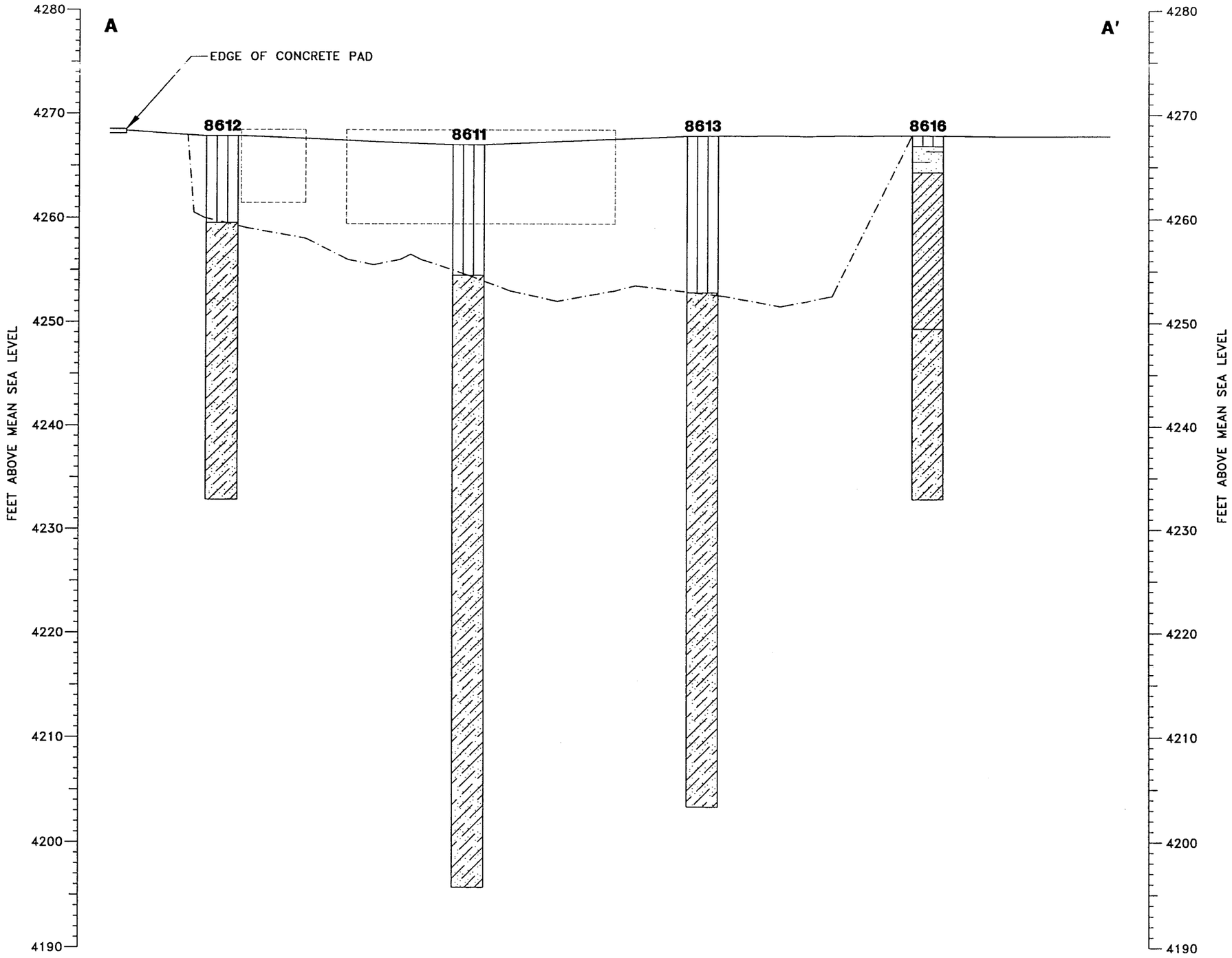


BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995

APPENDIX 1 SWMUs 86–90 (SITE SD–11) LOCATION OF GEOLOGIC CROSS-SECTIONS CANNON AFB, NEW MEXICO			
DRN. BY: JWB	DATE: 12/06/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	7–1

REPORT PHASE, PHASE I, RFI SITE SD-11

T:\CANNON\M11MM\3M11MM28 12/11/1995 10:08



LEGEND:

- ASPHALT
- SILTY CLAY FILL WITH FINE SAND AND OCCASIONAL FINE GRAVEL (CL)
- SILTY CLAY WITH FINE SAND (CL)
- CLAYEY SILT WITH FINE SAND, SANDY SILT, OR SILTY SAND (ML, SM)
- FINE SAND WITH SILT (SM, SP-SM)
- APPROXIMATE LOCATION OF FORMER OIL/WATER SEPARATOR
- APPROXIMATE LIMIT OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM

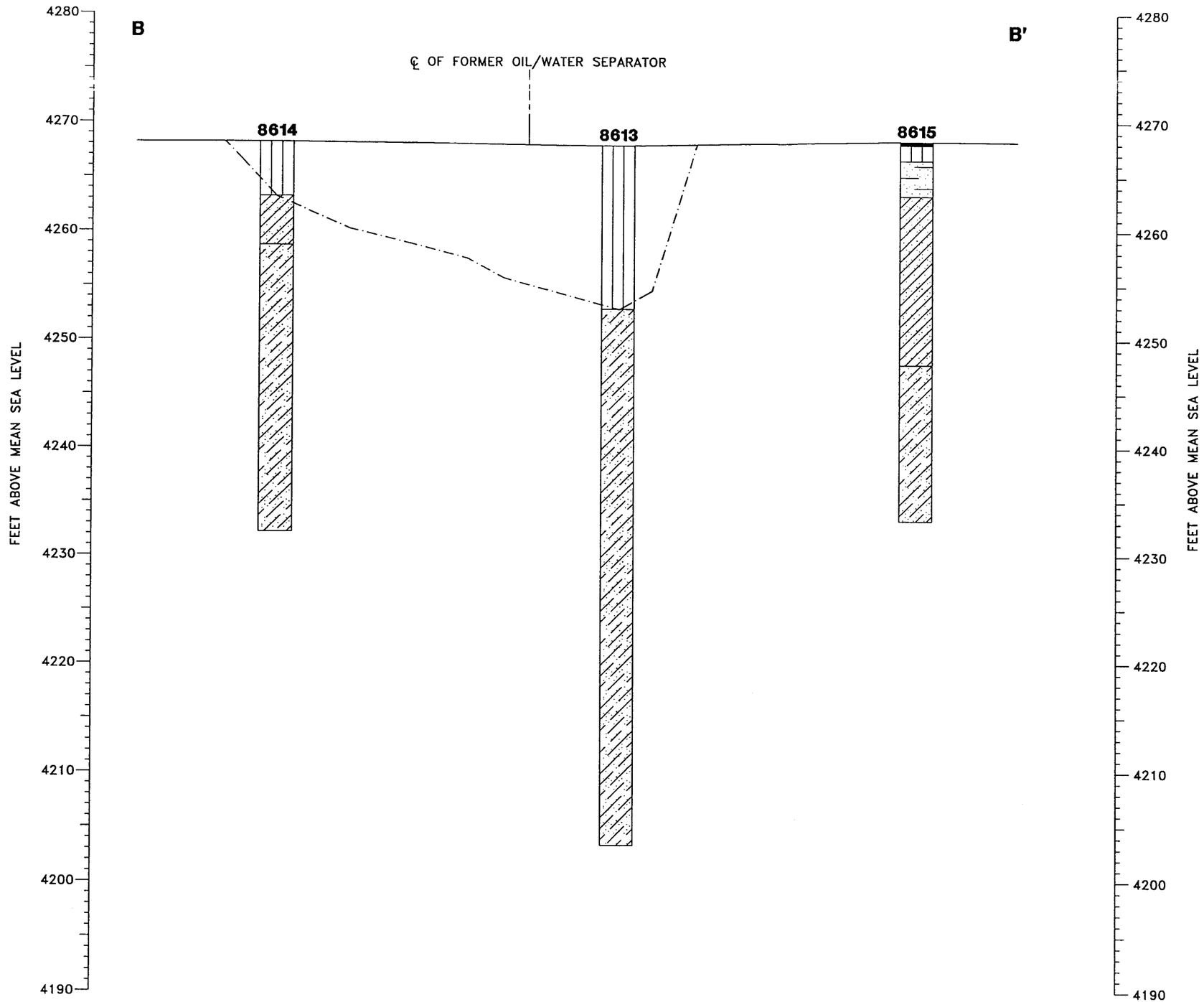
10 5 0 10
HORIZONTAL SCALE IN FEET

10 5 0 10
VERTICAL SCALE IN FEET

APPENDIX 1 SWMUs 86-90 (SITE SD-11)
GEOLOGIC CROSS-SECTION A - A'
CANNON AFB, NEW MEXICO

DRN. BY: JWB	DATE: 12/13/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	7-2

T:\CANNON\M11MM\3M11MM29 V=A-A 12/11/1995 10:08 REPORT PHASE: PHASE I RFI SITE SD-11



LEGEND:

- ASPHALT
- SILTY CLAY FILL WITH FINE SAND AND OCCASIONAL FINE GRAVEL (CL)
- SILTY CLAY WITH FINE SAND (CL)
- CLAYEY SILT WITH FINE SAND, SANDY SILT, OR SILTY SAND (ML, SM)
- FINE SAND WITH SILT (SM, SP-SM)
- APPROXIMATE LIMIT OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM

10 5 0 10
HORIZONTAL SCALE IN FEET

10 5 0 10
VERTICAL SCALE IN FEET

APPENDIX 1 SWMUs 86-90 (SITE SD-11)
GEOLOGIC CROSS-SECTION B - B'
CANNON AFB, NEW MEXICO

DRN. BY: JWB	DATE: 12/06/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	7-3

T:\CANNON\C3M11MM\3M11MM29 V=B-B 12/11/1995 10:08 REPORT PHASE: PHASE RFI SITE SD-11

8.0
RESULTS EVALUATION

8.1 NATURE AND EXTENT OF CONTAMINATION

8.1.1 General

Soils were sampled for chemical analysis at locations in the area of the former oil/water separator system at Appendix I SWMUs 86-90 (Site SD-11) to determine the vertical and lateral extent of contamination. Groundwater was also sampled at Base Well No. 9 which is located outside and hydraulically upgradient of the area of soil contamination. Analytical results for groundwater are evaluated separately in Section 8.5. Results for soil are evaluated below.

8.1.2 Soils

TPH serves as an indicator parameter for organic chemical contamination in soil. Generally, where TPH was not detected, other organic compounds (VOCs and SVOCs) were also not detected. A site map (Figure 8-1) shows the concentrations of TPH detected in soil samples. Two geologic cross sections (Figure 8-2, Section A-A'; Figure 8-3, Section B-B'), which are along the same lines as shown on Figure 7-1, illustrate vertically and horizontally TPH concentrations detected in soil. The cross sections were constructed with data obtained from soil boring logs and chemical analytical results for soil samples. Figure 8-2 also shows the vertical profile of microbial plate counts at boring 8611. Sections A-A' and B-B' show the general overburden subsurface profile and detected concentrations in an east to west and south to north direction, respectively. Both cross sections bisect the zone of backfill placed for the removal of the oil/water separator system.

VOCs, SVOCs, and/or TPH were generally detected below the elevation of the former oil/water separator system at borings 8611, 8612, and 8613. Only estimated amounts (J-qualified) of VOCs and SVOCs were detected in samples collected within the zone of backfill at these locations (Table 7-2). TPH levels were generally an order of magnitude lower in samples collected within the zone of backfill than in samples collected directly

below the zone of backfill (Figures 8-2 and 8-3). Below the zone of backfill, TPH concentrations generally decrease with depth to nondetect levels.

At boring 8611, ethylbenzene, toluene, xylenes, 2-methylnaphthalene, and naphthalene were detected in samples directly below the zone of backfill (Table 7-2). These concentrations decrease with depth to nondetect levels. At boring 8613, acetone, ethylbenzene, xylenes, 2-methylnaphthalene, and naphthalene were detected in samples directly below the zone of backfill at depths of 14, 24, and 34 feet bgs (Table 7-2). Concentrations of these compounds are nondetect below these depths.

Soils were found to be petroleum-stained to depths of 9 (boring 8612), 18 (boring 8611), and 32 (boring 8613) feet bgs. Petroleum odors were also evident within, and generally to some depth below, the zone of staining. Petroleum staining within the zone of backfill was generally mottled.

The extent of contamination of soil within the zone of backfill appears to be consistent with how soils were handled for removal of the oil/water separator system, which included excavation, mixing with uncontaminated soils, and backfilling. Lower or nondetect sample results may be due to volatilization during excavation and/or dilution by mixing.

No VOCs or SVOCs, except for estimated amounts (J-qualified), were detected in soil samples collected from borings 8615, 8616, 8617, 8618, and 8619, located outside the zone of backfill (Table 7-2). At boring 8614, located at the edge of the zone of backfill, low levels of polycyclic aromatic hydrocarbons (PAHs) were detected in the surface soil sample. Only benzo(a)pyrene was not an estimated value (Table 7-2).

Low levels of TPH were detected in surface soil samples at borings 8614, 8618, and 8619 (Figures 8-1 and 8-3). TPH at boring 8614 is likely due to placement of contaminated backfill. TPH at borings 8618 and 8619 is likely due to historical cleaning operations at the engine test cell.

Evaluation of metals results for soil samples is presented in the following section.

8.2 COMPARISON OF METALS CONCENTRATIONS TO BACKGROUND

Metals are natural constituents of soils. Therefore, site 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 8-1 shows the comparison of the maximum detected SWMUs 86-90 (Site SD-11) concentrations to background levels. All detected metals were considered to be within background levels. A brief discussion of the background comparison interpretations is given below.

Seven of forty soil samples contained aluminum at concentrations (ranging from 10,700 mg/kg to 12,500 mg/kg) which exceeded the background UTL (10,540 mg/kg). However, this concentration only slightly exceeded the maximum detected concentration of the Base-wide 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 Site SD-11 and was not evaluated further.

Three of forty soil samples contained barium at concentrations (685 mg/kg, 931 mg/kg, and 1260 mg/kg) which exceeded the background UTL (642 mg/kg). These concentrations are within or only slightly exceed the range of detected Base-wide background concentrations. Additionally, the elevated barium concentrations were at depths of 29 and 34 feet bgs. The samples nearer to the surface in these borings reported barium concentrations well below the UTL. 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.

Three of forty soil samples contained chromium at concentrations (13.3 mg/kg, 13.4 mg/kg, and 13.6 mg/kg) which exceeded the background UTL (12.5 mg/kg). However, these concentrations were within the range of detected Base-wide background concentrations and were below the literature value for chromium (30 mg/kg). Therefore, chromium was considered to be within background levels at Site SD-11 and was not evaluated further.

One of forty soil samples contained cobalt at a concentration (4.9 mg/kg) which exceeded the background UTL (4.5 mg/kg). However, this concentration was within the range of detected Base-wide background concentrations and was well below the literature value for cobalt in the region (7 mg/kg).

Eight of forty soil samples contained manganese at concentrations (ranging from 173 mg/kg to 214 mg/kg) which exceeded the background UTL (164 mg/kg). However, these concentrations were within the range of detected Base-wide background concentrations and were well below the literature value for manganese in the region (500 mg/kg).

Eight of forty soil samples contained nickel at concentrations (ranging from 9.2 mg/kg to 10.5 mg/kg) which exceeded the background UTL (9 mg/kg). However, these concentrations only slightly exceeded the maximum detected concentration of the Base-wide background range and were well below the literature value for nickel in the region (15 mg/kg). Therefore, nickel was considered to be within background levels at SWMU 86-90 (Site SD-11) and was not evaluated further.

Seven of forty soil samples contained zinc at concentrations (ranging from 23.9 mg/kg to 38.3 mg/kg) which exceeded the background UTL (21.9). However, most of these concentrations only slightly exceeded the range of detected Base-wide background concentrations, and all were well below the literature value for zinc in the region (45 mg/kg). Therefore, zinc was considered to be within background levels at Site SD-11 and was not evaluated further.

8.3 RISK EVALUATION

8.3.1 Exposure Pathway Flow Chart

There are three potentially complete exposure pathways at SWMUs 86-90 (Site SD-11):

- 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 site 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 site 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.

8.3.2 Comparison of Concentrations in Soil to RBCs

Table 7-2 shows a summary of chemicals detected in soil samples at SWMUs 86-90 (Site SD-11). Maximum detected soil concentrations of organic compounds (no metals exceeded background, see Section 8.2) were compared to conservative EPA Region III RBCs for residential soils (EPA 1995) to evaluate whether a significant release (i.e., that could pose a risk to human health) has occurred at SWMUs 86-90 (Site SD-11). 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 3.7 and Appendix D.

Table 8-2 shows the comparison of site concentrations to residential soil RBCs. Benzo(a)pyrene was the only chemical detected at a concentration (0.27 mg/kg) which exceeded the residential soil RBC of 0.088 mg/kg. The potential carcinogenic risk from this concentration is 3×10^{-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). Table 8-2 also shows that the total additive carcinogenic risk for chemicals of concern is 4×10^{-6} which is also within the EPA target risk range. The total potential noncarcinogenic hazard index for chemicals of concern is 0.01, assuming a residential exposure scenario. This is well below 1.0 which indicates that no unacceptable adverse health effects are to be anticipated from exposure to the soils at SWMUs 86-90 (Site SD-11). As stated earlier, these potential risks are based on residential exposure assumptions; however, SWMUs 86-90 (Site SD-11) are located in an industrial area of the Base; therefore, using residential RBCs significantly overestimates likely risks at these SWMUs.

A comparison of maximum detected concentrations to industrial RBCs and an estimation of potential risks based on industrial exposures are also shown in Table 8-2. None of the detected chemicals were at concentrations which exceeded industrial RBCs. 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 SWMUs 86-90 (Site SD-11).

Several samples had elevated reporting limits (RL) due to high concentrations of SVOCs (Section 7.3). These elevated RLs might have resulted in some target analytes to be reported as not detected when, in fact, they may have been present at low concentrations. This could result in an underestimation of the potential risk at the site. However, the contract laboratory reports estimated **"J"** concentrations as low as one-tenth the RL for VOCs and one-fifth for SVOCs. The highest RL for VOCs (i.e., BTEX) was 0.57 mg/kg (570 μg/kg). Both the RL and one-tenth the RL (0.057 mg/kg) are below the residential RBC for benzene (22 mg/kg). Therefore, the elevated RLs for VOCs would not impact the conclusions of the screening-level risk assessment.

The highest RL for SVOCs (i.e., PAHs) was 3.8 mg/kg (3,800 μg/kg). One-fifth of the level is 0.76 mg/kg. This concentration exceeds the residential RBCs for only the PAHs benzo(a)pyrene and dibenzo(a,h)anthracene (0.088 mg/kg). All of the PAHs in the samples with elevated RLs would have been reported at estimated (J-qualified) concentrations had they been present at concentrations above 0.76 mg/kg. The potential estimated additional cancer risk assuming a concentration of 0.76 mg/kg is 9×10^{-6}. Substituting this risk for the detected benzo(a)pyrene, the total cancer risk would be 1×10^{-5}. This is still well within the

EPA target risk range of 1×10^{-6} to 1×10^{-4}. Therefore, the elevated RLs for SVOCs may have affected the calculations of the risk assessment, but they would not impact the conclusions of the risk assessment.

TPH 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 TPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TPH constituents that are known to be potentially hazardous (such as BTEX, PAHs) were analyzed for individually in the soils samples collected at SWMUs 86-90 (Site SD-11).

At SWMUs 86-90 (Site SD-11), TPH was detected in nineteen of forty samples at a maximum concentration of 5,390 mg/kg which exceeds the State of New Mexico TPH action level of 100 mg/kg in soil. Benzo(a)pyrene was the only toxic constituent of TPH that was detected at a concentration exceeding the RBC for residential soil (see Table 8-2), 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 TPH constituents (i.e., those without EPA-established toxicity factors) would contribute significantly to risks at the site.

8.3.3 Evaluation of the Groundwater Pathway

The vertical distribution of soil contamination was used to evaluate whether a release could pose a threat to groundwater. The highest detected concentrations were located in the top 40 feet of soil. Most of the deeper soils were nondetect for target analytes indicating that contaminants are not being transported to groundwater approximately 280 feet bgs. Section 3.2 discusses the behavior of contaminant plumes in soil types like those found at Cannon AFB.

Caliche or clay layers are found throughout the area. These layers have very low permeability and act to retard the downward movement of the contaminant plume. Therefore, only large, continuous releases are likely to reach groundwater at concentrations of concern. The borings which showed the highest levels of contamination were located within the excavation area for the OWS. The excavation was backfilled with a mixture of off-site clean soil and excavated soils. The only source for groundwater contamination is the backfill soils and underlying contaminated soils. Additionally, Cannon AFB is located in the

arid southwestern United States where precipitation is limited, slowing the infiltration process.

In conclusion, the contaminants detected at SWMUs 86-90 (Site SD-11) are not likely to impact groundwater because

- Caliche has low permeability
- The OWS and some of the contaminated soils have been removed
- Lack of precipitation to promote leaching
- Depth to groundwater (280 feet bgs)

8.3.4 Conclusion

While no detected concentrations at this site pose an unacceptable human health risk, the results of the soil investigation at SWMUs 86-90 (Site SD-11) indicate that a release has occurred. Some uncertainty exists with regard to potential exposures to subsurface soils; however, the contaminated area is confined mainly to a small area of subsurface soils, and controls could be implemented to limit exposures to this soil during any future construction/excavation activity at this site. Therefore, potential risks from this site are minimal.

8.4 EVALUATION OF SOIL MICROBIAL POPULATIONS

Soil was sampled for microbiological analysis at boring 8611 (Figure 8-2) to assess the presence of microorganisms in soil capable of degrading site contaminants.

Microbial populations in soil can vary in soil depending on the type of soil, depth, and type and concentration of contaminants. Due to the lack of available oxygen, soils that are deep or are less porous than other soils generally are not as supportive of microbial populations. Also, high concentrations of certain chemicals (e.g., fuel-related VOCs) can have a toxic effect on indigenous microorganisms. Surveys taken of petroleum-contaminated sites indicate that microbial populations can range from 10^2 to at least 7×10^6 CFU/g of soil at various depths (Atlas 1984). One study of petroleum-contaminated soil compared microbial

plate counts versus soil depth and type (Federle et. al. 1986). This study found that soil samples collected from the upper 20 centimeters (~8 inches) contained from 10^5 to 10^8 CFU/g of soil. However, with increasing depth, the microbial population within the soil sample significantly decreased. Soil samples obtained from depths greater than 100 centimeters (3.3 feet) displayed less than 10^5 CFU/g of soil.

The results of the microbiological analysis for Site SD-11 (Table 7-4 and Figure 8-2) indicate that significant populations of heterotrophic bacteria (>10^6 CFU/g) may exist in soil down to a depth of at least 50 feet bgs at boring 8611. Soil conditions greater than this depth may not be able to support microbial growth. Microbial populations directly below the zone of backfill to a depth of about 40 feet bgs were found to be very low or negligible (< 10^3 CFU/g and < 10^2 CFU/g). The concentrations of VOCs at this depth interval may have a toxic effect on the indigenous microbial population. Although heterotrophic populations were found to be significant, only 1 of 3 samples having measurable plate counts showed *pseudomonas* at greater than 10^2 CFU/g at a count of 7.7×10^2 CFU/g. This population count is very low for soil.

The microbial plate count results can also be evaluated by calculating the ratio of petroleum hydrocarbon degrading bacteria to heterotrophic bacteria. A ratio of 0.10 or higher is generally a positive indicator of potential biodegradation of petroleum compounds. Ratios calculated for 7 to 8 feet, 11 to 12 feet, and 50.5 to 51.5 feet are 0.055, 0.31, and 0.38, respectively. These intervals, however, are not within the area of highest contamination where toxicity appears to limit indigenous microbial growth.

8.5 GROUNDWATER RESULTS

Groundwater from Base Well No. 9 is used to supply water for drinking and fire protection for nearby facilities.

Bromoform was the only organic compound detected in the groundwater sample from Well No. 9 and was detected at an estimated value of 1.3 μg/L. This value is below the EPA Region III RBC of 2.4 μg/L for tap water (Appendix D).

Arsenic, barium, copper, and vanadium were the only metals detected in the groundwater sample from Well No. 9 and were detected at the respective concentrations of 5.5 μg/L, 32 μg/L, 9.1 μg/L, and 37 μg/L. The value for copper was estimated. Background levels for metals in groundwater at the Base were established from data collected from 30 samples collected at six production wells, not including Well No. 9, and two monitoring wells (W-C 1995d). The background levels are defined by upper tolerance limits (UTLs). UTLs were selected for each metal as the highest detected concentration (if there was a detection) or the highest report limit (if all samples were nondetect). The background levels for arsenic, barium, copper, and vanadium are 50 μg/L, 74 μg/L, 20 μg/L, and 31 μg/L, respectively. Therefore, only vanadium was detected in the groundwater sample above background. The detected concentration of vanadium, however, is below the EPA Region III RBC of 260 μg/L for tap water (Appendix D).

TABLE 8-1

COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND(1) AT APPENDIX I SWMUs 86-90 (SD-11), 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
CAN086-8611-0000	Aluminum	12500	1,410 - 11,000	10540	50000	NO**
CAN086-8612-0000	Arsenic	3	0.67 - 28	15.5	6.5	NO
CAN086-8614-0034	Barium	1260	14.5 - 1200	642	500	NO**
CAN086-8611-0014	Beryllium	0.71	0.17 - 0.77	0.73	1-2	NO
CAN086-8611-0000	Chromium	13.6	4 - 15.4	12.5	30	NO**
CAN086-8617-0000	Cobalt	4.9	0.85 - 5.3	4.5	3-7	NO**
CAN086-8617-0029	Copper	9.6	<2 - 18.4	*	20	NO
CAN086-8619-0000	Lead	10.1	1.1 - 46	25.8	15	NO
CAN086-8617-0000	Manganese	214	22.4 - 216	164	500	NO**
CAN086-8611-0000	Nickel	10.5	1.3 - 9.8	9	15	NO**
CAN086-8614-0000	Thallium	0.18	0.14 - 0.22	*	----	NO
CAN086-8611-0000	Vanadium	24.2	5.2 - 28.3	25.3	30-70	NO
CAN086-8614-0009	Zinc	38.3	<4.3 - 27.5	21.9	45	NO**

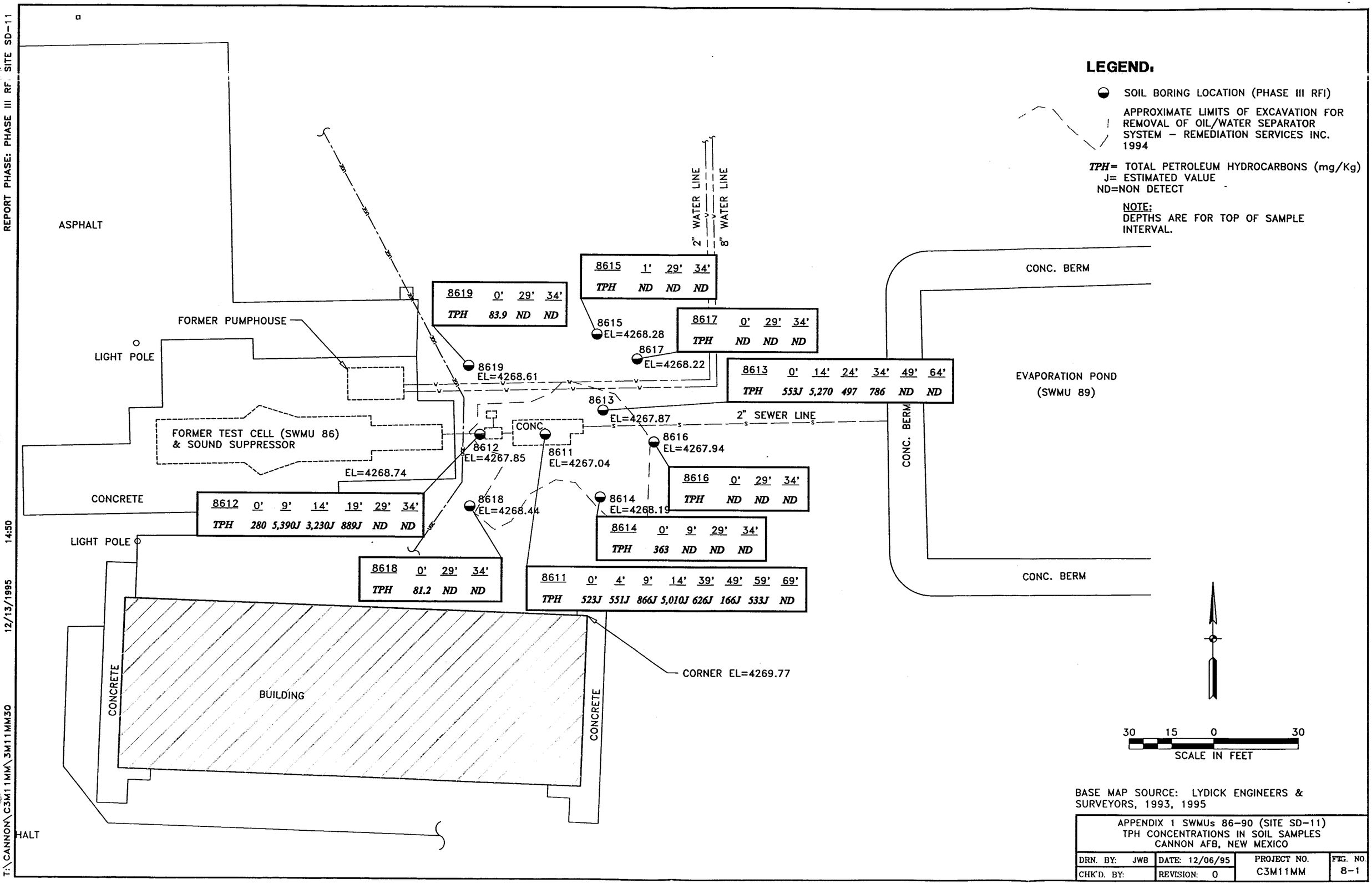
(1) All units in mg/kg.
(2) Compiled from data collected by Woodward-Clyde for the RFI and RI (W-C 1992 and W-C 1994) and Walk, Haydel and Associates for the IRP (Walk Haydel and Associates 1990). Summarized in "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater 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 Base-wide background range and within naturally occurring levels (USGS 1984); therefore, is not considered to exceed background.
*** Elevated concentrations only detected at depth and may be related to the caliche (see text).

TABLE 8-2

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS AT SITE SD-11 TO RBCs FOR RESIDENTIAL SOIL

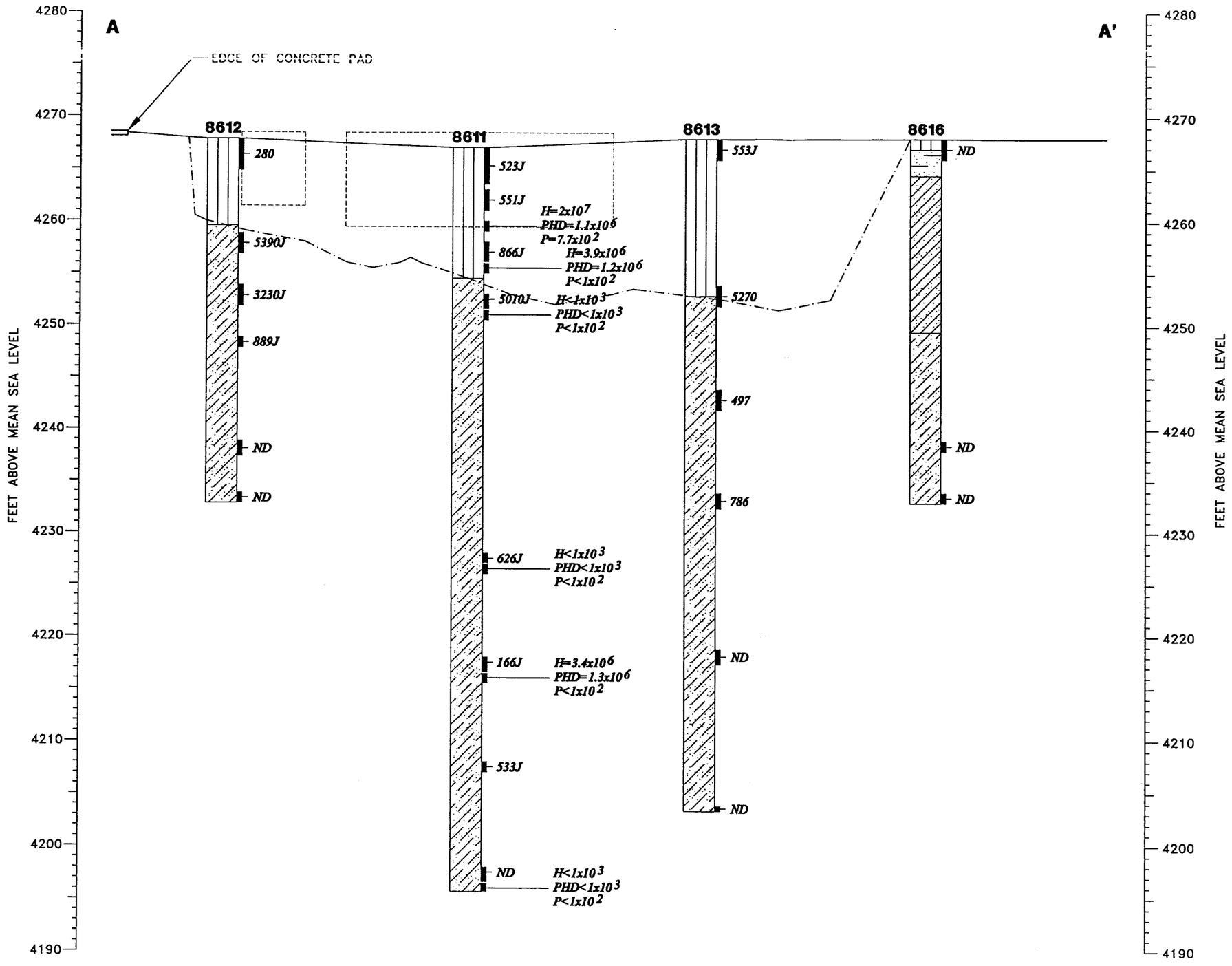
Chemicals	Carcinogen?	Maximum Concentration (mg/kg)	Residential RBC (mg/kg)	Exceeds RBC?	Industrial RBC (mg/kg)	Risk Residential (2)	Hazard Residential (3)	Risk Industrial (2)	Hazard Industrial (3)
VOCs									
Acetone	N	0.59	7800	NO	100000		0.00008		0.0000059
2-Butanone(MEK)	N	0.051	47000	NO	1.00E+06		0.00000		0.0000001
Ethylbenzene	N	18	7800	NO	200000		0.00231		0.00009
Methylene chloride	Y	0.0032	85	NO	380	3.76E-11		8.42E-12	
Toluene	N	0.0046	16000	NO	200000		0.0000003		0.000000023
Xylenes (total)	N	33	160000	NO	1.00E+06		0.00021		0.000033
SVOCs									
Benzo(a)anthracene	Y	0.2	0.88	NO	3.9	2.27E-07		5.13E-08	
Benzo(a)pyrene	Y	0.27	0.088	YES	0.39	3.07E-06		6.92E-07	
Benzo(b)fluoranthene	Y	0.44	0.88	NO	3.9	5.00E-07		1.13E-07	
Benzo(g,h,i)perylene		0.11	NA(a)	----					
Chrysene	N	0.26	88	NO	390		0.0030		0.00067
Dibenzofuran	N	0.15	310	NO	8200		0.00048		0.00002
Fluoranthene	N	0.21	3100	NO	41000		0.00007		0.0000051
Indeno(1,2,3-cd)pyrene	Y	0.089	0.88	NO	7.8	1.01E-07		1.14E-08	
Isophorone	Y	0.93	670	NO	6000	1.39E-09		1.55E-10	
2-Methylnaphthalene		18	NA(a)	----					
Naphthalene	N	11	3100	NO	82000		0.00355		0.0001341
Phenanthrene		0.057	NA(a)	----					
Pyrene	N	0.26	2300	NO	31000		0.00011		0.000008
TPH		5390	NA(a)	----					
Cumulative Risk(3)						4E-06	0.01	9E-07	0.001

(1) Risk = 1 E-06 X concentration/RBC
(2) Hazard = concentration/RBC
(3) Estimated total risk associated with chemicals detected at SD-11 based on RBCs.
(a) Not Applicable: EPA has not established a toxicity foacator for these chemicals, so RBCs could not be calculated.



APPENDIX 1 SWMUs 86-90 (SITE SD-11)
TPH CONCENTRATIONS IN SOIL SAMPLES
CANNON AFB, NEW MEXICO

DRN. BY: JWB	DATE: 12/06/95	PROJECT NO. C3M11MM	FIG. NO. 8-1
CHK'D. BY:	REVISION: 0		



LEGEND:

- ASPHALT
- SILTY CLAY FILL WITH FINE SAND AND OCCASIONAL FINE GRAVEL (CL)
- SILTY CLAY WITH FINE SAND (CL)
- CLAYEY SILT WITH FINE SAND, SANDY SILT, OR SILTY SAND (ML, SM)
- FINE SAND WITH SILT (SM, SP-SM)
- APPROXIMATE LOCATION OF FORMER OIL/WATER SEPARATOR
- APPROXIMATE LIMIT OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM
- *ND* = SOIL SAMPLE INTERVAL SELECTED FOR CHEMICAL OR BIOLOGICAL ANALYSIS

ND=NON DETECT
J=ESTIMATED VALUE
TPH=TOTAL PETROLEUM HYDROCARBONS (mg/Kg)
H=HETEROTROPHIC BACTERIA PLATE COUNT (CFU/g)
PHD=PETROLEUM HYDROCARBON DEGRADING BACTERIA PLATE COUNT (CFU/g)
P=PSEUDOMONAS PLATE COUNT (CFU/g)

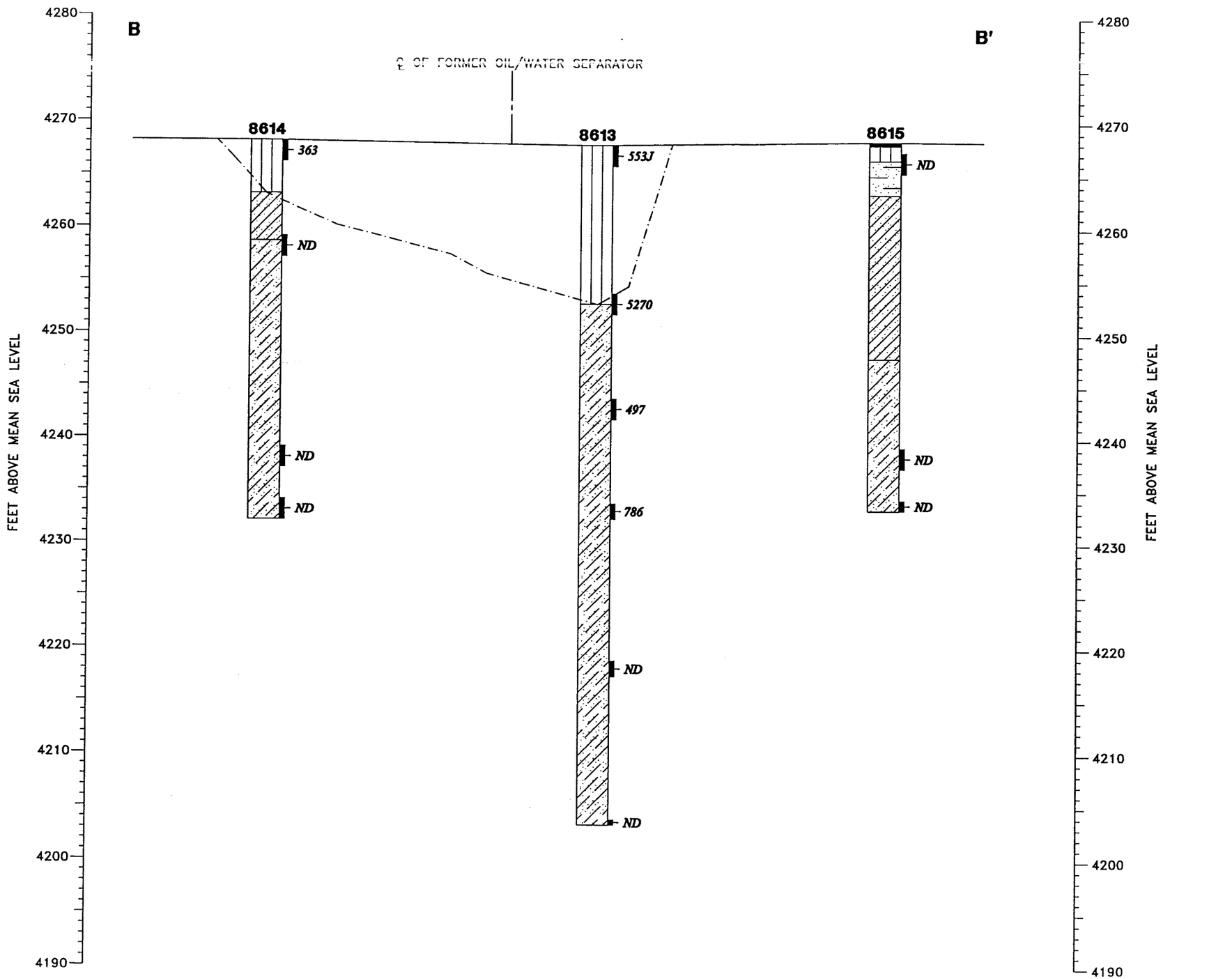
10 5 0 10
HORIZONTAL IN FEET

10 5 0 10
VERTICAL IN FEET

APPENDIX 1 SWMUs 86-90 (SITE SD-11)
TPH CONCENTRATIONS AND MICROBIAL PLATE COUNTS ALONG GEOLOGIC CROSS-SECTION A -A'
CANNON AFB, NEW MEXICO

DRN. BY: JWB	DATE: 12/06/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	8-2

T:\CANNON\C3M11MM\3M11MM29 V=CHEM-A 12/11/1995 10:08 REPORT PHASE: PHASE III R1 SITE SD-11



LEGEND:

- ASPHALT
- SILTY CLAY FILL WITH FINE SAND AND OCCASIONAL FINE GRAVEL (CL)
- SILTY CLAY WITH FINE SAND (CL)
- CLAYEY SILT WITH FINE SAND, SANDY SILT, OR SILTY SAND (ML, SM)
- FINE SAND WITH SILT (SM, SP-SM)
- APPROXIMATE LIMIT OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM
- *ND* = SOIL SAMPLE INTERVAL SELECTED FOR CHEMICAL ANALYSIS

ND=NON DETECT
J=ESTIMATED VALUE
TPH=TOTAL PETROLEUM HYDROCARBONS (mg/Kg)

10 5 0 10 HORIZONTAL IN FEET

10 5 0 10 VERTICAL IN FEET

APPENDIX 1 SWMUs 86-90 (SITE SD-11)
TPH CONCENTRATIONS ALONG
GEOLOGIC CROSS-SECTION B - B'
CANNON AFB, NEW MEXICO

DRN. BY: JWB	DATE: 12/06/95	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	C3M11MM	8-3

T:\CANNON\C3M11MM\3M11MM29 V=CHEM-B 12/13/1995 14:30 REPORT PHASE: PHASE III SITE SD-11

9.0
SUMMARY AND RECOMMENDATIONS

9.1 SUMMARY AND CONCLUSIONS OF FINDINGS

The following discussion presents a brief summary of the major findings (including physical characteristics, nature and extent of contamination, and risk evaluation) of the Phase III RFI at Appendix I SWMUs 86-90 (Site SD-11):

Physical Characteristics

- The topography at the site is relatively flat. Jet engines are currently being tested outdoors on the concrete pad. Jet thrust from these tests have eroded soil in the area of the former oil/water separator system.

- The depth of the zone of backfill placed for the removal of the oil/water separator system is about 15 feet at its deepest point. Backfill material consists primarily of silty clay with some fine sand and occasional gravel and, in some areas, is petroleum stained-mottled.

- The shallow geology at the site consists of silty clay with fine sand, clayey silt with fine sand, sandy silt, and/or silty sand underlain by fine-grained sand with silt. The fine-grained sand begins at depths of 15 to 20 feet below ground surface and contains cemented zones or layers of caliche. These alluvial sediments are part of the Ogallala Formation.

Nature and Extent of Contamination

- The extent of contamination at the site is generally defined by TPH concentrations detected in soil. Low to moderate levels of TPH (< 1,000 mg/kg) were detected in surface soil and/or in backfill soil placed for the removal of the oil/water separator system. Moderate to high concentrations (> 1,000 mg/kg) of TPH were detected in soils below the zone of backfill. Some VOCs and SVOCs were also detected directly below the zone of backfill.

- Below the zone of backfill, concentrations of contaminants decreased with depth to non-detect levels. The maximum depth of detected contamination was 60 feet.

- Only low levels of metals were detected in soil. All results are considered to be within background levels.

- Significant concentrations of indigenous microorganisms capable of degrading petroleum hydrocarbons appear to be present in natural soils. However, toxicity appears to severely limit indigenous microbial growth within the area of highest contamination.

Groundwater Results

- Bromoform, arsenic, barium, copper, and vanadium were detected in the groundwater sample from Base Well No. 9. Bromoform was detected below the RBC for tap water. Vanadium was the only metal detected above its background level for Base groundwater, but was below its RBC for tap water. Each compound detected was below its respective published MCL.

Risk Evaluation

- Benzo(a)pyrene was the only chemical detected at a concentration (0.27 mg/kg) that exceeded the residential soil RBC of 0.088 mg/kg. No chemicals were detected at concentrations exceeding industrial soil RBCs. Total estimated potential carcinogenic risk is within (residential) or below (industrial) the EPA target risk range of 10^{-4} to 10^{-6}. Total estimated potential noncarcinogenic hazard index is well below 1.0 (residential and industrial).

- Contaminants detected in soil are not likely to impact groundwater due to the presence of low permeability caliche, lack of precipitation to promote leaching, depth to groundwater (~280 feet bgs), and the fact that the OWS and some of the contaminated soils have been removed.

9.2 RECOMMENDATIONS

Based on the conclusions of the Phase III RFI at Appendix I SWMUs 86-90 (Site SD-11), no further action is recommended for the site under its current use and setting.

10.0
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APPENDIX A

COMPLETE ANALYTICAL DATA

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER	0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
	Result	RL	Qual	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	<	90	U	<	240	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Benzene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Bromodichloromethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Bromoform	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Bromomethane	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
2-Butanone (MEK)	<	11	U	12	11		33	28		<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Carbon disulfide	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Carbon tetrachloride	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Chlorobenzene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Chloroethane	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Chloroform	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Chloromethane	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Dibromochloromethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,1-Dichloroethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,2-Dichloroethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,1-Dichloroethene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,2-Dichloroethene (total)	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,2-Dichloropropane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
cis-1,3-Dichloropropene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
trans-1,3-Dichloropropene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Ethylbenzene	<	5.6	U	1.4	5.5	U	<	14	U	18000	570		7200	540		1.5	5.8	U	<	5.5	U	<	5.2	U
2-Hexanone	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Methylene chloride	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Styrene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,1,2,2-Tetrachloroethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Tetrachloroethene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Toluene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	300	540	J	<	5.8	U	<	5.5	U	<	5.2	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER	0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
1,1,1-Trichloroethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
1,1,2-Trichloroethane	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Trichloroethene	<	5.6	U	<	5.5	U	<	14	U	<	570	U	<	540	U	<	5.8	U	<	5.5	U	<	5.2	U
Vinyl acetate	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Vinyl chloride	<	11	U	<	11	U	<	28	U	<	1100	U	<	1100	U	<	12	U	<	11	U	<	10	U
Xylenes (total)	<	5.6	U	1.2	5.5	J	3	14	J	33000	570		22000	540		6.3	5.8		<	5.5	U	<	5.2	U
Semivolatile Organics (µg/kg)																								
Acenaphthene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Acenaphthylene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Anthracene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(a)anthracene	41	370	J	44	360	J	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(a)pyrene	40	370	J	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(b)fluoranthene	64	370	J	75	360	J	50	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(g,h,i)perylene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzo(k)fluoranthene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Benzoic acid	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
Benzyl alcohol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
bis(2-Chloroethoxy)methane	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
bis(2-Chloroethyl) ether	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
bis(2-Chloroisopropyl)ether	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
bis(2-Ethylhexyl)phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4-Bromophenyl phenyl ether	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Butyl benzyl phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Carbazole	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4-Chloro-3-methylphenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4-Chloroaniline	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2-Chloronaphthalene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2-Chlorophenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4-Chlorophenyl phenyl ether	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER	0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Chrysene	44	370	J	40	360	J	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Di-n-butyl phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Di-n-octyl phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Dibenz(a,h)anthracene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Dibenzofuran	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
1,2-Dichlorobenzene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
1,3-Dichlorobenzene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
1,4-Dichlorobenzene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2,4-Dichlorophenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
3,3'-Dichlorobenzidine	<	740	U	<	730	U	<	730	U	<	7500	U	<	710	U	<	760	U	<	720	U	<	690	U
Diethyl phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2,4-Dimethylphenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Dimethyl phthalate	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4,6-Dinitro-2-methylphenol	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
2,4-Dinitrophenol	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
2,4-Dinitrotoluene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2,6-Dinitrotoluene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Fluoranthene	70	370	J	90	360	J	56	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Fluorene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Hexachlorobenzene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Hexachlorobutadiene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Hexachlorocyclopentadiene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Hexachloroethane	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Isophorone	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2-Methylnaphthalene	<	370	U	190	360	J	110	370	J	18000	3800		3900	350		120	380	J	140	360	J	<	340	U
2-Methylphenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4-Methylphenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Naphthalene	<	370	U	79	360	J	<	370	U	11000	3800		2200	350		85	380	J	83	360	J	<	340	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER	0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
3-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
4-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
Nitrobenzene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2-Nitrophenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
4-Nitrophenol	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
N-Nitroso-di-n-propylamine	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
N-Nitrosodiphenylamine	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Pentachlorophenol	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
Phenanthrene	<	370	U	55	360	J	38	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Phenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Pyrene	61	370	J	69	360	J	48	370	J	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
1,2,4-Trichlorobenzene	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
2,4,5-Trichlorophenol	<	1800	U	<	1800	U	<	1800	U	<	18000	U	<	1700	U	<	1800	U	<	1700	U	<	1700	U
2,4,6-Trichlorophenol	<	370	U	<	360	U	<	370	U	<	3800	U	<	350	U	<	380	U	<	360	U	<	340	U
Metals (mg/kg)																								
Aluminum	12500	11.2		11600	11		10600	11.1		6640	57		4500	10.7		3450	11.5		3880	10.9		1770	10.4	
Antimony	<	6.7	UJ	<	6.6	UJ	<	6.7	UJ	<	34.2	UJ	<	6.4	UJ	<	6.9	UJ	<	6.5	UJ	<	6.3	UJ
Arsenic	2.2	1.1		2.3	1.1		2.8	0.56		1.4	1.1		0.9	0.54		0.54	0.58	J	0.78	0.55		0.56	0.52	
Barium	213	1.1	J	230	1.1	J	273	1.1	J	326	5.7	J	83	1.1	J	26.5	1.2	J	43.4	1.1	J	20.4	1	J
Beryllium	0.62	0.22		0.67	0.22		0.63	0.22		0.71	1.1	J	0.26	0.21		0.22	0.23	J	0.27	0.22		0.14	0.21	J
Cadmium	<	0.56	U	<	0.55	U	<	0.56	U	<	2.8	U	<	0.54	U	<	0.58	U	<	0.55	U	<	0.52	U
Calcium	49900	22.5		74200	22.1		64900	22.2		246000	114		82600	21.5		22400	23		73900	21.8		899	20.9	
Chromium	13.6	1.1		13.4	1.1		11.1	1.1		4.7	5.7	J	5.4	1.1		4	1.2		10.5	1.1		2.9	1	
Cobalt	4.1	1.1		4.3	1.1		3.8	1.1		<	5.7	U	1.6	1.1		1.4	1.2		2.1	1.1		<	1	U
Copper	7.5	2.2		7.7	2.2		6.4	2.2		2.3	11.4	J	2.6	2.1		1.5	2.3	J	9.5	2.2		1.3	2.1	J
Iron	10600	11.2		10100	11		9420	11.1		4660	57		3850	10.7		3740	11.5		3980	10.9		2370	10.4	
Lead	7.6	0.56		7.5	0.55		9	1.1		2.6	0.57		2	0.54		2	0.58		5.5	0.55		1.3	0.52	
Magnesium	2880	22.5		2820	22.1		2770	22.2		6050	114		4110	21.5		3730	23		5680	21.8		1430	20.9	

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LOCATOR	CAN086-8611-0000			CAN086-8611-0004			CAN086-8611-0009			CAN086-8611-0014			CAN086-8611-0039			CAN086-8611-0049			CAN086-8611-0059			CAN086-8611-0069		
LAB SAMPLE NUMBER	0452880010SA			0452880011SA			0452880012SA			0452880013SA			0452880014SA			0452880015SA			0452880016SA			0452880017SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/19/95			10/19/95			10/19/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Manganese	173	1.1		204	1.1		143	1.1		105	5.7		37.1	1.1		42.9	1.2		48.7	1.1		18	1	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U	<	0.11	U	<	0.1	U
Nickel	10.5	4.5		10.3	4.4		8.3	4.4		6.2	22.8	J	3.9	4.3	J	3.1	4.6	J	5.3	4.4		2.6	4.2	J
Potassium	2020	562		1900	552		1800	556		1970	2850	J	919	536		669	575		668	545		421	521	J
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.2	UJ	<	1.1	UJ	<	1	UJ
Silver	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	5.7	UJ	<	1.1	UJ	<	1.2	UJ	<	1.1	UJ	<	1	UJ
Sodium	<	562	U	204	552	J	<	556	U	<	2850	U	149	536	J	<	575	U	<	545	U	172	521	J
Thallium	<	0.56	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	0.58	UJ	<	1.1	UJ	<	0.52	UJ
Vanadium	24.2	1.1		22.9	1.1		22.2	1.1		12.4	5.7		9.6	1.1		10.8	1.2		13.9	1.1		6.5	1	
Zinc	33.6	2.2		29.5	2.2		27.6	2.2		12.1	11.4		7.7	2.1		7.1	2.3		14.4	2.2		4.2	2.1	
TPH (mg/kg)																								
Total Petroleum Hydrocarbons	523	44.9	J	551	44.2	J	866	44.5	J	5010	456	J	626	42.9	J	166	46	J	533	43.6	J	<	41.7	U

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Qual = Qualification

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	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	<	55	U	<	110	U	<	63	U	<	11	U	<	11	U	<	11	U	590	57	J
Benzene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Bromodichloromethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Bromoform	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Bromomethane	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
2-Butanone (MEK)	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	36	57	J
Carbon disulfide	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Carbon tetrachloride	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Chlorobenzene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Chloroethane	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
Chloroform	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Chloromethane	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
Dibromochloromethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,1-Dichloroethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,2-Dichloroethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,1-Dichloroethene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,2-Dichloroethene (total)	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,2-Dichloropropane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
cis-1,3-Dichloropropene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
trans-1,3-Dichloropropene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Ethylbenzene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	480	29	J
2-Hexanone	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
Methylene chloride	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Styrene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,1,2,2-Tetrachloroethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Tetrachloroethene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Toluene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	3	5.5	J	<	29	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
1,1,1-Trichloroethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
1,1,2-Trichloroethane	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Trichloroethene	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	<	29	U
Vinyl acetate	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
Vinyl chloride	<	11	U	<	55	U	<	110	U	<	56	U	<	11	U	<	11	U	<	11	U	<	57	U
Xylenes (total)	<	5.7	U	<	28	U	<	56	U	<	28	U	<	5.6	U	<	5.5	U	<	5.5	U	540	29	J
Semivolatile Organics (µg/kg)																								
Acenaphthene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Acenaphthylene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Anthracene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Benzo(a)anthracene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	94	360	J	<	3800	U
Benzo(a)pyrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	98	360	J	<	3800	U
Benzo(b)fluoranthene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	160	360	J	<	3800	U
Benzo(g,h,i)perylene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	49	360	J	<	3800	U
Benzo(k)fluoranthene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Benzoic acid	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
Benzyl alcohol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
bis(2-Chloroethoxy)methane	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
bis(2-Chloroethyl) ether	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
bis(2-Chloroisopropyl)ether	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
bis(2-Ethylhexyl)phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4-Bromophenyl phenyl ether	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Butyl benzyl phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Carbazole	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4-Chloro-3-methylphenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4-Chloroaniline	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2-Chloronaphthalene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2-Chlorophenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4-Chlorophenyl phenyl ether	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U

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SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Chrysene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	110	360	J	<	3800	U
Di-n-butyl phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Di-n-octyl phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Dibenz(a,h)anthracene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Dibenzofuran	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
1,2-Dichlorobenzene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
1,3-Dichlorobenzene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
1,4-Dichlorobenzene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2,4-Dichlorophenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
3,3'-Dichlorobenzidine	<	760	U	<	2900	U	<	740	U	<	740	U	<	740	U	<	730	U	<	720	U	<	7500	U
Diethyl phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2,4-Dimethylphenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Dimethyl phthalate	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4,6-Dinitro-2-methylphenol	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
2,4-Dinitrophenol	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
2,4-Dinitrotoluene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2,6-Dinitrotoluene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Fluoranthene	38	380	J	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	150	360	J	<	3800	U
Fluorene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Hexachlorobenzene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Hexachlorobutadiene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Hexachlorocyclopentadiene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Hexachloroethane	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Indeno(1,2,3-cd)pyrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	40	360	J	<	3800	U
Isophorone	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	930	3800	J
2-Methylnaphthalene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	940	3800	J
2-Methylphenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4-Methylphenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Naphthalene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	760	3800	J

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LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Nitroaniline	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
3-Nitroaniline	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
4-Nitroaniline	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
Nitrobenzene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2-Nitrophenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
4-Nitrophenol	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
N-Nitroso-di-n-propylamine	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
N-Nitrosodiphenylamine	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Pentachlorophenol	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
Phenanthrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	57	360	J	<	3800	U
Phenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Pyrene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	110	360	J	<	3800	U
1,2,4-Trichlorobenzene	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
2,4,5-Trichlorophenol	<	1800	U	<	7100	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	18000	U
2,4,6-Trichlorophenol	<	380	U	<	1500	U	<	370	U	<	370	U	<	370	U	<	360	U	<	360	U	<	3800	U
Metals (mg/kg)																								
Aluminum	11300	11.5		7080	22.1		6060	22.5		6540	22.3		5240	22.4		8020	11		10100	10.9		8080	22.8	
Antimony	<	6.9	UJ	<	13.3	UJ	<	13.5	UJ	<	13.4	UJ	<	13.4	UJ	<	6.6	UJ	<	6.5	UJ	<	13.7	UJ
Arsenic	3	0.57		1.7	0.55		1.6	0.56		0.89	0.56		0.95	0.56		0.71	0.55		2	0.55		1.5	0.57	
Barium	215	1.1	J	327	2.2	J	189	2.3	J	129	2.2	J	685	2.2	J	40.9	1.1	J	410	1.1	J	297	2.3	J
Beryllium	0.47	0.23		0.59	0.44		0.49	0.45		0.39	0.45	J	0.24	0.45	J	0.31	0.22		0.58	0.22		0.45	0.46	J
Cadmium	<	0.57	U	<	1.1	U	<	1.1	U	<	1.1	U	<	1.1	U	<	0.55	U	<	0.55	U	<	1.1	U
Calcium	75100	22.9		126000	44.2		218000	45.1		159000	44.6		147000	44.7		65300	22.1		71400	21.8		199000	45.6	
Chromium	9.5	1.1		5.3	2.2		4.3	2.3		6	2.2		4.9	2.2		6.5	1.1		13.3	1.1		8.1	2.3	
Cobalt	3.6	1.1		2.7	2.2		<	2.3	U	<	2.2	U	<	2.2	U	1.3	1.1		3.7	1.1		2.4	2.3	
Copper	6.6	2.3		2.5	4.4	J	1.6	4.5	J	1.2	4.5	J	1.9	4.5	J	1.7	2.2	J	7.5	2.2		4.3	4.6	J
Iron	9250	11.5		4940	22.1		4330	22.5		4430	22.3		3470	22.4		5260	11		9520	10.9		5800	22.8	
Lead	8.5	2.9		5.1	0.55		3.5	0.56		2.8	0.56		1.9	0.56		2.9	0.55		8	1.1	J	3.7	0.57	
Magnesium	2770	22.9		3580	44.2		4000	45.1		5230	44.6		13200	44.7		8250	22.1		2590	21.8	J	4900	45.6	

J = Estimated value. RL = Reporting Limit.
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U = Nondetected value.

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8612-0000			CAN086-8612-0009			CAN086-8612-0014			CAN086-8612-0019			CAN086-8612-0029			CAN086-8612-0034			CAN086-8613-0000			CAN086-8613-0014		
LAB SAMPLE NUMBER	0452600005SA			0452880002SA			0452880003SA			0452880004SA			0452880008SA			0452880009SA			0452880007SA			0453180002SA		
COLLECT DATE	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/18/95			10/19/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Manganese	205	1.1		60.7	2.2		39.2	2.3		32.8	2.2		27.7	2.2		35.6	1.1		175	1.1		160	2.3	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	9	4.6		5.3	8.8	J	3.8	9	J	3.6	8.9	J	6.1	8.9	J	5.1	4.4		9.8	4.4		8.4	9.1	J
Potassium	1950	573		1450	1100		1400	1130		1390	1120		1000	1120	J	1320	552		1740	545		1810	1140	
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Silver	<	1.1	UJ	<	2.2	UJ	<	2.3	UJ	<	2.2	UJ	<	2.2	UJ	<	1.1	UJ	<	1.1	UJ	<	2.3	UJ
Sodium	<	573	U	<	1100	U	<	1130	U	<	1120	U	<	1120	U	<	552	U	<	545	U	<	1140	U
Thallium	0.13	0.57	J	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ
Vanadium	19.6	1.1		12.2	2.2		12.3	2.3		12.8	2.2		15.9	2.2		15.5	1.1		21.8	1.1		19.1	2.3	
Zinc	26.1	2.3		13.7	4.4		11.8	4.5		10.9	4.5		7.4	4.5		10.7	2.2		38.3	2.2		16.2	4.6	
TPH (mg/kg)																								
Total Petroleum Hydrocarbons	280	45.9		5390	442	J	3230	225	J	889	44.6	J	<	44.7	U	<	44.2	U	553	43.6	J	5270	456	

J = Estimated value.
R = Rejected value.
U = Nondetected value.

RL = Reporting Limit.
Qual = Qualification

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	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	130	27		240	58		<	11	U	<	11	U	<	14	U	<	14	U	<	17	U	<	11	U
Benzene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Bromodichloromethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Bromoform	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Bromomethane	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	20	27	J	51	58	J	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Carbon disulfide	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Carbon tetrachloride	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Chlorobenzene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Chloroethane	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chloroform	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Chloromethane	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Dibromochloromethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,1-Dichloroethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,2-Dichloroethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,1-Dichloroethene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,2-Dichloroethene (total)	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,2-Dichloropropane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
cis-1,3-Dichloropropene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
trans-1,3-Dichloropropene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Ethylbenzene	150	14		180	29		<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
2-Hexanone	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	3.2	14	J	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Styrene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,1,2,2-Tetrachloroethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Tetrachloroethene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Toluene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U

J = Estimated value. RL = Reporting Limit.
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U = Nondetected value.

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
1,1,1-Trichloroethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
1,1,2-Trichloroethane	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Trichloroethene	<	14	U	<	29	U	<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Vinyl acetate	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Vinyl chloride	<	27	U	<	58	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Xylenes (total)	200	14		400	29		<	5.4	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																								
Acenaphthene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Acenaphthylene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Anthracene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Benzo(a)anthracene	<	720	U	<	760	U	<	360	U	<	360	U	200	360	J	<	360	U	<	360	U	<	360	U
Benzo(a)pyrene	<	720	U	<	760	U	<	360	U	<	360	U	270	360	J	<	360	U	<	360	U	<	360	U
Benzo(b)fluoranthene	<	720	U	<	760	U	<	360	U	<	360	U	440	360		<	360	U	<	360	U	<	360	U
Benzo(g,h,i)perylene	<	720	U	<	760	U	<	360	U	<	360	U	110	360	J	<	360	U	<	360	U	<	360	U
Benzo(k)fluoranthene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Benzoic acid	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Benzyl alcohol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
bis(2-Chloroethoxy)methane	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
bis(2-Chloroethyl) ether	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
bis(2-Chloroisopropyl)ether	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4-Bromophenyl phenyl ether	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Butyl benzyl phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Carbazole	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4-Chloro-3-methylphenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4-Chloroaniline	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2-Chloronaphthalene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2-Chlorophenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4-Chlorophenyl phenyl ether	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U

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R = Rejected value.
U = Nondetected value.

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Qual = Qualification

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Chrysene	<	720	U	<	760	U	<	360	U	<	360	U	260	360	J	<	360	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Di-n-octyl phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Dibenz(a,h)anthracene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Dibenzofuran	<	720	U	150	760	J	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
1,2-Dichlorobenzene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
1,3-Dichlorobenzene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
1,4-Dichlorobenzene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2,4-Dichlorophenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
3,3'-Dichlorobenzidine	<	1400	U	<	1500	U	<	720	U	<	720	U	<	730	U	<	730	U	<	730	U	<	730	U
Diethyl phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2,4-Dimethylphenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Dimethyl phthalate	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4,6-Dinitro-2-methylphenol	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4-Dinitrophenol	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4-Dinitrotoluene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2,6-Dinitrotoluene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Fluoranthene	<	720	U	<	760	U	<	360	U	<	360	U	210	360	J	<	360	U	<	360	U	<	360	U
Fluorene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Hexachlorobenzene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Hexachlorobutadiene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Hexachlorocyclopentadiene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Hexachloroethane	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	720	U	<	760	U	<	360	U	<	360	U	89	360	J	<	360	U	<	360	U	<	360	U
Isophorone	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2-Methylnaphthalene	2600	720		4800	760		<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2-Methylphenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4-Methylphenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Naphthalene	970	720		1500	760		<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U

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U = Nondetected value.

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Nitroaniline	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
3-Nitroaniline	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
4-Nitroaniline	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Nitrobenzene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2-Nitrophenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
4-Nitrophenol	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
N-Nitroso-di-n-propylamine	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
N-Nitrosodiphenylamine	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Pentachlorophenol	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Phenanthrene	<	720	U	<	760	U	<	360	U	<	360	U	56	360	J	<	360	U	<	360	U	<	360	U
Phenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Pyrene	<	720	U	<	760	U	<	360	U	<	360	U	260	360	J	<	360	U	<	360	U	<	360	U
1,2,4-Trichlorobenzene	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
2,4,5-Trichlorophenol	<	3500	U	<	3700	U	<	1700	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4,6-Trichlorophenol	<	720	U	<	760	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U	<	360	U
Metals (mg/kg)																								
Aluminum	6830	11		6880	11.5		3690	10.9		3440	10.9		11700	11		8840	11		3760	22.1		6150	11	
Antimony	<	6.6	UJ	<	6.9	UJ	<	6.5	UJ	<	6.5	UJ	<	6.6	UJ	<	6.6	UJ	<	13.3	UJ	<	6.6	UJ
Arsenic	1	0.55		1	0.58		<	3.3	U	<	3.3	U	2.8	0.55		2	0.55	J	1.2	0.55	J	1.1	0.55	J
Barium	176	1.1	J	193	1.2	J	58.7	1.1	J	24.5	1.1	J	253	1.1	J	463	1.1	J	67.4	2.2	J	1260	1.1	J
Beryllium	0.26	0.22		0.19	0.23	J	0.14	0.22	J	0.14	0.22	J	0.53	0.22		0.5	0.22		0.22	0.44	J	0.2	0.22	J
Cadmium	<	0.55	U	<	0.58	U	<	0.54	U	<	0.55	U	<	0.55	U	<	0.55	U	<	1.1	U	<	0.55	U
Calcium	34400	21.9		115000	23		55600	21.7		7600	21.8		56400	22		103000	22.1		168000	44.2		39100	22	
Chromium	4.9	1.1		6	1.2		3.5	1.1		3.6	1.1				R			R			R			R
Cobalt	1.4	1.1		1.5	1.2		<	1.1	U	1.2	1.1		4.1	1.1		2.6	1.1		<	2.2	U	<	1.1	U
Copper	1.9	2.2	J	2.4	2.3		1.1	2.2	J	1.5	2.2	J	7.3	2.2		4.2	2.2		<	4.4	U	1.9	2.2	J
Iron	5240	11		4020	11.5		3510	10.9		4280	10.9		10200	11		5980	11		2690	22.1		5030	11	
Lead	3.1	0.55		2.5	0.58		2	0.54		2	0.55		4.6	1.1		3.3	0.55		1.4	0.55		2.3	1.1	
Magnesium	3120	21.9		12700	23		5540	21.7		2970	21.8		2680	22		3120	22.1		5930	44.2		3650	22	

J = Estimated value. RL = Reporting Limit.
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U = Nondetected value.

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8613-0024			CAN086-8613-0034			CAN086-8613-0049			CAN086-8613-0064			CAN086-8614-0000			CAN086-8614-0009			CAN086-8614-0029			CAN086-8614-0034		
LAB SAMPLE NUMBER	0453180003SA			0453180004SA			0453180005SA			0453180006SA			0452600001SA			0452600002SA			0452600003SA			0452600004SA		
COLLECT DATE	10/19/95			10/19/95			10/20/95			10/20/95			10/17/95			10/17/95			10/17/95			10/17/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Manganese	34.2	1.1		30.5	1.2		44.6	1.1		57.8	1.1		191	1.1	J	95.3	1.1	J	23.8	2.2	J	48	1.1	J
Mercury	<	0.11	U	<	0.12	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	4.2	4.4	J	4.3	4.6	J	2.6	4.3	J	2.4	4.4	J	9.3	4.4		6	4.4		2.8	8.8	J	4.5	4.4	
Potassium	1490	548		1390	576		715	543		675	545		2030	550		1600	552		672	1110	J	1550	550	
Selenium	<	1.1	UJ	<	1.2	UJ	<	1.1	UJ	<	1.1	UJ	<	2.2	UJ	<	5.5	UJ	<	2.2	UJ	<	1.1	UJ
Silver	<	1.1	UJ	<	1.2	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	U	<	1.1	U	<	2.2	U	<	1.1	U
Sodium	<	548	U	<	576	U	<	543	U	<	545	U	<	550	U	<	552	U	<	1110	U	<	550	U
Thallium	<	0.55	UJ	<	1.2	UJ	<	0.54	UJ	<	0.55	UJ	0.18	1.1	J	0.17	1.1	J	0.12	1.1	J	0.11	1.1	J
Vanadium	12.6	1.1		15	1.2		11	1.1		12.7	1.1		21.1	1.1		14.4	1.1		14.7	2.2		13.1	1.1	
Zinc	10.9	2.2		7	2.3		6.3	2.2		6.7	2.2		29.3	2.2		15.2	2.2		7.7	4.4		10.9	2.2	
TPH (mg/kg)																								
Total Petroleum Hydrocarbons	497	43.8		786	46.1		<	43.4	U	<	43.6	U	363	44		<	44.2	U	<	44.2	U	<	44	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.
RL = Reporting Limit.
Qual = Qualification

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	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	<	11	U	<	11	U
Benzene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Bromodichloromethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Bromoform	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Bromomethane	<	11	U	<	11	U	<	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	<	11	U	<	11	U
Carbon disulfide	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Carbon tetrachloride	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Chlorobenzene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Chloroethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chloroform	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Chloromethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Dibromochloromethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,1-Dichloroethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,2-Dichloroethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,1-Dichloroethene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,2-Dichloroethene (total)	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,2-Dichloropropane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
cis-1,3-Dichloropropene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
trans-1,3-Dichloropropene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Ethylbenzene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
2-Hexanone	<	11	U	<	11	U	<	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	<	11	U	<	11	U
Methylene chloride	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Styrene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,1,2,2-Tetrachloroethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Tetrachloroethene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Toluene	<	5.7	U	4.6	5.5	J	<	5.4	U	<	5.7	U	1.6	5.6	J	<	5.7	U	<	5.6	U	<	5.5	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.

RL = Reporting Limit.
Qual = Qualification

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
1,1,1-Trichloroethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
1,1,2-Trichloroethane	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Trichloroethene	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Vinyl acetate	<	11	U	<	11	U	<	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	<	11	U	<	11	U
Xylenes (total)	<	5.7	U	<	5.5	U	<	5.4	U	<	5.7	U	<	5.6	U	<	5.7	U	<	5.6	U	<	5.5	U
Semivolatile Organics (µg/kg)																								
Acenaphthene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Acenaphthylene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Anthracene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(a)anthracene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(a)pyrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(b)fluoranthene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(g,h,i)perylene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzo(k)fluoranthene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Benzoic acid	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Benzyl alcohol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Chloroethoxy)methane	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Chloroethyl) ether	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Chloroisopropyl)ether	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Bromophenyl phenyl ether	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Butyl benzyl phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Carbazole	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Chloro-3-methylphenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Chloroaniline	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Chloronaphthalene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Chlorophenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Chlorophenyl phenyl ether	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U

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U = Nondetected value.

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Chrysene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Di-n-butyl phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Di-n-octyl phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Dibenz(a,h)anthracene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Dibenzofuran	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,2-Dichlorobenzene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,3-Dichlorobenzene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,4-Dichlorobenzene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,4-Dichlorophenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
3,3'-Dichlorobenzidine	<	760	U	<	730	U	<	720	U	<	750	U	<	740	U	<	750	U	<	740	U	<	730	U
Diethyl phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,4-Dimethylphenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Dimethyl phthalate	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4,6-Dinitro-2-methylphenol	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4-Dinitrophenol	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4-Dinitrotoluene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,6-Dinitrotoluene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Fluoranthene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Fluorene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachlorobenzene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachlorobutadiene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachlorocyclopentadiene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Hexachloroethane	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Isophorone	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Methylnaphthalene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Methylphenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Methylphenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Naphthalene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Nitroaniline	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
3-Nitroaniline	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
4-Nitroaniline	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Nitrobenzene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2-Nitrophenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
4-Nitrophenol	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
N-Nitroso-di-n-propylamine	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
N-Nitrosodiphenylamine	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Pentachlorophenol	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
Phenanthrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Phenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Pyrene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
1,2,4-Trichlorobenzene	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
2,4,5-Trichlorophenol	<	1800	U	<	1800	U	<	1700	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1800	U
2,4,6-Trichlorophenol	<	380	U	<	360	U	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	360	U
Metals (mg/kg)																								
Aluminum	12000	11.5		6280	11		5990	10.9		8770	11.3		4430	22.5		5420	11.3		10700	11.1		3730	22	
Antimony	<	6.9	UJ	<	6.6	UJ	<	6.5	UJ	<	6.8	UJ	<	13.5	UJ	<	6.8	UJ	<	6.7	UJ	<	13.2	UJ
Arsenic	2.5	0.57		1.4	0.55		1	0.54		2.4	0.57		0.78	0.56		0.69	0.57		2.6	1.1		0.89	0.55	
Barium	78.6	1.1	J	260	1.1	J	110	1.1	J	86.1	1.1	J	931	2.2	J	63.6	1.1	J	145	1.1	J	90.9	2.2	J
Beryllium	0.58	0.23		0.23	0.22		0.19	0.22	J	0.53	0.23		<	0.45	U	0.19	0.23	J	0.55	0.22		<	0.44	U
Cadmium	<	0.57	U	<	0.55	U	<	0.54	U	<	0.57	U	<	1.1	U	<	0.57	U	<	0.56	U	<	1.1	U
Calcium	1940	23		80300	22.1		83000	21.7		6370	22.6	J	153000	45	J	108000	22.7	J	20900	22.3		167000	44	
Chromium	11.2	1.1		4.8	1.1		4.3	1.1		8.8	1.1		3.6	2.2		5.7	1.1		9.7	1.1		7.1	2.2	
Cobalt	4.4	1.1		2.4	1.1		<	1.1	U	4.5	1.1		<	2.2	U	1.7	1.1		4.9	1.1		1.8	2.2	J
Copper	8.2	2.3		2	2.2	J	1.4	2.2	J	6.9	2.3		1.6	4.5	J	1.6	2.3	J	9.2	2.2		9.6	4.4	
Iron	11800	11.5		4670	11		4120	10.9		9400	11.3		2800	22.5		3260	11.3		10400	11.1		2620	22	
Lead	8.3	0.57		3	0.55		2.4	0.54		5.7	0.57		1.7	0.56		2	0.57		8.7	0.56		1.8	0.55	
Magnesium	1780	23		5070	22.1		6480	21.7		1650	22.6		9970	45		9670	22.7		2100	22.3		8610	44	

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8615-0001			CAN086-8615-0029			CAN086-8615-0034			CAN086-8616-0000			CAN086-8616-0029			CAN086-8616-0034			CAN086-8617-0000			CAN086-8617-0029		
LAB SAMPLE NUMBER	0453180007SA			0453180008SA			0453180009SA			0453390001SA			0453390002SA			0453390003SA			0453390004SA			0453390005SA		
COLLECT DATE	10/20/95			10/20/95			10/20/95			10/21/95			10/21/95			10/21/95			10/21/95			10/21/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Manganese	183	1.1		47.7	1.1		27.3	1.1		199	1.1		25	2.2		30.3	1.1		214	1.1		37.9	2.2	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U
Nickel	9.2	4.6		4.7	4.4		3.8	4.3	J	9.5	4.5		4.5	9	J	5.2	4.5		9.4	4.5		6.1	8.8	J
Potassium	1950	575		1520	551		1190	543		1630	566		667	1120	J	959	567		1820	557		629	1100	J
Selenium	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	1.1	UJ	<	2.2	UJ	<	2.3	UJ	<	1.1	UJ	<	2.2	UJ
Silver	<	1.1	U	<	1.1	U	<	1.1	U	<	1.1	U	<	2.2	U	<	1.1	U	<	1.1	U	<	2.2	U
Sodium	<	575	U	<	551	U	<	543	U	<	566	U	<	1120	U	<	567	U	<	557	U	<	1100	U
Thallium	0.18	0.57	J	<	1.1	UJ	<	0.54	UJ	<	0.57	UJ	<	2.2	UJ	<	1.1	UJ	0.14	0.56	J	<	2.2	UJ
Vanadium	24.1	1.1		11.8	1.1		10.1	1.1		21.1	1.1		14.8	2.2		13.5	1.1		21.6	1.1		10.2	2.2	
Zinc	24.8	2.3		10.5	2.2		8	2.2		20.6	2.3		8.3	4.5		6.5	2.3		22.1	2.2		6.3	4.4	
TPH (mg/kg)																								
Total Petroleum Hydrocarbons	<	46	U	<	44.1	U	<	43.4	U	<	45.3	U	<	45	U	<	45.3	U	<	44.6	U	<	44	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	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	<	12	U	<	11	U
Benzene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Bromodichloromethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Bromoform	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Bromomethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Carbon disulfide	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Carbon tetrachloride	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Chlorobenzene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Chloroethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Chloroform	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Chloromethane	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Dibromochloromethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,1-Dichloroethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,2-Dichloroethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,1-Dichloroethene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,2-Dichloroethene (total)	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,2-Dichloropropane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
cis-1,3-Dichloropropene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
trans-1,3-Dichloropropene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Ethylbenzene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
2-Hexanone	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
4-Methyl-2-pentanone (MIBK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Methylene chloride	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Styrene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,1,2,2-Tetrachloroethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Tetrachloroethene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Toluene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U

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SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
1,1,1-Trichloroethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
1,1,2-Trichloroethane	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Trichloroethene	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	<	5.3	U	<	5.8	U	<	5.5	U
Vinyl acetate	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Vinyl chloride	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U
Xylenes (total)	<	5.6	U	<	5.7	U	<	5.6	U	<	5.6	U	1.1	5.3	J	<	5.8	U	<	5.5	U
Semivolatile Organics (µg/kg)																					
Acenaphthene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Acenaphthylene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzo(k)fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Benzoic acid	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
Benzyl alcohol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
bis(2-Chloroethoxy)methane	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
bis(2-Chloroethyl) ether	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
bis(2-Chloroisopropyl)ether	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
bis(2-Ethylhexyl)phthalate	<	370	U	<	370	UJ	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4-Bromophenyl phenyl ether	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Butyl benzyl phthalate	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Carbazole	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4-Chloro-3-methylphenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4-Chloroaniline	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2-Chloronaphthalene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2-Chlorophenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4-Chlorophenyl phenyl ether	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U

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TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Chrysene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Di-n-octyl phthalate	<	370	U	<	370	UJ	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Dibenz(a,h)anthracene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Dibenzofuran	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
1,2-Dichlorobenzene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
1,3-Dichlorobenzene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
1,4-Dichlorobenzene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2,4-Dichlorophenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
3,3'-Dichlorobenzidine	<	740	U	<	750	U	<	750	U	<	730	U	<	700	U	<	760	U	<	730	U
Diethyl phthalate	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2,4-Dimethylphenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Dimethyl phthalate	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4,6-Dinitro-2-methylphenol	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
2,4-Dinitrophenol	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
2,4-Dinitrotoluene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2,6-Dinitrotoluene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Fluoranthene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Fluorene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Hexachlorobenzene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Hexachlorobutadiene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Hexachlorocyclopentadiene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Hexachloroethane	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Indeno(1,2,3-cd)pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Isophorone	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2-Methylnaphthalene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2-Methylphenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4-Methylphenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Naphthalene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U

J = Estimated value.
R = Rejected value.
U = Nondetected value.

RL = Reporting Limit.
Qual = Qualification

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
2-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
3-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
4-Nitroaniline	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
Nitrobenzene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2-Nitrophenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
4-Nitrophenol	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
N-Nitroso-di-n-propylamine	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
N-Nitrosodiphenylamine	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Pentachlorophenol	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
Phenanthrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Phenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Pyrene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
1,2,4-Trichlorobenzene	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
2,4,5-Trichlorophenol	<	1800	U	<	1800	U	<	1800	U	<	1800	U	<	1700	U	<	1900	U	<	1800	U
2,4,6-Trichlorophenol	<	370	U	<	370	U	<	370	U	<	370	U	<	350	U	<	380	U	<	360	U
Metals (mg/kg)																					
Aluminum	5090	11.2		10200	11.3		4100	22.6		5820	11.1		7790	10.6		4090	23.1		5500	22	
Antimony	<	6.7	UJ	<	6.8	UJ	<	13.5	UJ	<	6.7	UJ	<	6.4	UJ	<	13.9	UJ	<	13.2	UJ
Arsenic	0.78	1.1	J	2.5	0.57		0.78	0.56		0.77	0.56		2.2	0.53		0.69	0.58		0.84	1.1	J
Barium	53.7	1.1	J	177	1.1	J	129	2.3	J	131	1.1	J	129	1.1	J	289	2.3	J	124	2.2	J
Beryllium	<	0.22	U	0.56	0.23		<	0.45	U	0.26	0.22		0.42	0.21		<	0.46	U	<	0.44	U
Cadmium	<	0.56	U	<	0.57	U	<	1.1	U	<	0.56	U	<	0.53	U	<	1.2	U	<	1.1	U
Calcium	103000	22.4		64100	22.6		206000	45.2		68900	22.2		32700	21.3		205000	46.3		140000	44.1	
Chromium	3.7	1.1		8.8	1.1		9.7	2.3		4.1	1.1		8	1.1		3.4	2.3		3.5	2.2	
Cobalt	1.4	1.1		3.6	1.1		<	2.3	U	1.4	1.1		2.9	1.1		1.7	2.3	J	2	2.2	J
Copper	<	2.2	U	6.6	2.3		2.4	4.5	J	1.6	2.2	J	5.4	2.1		2	4.6	J	1.4	4.4	J
Iron	3330	11.2		8960	11.3		3010	22.6		4160	11.1		7500	10.6		2420	23.1		3370	22	
Lead	2.2	0.56		5.5	1.1		1.5	0.56		2.6	0.56		10.1	1.1		1.4	0.58		1.8	0.55	
Magnesium	8140	22.4		2900	22.6		6240	45.2		5040	22.2		1760	21.3		13400	46.3		9000	44.1	

J = Estimated value. RL = Reporting Limit.
R = Rejected value. Qual = Qualification
U = Nondetected value.

TABLE A-1

SUMMARY OF CHEMICALS DETECTED IN SOIL SAMPLES COLLECTED AT SITE SD-11

LOCATOR	CAN086-8617-0034			CAN086-8618-0000			CAN086-8618-0029			CAN086-8618-0034			CAN086-8619-0000			CAN086-8619-0029			CAN086-8619-0034		
LAB SAMPLE NUMBER	0453390006SA			0453690004SA			0453690005SA			0453690006SA			0453690007SA			0453690008SA			0453690009SA		
COLLECT DATE	10/21/95			10/23/95			10/23/95			10/23/95			10/24/95			10/24/95			10/24/95		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Manganese	30.1	1.1		109	1.1		28.1	2.3		34.2	1.1		130	1.1		22.6	2.3		41.6	2.2	
Mercury	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.11	U	<	0.12	U	<	0.11	U
Nickel	4.5	4.5		9.9	4.5		4.9	9	J	4.7	4.4		7.3	4.3		4.8	9.3	J	4.6	8.8	J
Potassium	879	559		1700	565		690	1130	J	1290	555		1430	532		634	1160	J	962	1100	J
Selenium	<	2.2	UJ	<	2.3	UJ	<	2.3	UJ	<	2.2	UJ	<	1.1	UJ	<	2.3	UJ	<	2.2	UJ
Silver	<	1.1	U	<	1.1	U	<	2.3	U	<	1.1	U	<	1.1	U	<	2.3	U	<	2.2	U
Sodium	<	559	U	<	565	U	<	1130	U	<	555	U	<	532	U	<	1160	U	<	1100	U
Thallium	<	2.2	UJ	<	1.1	UJ	<	2.3	UJ	<	1.1	UJ	<	0.53	UJ	<	2.3	UJ	<	2.2	UJ
Vanadium	13.7	1.1		19.4	1.1		13.7	2.3		10.4	1.1		16.2	1.1		14.5	2.3		11.7	2.2	
Zinc	6.6	2.2		19.1	2.3		10	4.5		8.1	2.2		23.9	2.1		9.8	4.6		7.5	4.4	
TPH (mg/kg)																					
Total Petroleum Hydrocarbons	<	44.7	U	81.2	45.2		<	45.2	U	<	44.4	U	83.9	42.6		<	46.3	U	<	44.1	U

J = Estimated value. RL = Reporting Limit.
R = Rejected value. Qual = Qualification
U = Nondetected value.

TABLE A-2

SUMMARY OF ANALYTICAL RESULTS FOR THE GROUNDWATER SAMPLE

LOCATOR	CAN086-86W9-2001		
LAB SAMPLE NUMBER	0453690001SA		
COLLECT DATE	10/24/95		
	Result	RL	Qual
Volatile Organics (µg/L)			
1,1,1,2-Tetrachloroethane	<	5	U
1,1,1-Trichloroethane	<	5	U
1,1,2,2-Tetrachloroethane	<	5	U
1,1,2-Trichloroethane	<	5	U
1,1-Dichloroethane	<	5	U
1,1-Dichloroethene	<	5	U
1,2,3-Trichloropropane	<	5	U
1,2-Dibromo-3-chloro-propane (DBCP)	<	10	U
1,2-Dibromoethane (EDB)	<	10	U
1,2-Dichloroethane	<	5	U
1,2-Dichloroethene (total)	<	5	U
1,2-Dichloropropane	<	5	U
1,4-Dioxane	<	500	U
2-Butanone (MEK)	<	10	U
2-Hexanone	<	10	U
4-Methyl-2-pentanone (MIBK)	<	10	U
Acetone	<	10	U
Acetonitrile	<	200	U
Acrolein	<	100	U
Acrylonitrile	<	100	U
Allyl chloride	<	10	U
Benzene	<	5	U
Bromodichloromethane	<	5	U
Bromoform	1.3	5	J
Bromomethane	<	10	U
Carbon disulfide	<	5	U
Carbon tetrachloride	<	5	U
Chlorobenzene	<	5	U
Chloroethane	<	10	U
Chloroform	<	5	U
Chloromethane	<	10	U
Chloroprene	<	5	U
cis-1,3-Dichloropropene	<	5	U
Dibromochloromethane	<	5	U
Dibromomethane	<	5	U
Dichlorodifluoromethane	<	20	U
Ethyl methacrylate	<	20	U
Ethylbenzene	<	5	U
Iodomethane	<	5	U
Isobutanol	<	200	U
Methacrylonitrile	<	5	U
Methyl methacrylate	<	20	U
Methylene chloride	<	5	U
Propionitrile	<	5	U
Styrene	<	5	U

U = Nondetect RL = Reporting Limit
J = Estimated Qual = Qualification

TABLE A-2

SUMMARY OF ANALYTICAL RESULTS FOR THE GROUNDWATER SAMPLE

LOCATOR	CAN086-86W9-2001		
LAB SAMPLE NUMBER	0453690001SA		
COLLECT DATE	10/24/95		
	Result	RL	Qual
Tetrachloroethene	<	5	U
Toluene	<	5	U
trans-1,3-Dichloropropene	<	5	U
trans-1,4-Dichloro-2-butene	<	5	U
Trichloroethene	<	5	U
Trichlorofluoromethane	<	5	U
Vinyl acetate	<	10	U
Vinyl chloride	<	10	U
Xylenes (total)	<	5	U
Semivolatile Organics (µg/L)			
1,2,4,5-Tetrachloro-benzene	<	10	U
1,2,4-Trichlorobenzene	<	10	U
1,2-Dichlorobenzene	<	10	U
1,3,5-Trinitrobenzene	<	10	U
1,3-Dichlorobenzene	<	10	U
1,3-Dinitrobenzene	<	10	U
1,4-Dichlorobenzene	<	10	U
1,4-Naphthoquinone	<	10	U
1-Naphthylamine	<	10	U
2,3,4,6-Tetrachlorophenol	<	50	U
2,4,5-Trichlorophenol	<	50	U
2,4,6-Trichlorophenol	<	10	U
2,4-Dichlorophenol	<	10	U
2,4-Dimethylphenol	<	10	U
2,4-Dinitrophenol	<	50	U
2,4-Dinitrotoluene	<	10	U
2,6-Dichlorophenol	<	10	U
2,6-Dinitrotoluene	<	10	U
2-Acetylaminofluorene	<	100	U
2-Chloronaphthalene	<	10	U
2-Chlorophenol	<	10	U
2-Methylnaphthalene	<	10	U
2-Methylphenol	<	10	U
2-Naphthylamine	<	10	U
2-Nitroaniline	<	50	U
2-Nitrophenol	<	10	U
2-Picoline	<	10	U
2-sec-Butyl-4,6-dinitro-phenol	<	10	U
2-Toluidine	<	10	U
3,3'-Dichlorobenzidine	<	20	U
3,3'-Dimethylbenzidine	<	10	U
3-Methylcholanthrene	<	10	U
3-Nitroaniline	<	50	U
3/4-Methylphenol	<	10	U
4,6-Dinitro-2-methylphenol	<	50	U
4-Aminobiphenyl	<	10	U

U = Nondetect RL = Reporting Limit
J = Estimated Qual = Qualification

TABLE A-2

SUMMARY OF ANALYTICAL RESULTS FOR THE GROUNDWATER SAMPLE

LOCATOR	CAN086-86W9-2001		
LAB SAMPLE NUMBER	0453690001SA		
COLLECT DATE	10/24/95		
	Result	RL	Qual
4-Bromophenyl phenyl ether	<	10	U
4-Chloro-3-methylphenol	<	10	U
4-Chloroaniline	<	10	U
4-Chlorophenyl phenyl ether	<	10	U
4-Nitroaniline	<	50	U
4-Nitrophenol	<	50	U
4-Nitroquinoline-1-oxide	<	100	U
4-Phenylenediamine	<	100	U
5-Nitro-o-toluidine	<	10	U
7,12-Dimethylbenz(a)-anthracene	<	10	U
a,a-Dimethylphenethyl-amine	<	10	U
Acenaphthene	<	10	U
Acenaphthylene	<	10	U
Acetophenone	<	10	U
Aniline	<	10	U
Anthracene	<	10	U
Aramite	<	10	U
Benzo(a)anthracene	<	10	U
Benzo(a)pyrene	<	10	U
Benzo(b)fluoranthene	<	10	U
Benzo(g,h,i)perylene	<	10	U
Benzo(k)fluoranthene	<	10	U
Benzyl alcohol	<	10	U
bis(2-Chloroethoxy)methane	<	10	U
bis(2-Chloroethyl) ether	<	10	U
bis(2-Chloroisopropyl)ether	<	10	U
bis(2-Ethylhexyl)phthalate	<	10	U
Butyl benzyl phthalate	<	10	U
Chrysene	<	10	U
Di-n-butyl phthalate	<	10	U
Di-n-octyl phthalate	<	10	U
Dibenz(a,h)anthracene	<	10	U
Dibenzofuran	<	10	U
Diethyl phthalate	<	10	U
Dimethoate	<	50	U
Dimethyl phthalate	<	10	U
Diphenylamine	<	10	U
Disulfoton	<	50	U
Ethyl methanesulfonate	<	10	U
Famphur	<	50	U
Fluoranthene	<	10	U
Fluorene	<	10	U
Hexachlorobenzene	<	10	U
Hexachlorobutadiene	<	10	U
Hexachlorocyclopentadiene	<	10	U
Hexachloroethane	<	10	U

U = Nondetect RL = Reporting Limit
J = Estimated Qual = Qualification

TABLE A-2

SUMMARY OF ANALYTICAL RESULTS FOR THE GROUNDWATER SAMPLE

LOCATOR	CAN086-86W9-2001		
LAB SAMPLE NUMBER	0453690001SA		
COLLECT DATE	10/24/95		
	Result	RL	Qual
Hexachlorophene	<		U
Hexachloropropene	<	10	U
Indeno(1,2,3-cd)pyrene	<	10	U
Isophorone	<	10	U
Isosafrole	<	20	U
Methapyrilene	<	10	U
Methyl methanesulfonate	<	10	U
Methyl parathion	<	50	U
N-Nitroso-di-n-butylamine	<	10	U
N-Nitroso-di-n-propylamine	<	10	U
N-Nitrosodiethylamine	<	10	U
N-Nitrosodimethylamine	<	10	U
N-Nitrosodiphenylamine	<	10	U
N-Nitrosomethylethylamine	<	10	U
N-Nitrosomorpholine	<	10	U
N-Nitrosopiperidine	<	10	U
N-Nitrosopyrrolidine	<	10	U
Naphthalene	<	10	U
Nitrobenzene	<	10	U
O,O,O-Triethylphosphoro-thioate	<	10	U
p-Dimethylaminoazobenzene	<	10	U
Parathion	<	50	U
Pentachlorobenzene	<	10	U
Pentachloroethane	<	10	U
Pentachloronitrobenzene	<	50	U
Pentachlorophenol	<	50	U
Phenacetin	<	10	U
Phenanthrene	<	10	U
Phenol	<	10	U
Phorate	<	100	U
Pronamide	<	10	U
Pyrene	<	10	U
Pyridine	<	20	U
Safrole	<	10	U
Sulfotepp	<	50	U
Thionazin	<	50	U
Pesticides/PCB's (µg/L)			
Aroclor 1016	<	1	U
Aroclor 1221	<	1	U
Aroclor 1232	<	1	U
Aroclor 1242	<	1	U
Aroclor 1248	<	1	U
Aroclor 1254	<	1	U
Aroclor 1260	<	1	U
4,4'-DDD	<	0.1	U
4,4'-DDE	<	0.1	U

U = Nondetect RL = Reporting Limit
J = Estimated Qual = Qualification

TABLE A-2

SUMMARY OF ANALYTICAL RESULTS FOR THE GROUNDWATER SAMPLE

LOCATOR	CAN086-86W9-2001		
LAB SAMPLE NUMBER	0453690001SA		
COLLECT DATE	10/24/95		
	Result	RL	Qual
4,4'-DDT	<	0.1	U
Aldrin	<	0.05	U
alpha-BHC	<	0.05	U
alpha-Chlordane	<	0.05	U
beta-BHC	<	0.05	U
Chlorobenzilate	<	1	U
delta-BHC	<	0.05	U
Diallate	<	1	U
Dieldrin	<	0.1	U
Endosulfan I	<	0.05	U
Endosulfan II	<	0.1	U
Endosulfan sulfate	<	0.1	U
Endrin	<	0.1	U
Endrin aldehyde	<	0.1	U
gamma-BHC (Lindane)	<	0.05	U
gamma-Chlordane	<	0.05	U
Heptachlor	<	0.05	U
Heptachlor epoxide	<	0.05	U
Isodrin	<	0.1	U
Kepone	<	1	U
Methoxychlor	<	0.5	U
Toxaphene	<	5	U
Herbicides (µg/L)			
2,4-D	<	1.2	U
2,4,5-T	<	0.2	U
2,4,5-TP (Silvex)	<	0.17	U
Metals (mg/L)			
Antimony	<	0.06	U
Arsenic	0.0055	0.005	
Barium	0.032	0.01	
Beryllium	<	0.002	U
Cadmium	<	0.005	U
Chromium	<	0.01	U
Cobalt	<	0.01	U
Copper	0.0091	0.02	J
Lead	<	0.005	U
Mercury	<	0.0002	U
Nickel	<	0.04	U
Selenium	<	0.01	UJ
Silver	<	0.01	U
Thallium	<	0.01	UJ
Tin	<	0.1	U
Vanadium	0.037	0.01	
Zinc	<	0.02	U
TPH (mg/L)			
Total Petroleum Hydrocarbons	<	1	UJ

U = Nondetect RL = Reporting Limit
J = Estimated Qual = Qualification

APPENDIX B

FIELD LOGS

APPENDIX B.1

BORING LOGS

HTW DRILLING LOG

HOLE NO. 8611

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
SHEET 1 OF 8 SHEETS	
PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90	4. LOCATION: Cannon AFB, NM
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon; 2" California sampler with stainless steel liners; 2" stainless steel split spoon	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4267.04
	10. DATE STARTED: 10-18-95 / 1520 — 11. DATE COMPLETED: 10-19-95 / 1230
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 71.3 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
3	✓		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
8	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Gittelly

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SR ~~ML~~/CL, stiff, dry to moist, dark brown to reddish brown, ~~clayey silt or~~ silty clay, with occasional fine to coarse gravel and fine-grained sand (FILL)				5	START 10-18-95 1520
	1			CAN086-8611-0000	CAN086-8611-0000	6	16"/24"
			BZ=BH=ND HS=34ppm			11	
						13	
	2					13	
		becomes stained with petroleum odors - staining is mottled with reddish brown to dark brown				11	14"/18"
	3				(duplicate)	15	
	4		BZ=ND BH=16ppm HS=61ppm TA>10 ppm >100ppm for TPH			10	
	5				CAN086-8611-0004	13	18"/24"

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90

HOLE NO. 8611

HTW DRILLING LOG

HOLE NO. 8611

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR: J. M. Stitely

SHEET 2 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5					14	
					(duplicate)	12	
	6					11	2" Cal. 2"/12" - hit rock in tip
						14	
	7				CAN086 -8611 -0007 (microbial plate count)	6	2" Cal. 12"/12"
						9	
	8						
		becomes more petroleum-stained					
	9	~~becomes~~ SR	BZ=ND BH=250ppm HS=18ppm* IA>10ppm >100ppm for TPH			8	* foil came off while unscrewing lid of jar - result may be underestimated.
					CAN086 -8611 -0009	9	20"/24"
	10					10	
					(USACE-MRD split)	12	
	11				CAN086 -8611 -0011 (microbial plate count)	6	2" Cal. 12"/12"
						9	
	12						
	13	~~SM~~ SR ~~Mal~~ SP-SM/SR, medium dense, dry, pink or light red, ~~very fine to~~ fine-grained sand, mottled with some petroleum staining, with silt					
	14					6	

HTW DRILLING LOG

HOLE NO. 8611

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Kittelsy

SHEET 3 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
			BZ=ND BH=180ppm HS=430ppm IA>10 ppm >100 ppm for TPH		CAN086 -8611 -0014	13	12"/16"
	15	becomes dense, cemented, grayish white with some petroleum staining				50/4"	← Caliche
					CAN086 -8611 -0016 (microbial plate count)	~~[illegible]~~ 33	2" Cal. 12"/12"
	16					19	
	17						
	18	becomes mostly grayish white without staining - mottled - but still with odor					
	19		BZ=ND BH=100ppm HS=440ppm IA>10 ppm >100 ppm for TPH			16	
						31	14"/16"
	20					50/4"	
	21						
	22		BZ=2+03 ppm during drilling				
	23						
	24						

HTW DRILLING LOG

HOLE NO. 8611

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR Jim M. Hitteley

SHEET 4 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24		BZ= ND BH= 180ppm IA>10ppm >100ppm for TPH			21	
						36	13"/15"
	25					50/3"	STOP 10-18-95 1735
							START 10-19-95 0845
		becoming light reddish brown					
	26						← hard drilling from 24'-29'
	27	becomes medium dense	BZ=3-4 ppm during drilling				
	28						
	29		BZ=ND HS= 152 ppm IA>10ppm >100ppm for TPH			10	
						22	
	30					28	20"/24"
						32	
	31						
	32		BZ ≈ 5 ppm (not sustained) during drilling				
	33						

HTW DRILLING LOG

HOLE NO. 8611

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Kittelly

SHEET 5 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ = 0-1 ppm BH = 80-90 ppm HS = 220 ppm IA > 10 ppm >100 ppm for TPH			25 44	12"/14"
	35					50/2"	
	36		BZ = 3-4 ppm during drilling				
	37						
	38						
	39		BZ = ND BH = 6.5 ppm HS = 350 ppm IA > 10 ppm >100 ppm for TPH		CAN086-8611	40 50	11"/12"
	40				0039 CAN086-8611-0040 (microbial plate count)	33 36	← refusal 2" Cal. 12"/12"
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8611

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR [illegible]

SHEET 6 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	43						
	44	with less silt	B2=ND BH=50-80ppm IA>10ppm >100ppm for TPH	CAN086 -8611 -0044		23 36 50/5"	15"/17"
	45						
	46						
	47						
		becomes red, without petroleum odor					
	48						
	49	with cemented chunks	B2=ND BH=40-50ppm HS=200ppm IA>10ppm <100ppm for TPH		CAN086 -8611 -0049	8 13 50	13"/18"
	50						← refusal
	51				CAN086 -8611 -0051 (microbial plate count)	21 35	2" Cal. 12"/12"
	52						

HTW DRILLING LOG

HOLE NO. 8611

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR Jim M. Gittely

SHEET 7 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
	54						
	55	becomes less red					
	56						
	57						
	58						
	59		B2=BH=ND IA<10ppm <100ppm for TPH		CAN086 -8611 -0059	20 50/3" 50/4"	6"/9" } 2" SS. 2"/4"
	60						
	61						
	62						

HTW DRILLING LOG

HOLE NO. 8611

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Hottely

SHEET 8 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	62						
	63						
	64						
	65		BZ=ND BH=1ppm				
	66						
	67						
	68						Grouted boring 10-25-95.
	69	with less silt, SP-SM	BZ=BH=ND IA<10ppm <100ppm for TPH HS=26ppm	CAN086-8611-0069	CAN086-8611-0069	6	
						25	15"/16"
	70					50/4"	
					CAN086-8611-0071 (microbial plate count)	24	2" Cal. 12"/12"
	71					24	STOP 10-19-95 1230 Bottom at 71.3'

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90 HOLE NO. 8611

HTW DRILLING LOG

HOLE NO. 8612

SHEET 1 OF 5 SHEETS

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
PROJECT: Cannon AFB App. I SWMUs 86-90 - Phase III RFI	4. LOCATION: Cannon AFB, New Mexico
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon; 2" stainless steel split spoon	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4267.85
	10. DATE STARTED: 10-18-95 / 0810 — 11. DATE COMPLETED: 10-18-95 / 1430
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 35.5 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
1	✓		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
6	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Flitterly

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c. (SR)	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	~~MC~~/CL, stiff, dry to moist, dark brown to reddish brown, ~~clayey silty or~~ silty clay with occasional fine to coarse gravel and fine grained sand (FILL)				4	START 10-18-95 0810
					CAN086	5	
	1				-8612		18"/24"
			BZ=ND * BH=24ppm HS=ND		-0000	5	
						5	
	2						← augers hitting rock at 2' - asphalt chunks in cuttings
						3	
					(USACE-MRD split)	5	
	3						18"/24"
						6	
						6	
	4						
			BZ=ND * HS=20ppm			4	
			IA<10ppm <10ppm for TPH			4	
	5						21"/24"

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90

HOLE NO. 8612

HTW DRILLING LOG

HOLE NO. 8612

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5					3	
						3	
	6	becomes moist to wet, SR petroleum-stained with petroleum odors					← petroleum staining begins
	7						
	8						
	9	~~SM~~ SR ~~MCL~~/SP-SM/SR, dry, pink, loose to medium dense, ~~very fine to~~ fine-grained sand with silt					← staining no longer evident
						3	
	10	becomes reddish brown	B2=BH=ND HS=93ppm* IA>10ppm >100ppm for TPH		CAN086 -8612 -0009	9	12"/24"
						4	
						4	
	11						
	12	becomes pink or light red, medium dense					
	13						
	14					5	

HTW DRILLING LOG

HOLE NO. 8612

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR Jon M. Gottesly

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15		BZ = ND BH = 1ppm* HS = 150ppm* IA > 10ppm >100ppm for TPH		CAN086 -8612 -0014	10 16 17	19"/24"
	16						
	17						
	18						
	19	becomes dense, cemented, mostly SP-SM	BZ = ND HS = 60-160ppm* IA > 10ppm >100ppm for TPH		CAN086 -8612 -0019	8 65	11"/12"
	20						refusal STOP 10-18-95 0910 RESUME 10-18-95 1330
	21						
	22						
	23						
	24						

HTW DRILLING LOG

HOLE NO. 8612

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Hitchcock

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24		BZ = ND BH = 11 ppm HS = 22 ppm IA < 10 ppm < 100 ppm for TPH			9	
						25	11"/16"
	25					50/4"	← Caliche
	26						
	27						
	28						← begins to not drill as hard
	29		BZ = ND BH = 17.5 ppm HS = 4.8 ppm IA < 10 ppm < 100 ppm for TPH	CAN086 -8612 -0029	CAN086 -8612 -0029	47	8"/9"
						50/3"	← cemented chunks in sample
	30					42	2" S.S. 7"/8"
						50/2"	
	31						
	32	becomes red					
	33						

HTW DRILLING LOG

HOLE NO. 8612

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelg

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		B2=ND BH=50ppm HS=1.2ppm IA<10ppm <100ppm for TPH		CAN086 -8612 -0034	15	
						36	16"/16"
	35					50/4"	
							STOP 10-18-95 1430 Bottom of boring at 35.3'
	36						* HNu not calibrating properly - xthg "jumpy". Results may be overestimated.
	37						Grouted boring 10-25-95.
	38						
	39						
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8613

SHEET 1 OF 8 SHEETS

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90	4. LOCATION: Cannon AFB, New Mexico
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon; 2" stainless steel split spoon; 2" California Sampler with stainless steel liners	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4267.87
	10. DATE STARTED: 10-18-95 / 1245 — 11. DATE COMPLETED: 10-20-95 / 1015
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 64.8 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
1	✓		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
6	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Flattely

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SR ~~MH~~ CL, stiff, dry, dark brown to reddish brown, ~~clayey silt or~~ silty clay with occasional fine to coarse gravel (FILL) and fine-grained sand					START 10-18-95 1245
					CAN086	8	
					-8613		
			BZ= ND			6	
	1				-0000		20"/24"
						5	
						5	Hit water line upon dropping spoon at 2 ft.
	2				(MS/MSD)		Stop 10-18-95 1255
							START 10-19-95 1450 at hole ~5' south of original location
	3						
	4		BZ= ND HS= 58ppm IA > 10ppm ≅ 100ppm for TPH			12	
						19	
	5						22"/24"

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90 — HOLE NO. 8613

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Kittly

SHEET 2 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5					18	
						14	
	6	becomes petroleum-stained					
	7						
	8						
	9					12	
			BZ=BH=ND			20	
	10					15	4"/24" - rock in tip
						14	
	11					10	
			HS=51 ppm IA>10 ppm >100 ppm for TPH			11	
	12					12	20"/24"
		petroleum staining ends				9	
	13						
	14				CAN086	7	

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittly

SHEET 3 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c. SR	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
		SM ~~ML~~ / SP-SM / ~~SR~~, medium dense dry to moist, gray - petroleum stained, ~~very fine to~~ fine-grained sand with silt	BZ = ND BH = 3 ppm HS = 240 ppm IA > 10 ppm > 100 ppm for TPH		-8613 -0014 (duplicate)	6 9 20	20/24"
	15						
	16						
	17	becomes dry					
	18						
	19		BZ = ND BH = 40 ppm HS = 340 ppm IA > 10 ppm > 100 ppm for TPH			6 29 30 24	22"/24"
	20						
	21						
	22		BZ = ND during drilling				
	23						
	24						

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittely

SHEET 4 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24		BZ=BH=ND HS=310ppm IA>10ppm >100ppm for TPH	CAN086 -8613 -0024	CAN086 -8613 -0024	11 22 28 32	20"/24"
	25						
	26						
	27						
	28						
	29	becomes grayish-white with less staining	BZ=ND BH=20ppm HS=350ppm IA>10ppm >100ppm for TPH			23 50	12"/12" ← refusal
	30						
	31						
	32	becomes light reddish brown without staining but still has odor					
	33						

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Whitely

SHEET 5 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ = ND BH = 3 ppm HS = 290 ppm IA > 10 ppm >100 ppm for TPH		CAN086-8613-0034	9 30 50/5"	15"/17"
	35						
	36						
	37						
		becomes red					
	38						
	39		BZ = ND BH = 1 ppm HS = 200 ppm IA > 10 ppm >100 ppm for TPH			11 50/3" 50/5"	8"/9" 2" S.S. 4"/5" STOP 10-19-95 1720 RESUME 10-20-95 0810
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittly

SHEET 6 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	43						
	44						
	45	becomes ~~tight red~~ SR without petroleum odor	BZ=1-3ppm during drilling				
	46						
	47						
	48						
	49		BZ=ND HS=1.6ppm IA<10ppm <100ppm for TPH		CAN086 -8613 -0049	19	
						47	12"/16"
	50					50/4"	
	51						
	52						

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 7 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
	54						
	55						
	56						
	57						
	58						
	59					50/3"	1"/3"
			BZ=BH=ND			50/3"	2" S.S. 1"/3"
						50/4"	2" Cal. 0"/4" (fell out)
	60						not enough recovery for Sample
	61						
	62						

HTW DRILLING LOG

HOLE NO. 8613

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Little

SHEET 8 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	62						
	63						
	64		BZ=ND HS=ND IA<10ppm <100 ppm for TPH		CAN086-8613-0064	40 50/4"	10"/10" STOP 10-20-95 1015
	65						Bottom of boring at 64.8'. Grouted boring 10-25-95.
	66						
	67						
	68						
	69						
	70						
	71						

HTW DRILLING LOG

HOLE NO. 8614

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
SHEET 1 OF 5 SHEETS	
PROJECT: Phase III RFI Cannon AFB App. I SWMUs 86-90 (Site SD-11)	4. LOCATION: ~~IAP~~ Cannon AFB, Clovis, NM
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon	8. HOLE LOCATION: 8614 at Site SD-11
	9. SURFACE ELEVATION: 4268.19
	10. DATE STARTED: 10-17-95 / 1240 — 11. DATE COMPLETED: 10-17-95 / 1440
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 36 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
4	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Gutteley

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	CL SR ~~ML~~, stiff, dry, reddish brown, silty clay ~~clayey silt~~ with some fine-grained sand and occassional fine to coarse grained gravel (FILL) and fine-grained sand				8	START 10-17-95 1240
					CAN086		
			BZ=ND		-8614	8	13"/24"
	1		HS=ND		-0000	7	← hit coarse gravel rock - recovered in tip - also wire in tip
						7	
	2				3" S.S.		
	3						
	4					6	
			BZ=ND			13	
	5		HS=130 ppm*				20"/24"

PROJECT: Cannon AFB App. I SWMUs 86-90 Phase III RFI

HOLE NO. 8614

HTW DRILLING LOG

HOLE NO. 8614

PROJECT Cannon AFB App. I SWMUs - Phase III RFI

INSPECTOR J. M. Stitely

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5		IA < 10 ppm < 100 ppm for TPH			9	
		SR					
		ML/SM-~~SR~~, medium dense, dry, reddish brown, fine-grained sandy silt or silty sand				7	
	6						
	7						
	8						
	9					8	
		SR			CAN086		
		~~ML~~ SM/SP-SM/~~SR~~, medium dense, dry, light red or pink, ~~very fine to~~ fine-grained sand with silt	BZ=ND HS=62* ppm IA < 10 ppm < 100 ppm for TPH		-8614 -0009	12	18"/24"
	10					19	← (slight in tip
						13	
	11						
	12						
	13						
	14					4	

HTW DRILLING LOG

Phase III RFI

HOLE NO. 8614

PROJECT Cannon AFB App. I SWMUs 86-90

INSPECTOR Jon M. Gitterly

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						6	20"/24"
	15		BZ=BH=ND HS=44ppm* IA<10ppm <100ppm for TPH			10	
						12	
	16						
	17						
		SR					
	18	SM ~~ML~~/SP-SM/SR, dry, medium dense, reddish brown, ~~very fine~~ to fine grained sand with occasional white specs, with silt					
	19					5	
						13	20"/24"
	20		BZ=BH=ND HS=20ppm* IA<10ppm <100ppm for TPH			19	
						20	
	21						
	22						
	23						
	24						

HTW DRILLING LOG

Phase III RFI

HOLE NO. 8614

PROJECT Cannon AFB App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24					8	
		SR				12	
	25	~~ML~~ SM / SP-SM / ~~SR~~, dry, medium dense, red, ~~very fine-grained to~~ fine grained sand with ~~trace of~~ silt	BZ=BH=ND HS=38ppm* IA<10ppm <100ppm for TPH			22	22"/24"
						28	
	26						
	27						
		SR					
	28	~~ML~~ SM / SP-SM / ~~SR~~, medium dense, dry, pink, ~~very fine to~~ fine grained sand with some silt					
	29					9	
					CAN086 -8614 -0029	20	
	30		BZ=BH=ND HS=26ppm* IA<10ppm <100ppm for TPH			36	19"/24" ← Caliche in tip of sampler
						30	
	31						
	32						
	33						

HTW DRILLING LOG

Phase III RFI

HOLE NO. 8614

PROJECT Cannon AFB App. I. SWMUs 86-90

INSPECTOR J. M. Slotterly

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34	SR			CAN086	16	
		~~ML~~ SM/SP-SM/~~SR~~, medium dense, reddish brown, dry to moist, ~~very fine to~~ fine-grained sand with occasional cemented lighter-color chunks, with some silt	BZ=BH=ND HS=28 ppm* TA<10 ppm <100 ppm for TPH		-8614 -0034	14	22"/24"
	35					SR ~~16~~ 10	
						SR ~~14~~ 14	
	36					SR ~~10~~	STOP 10-17-95 1440 Bottom of boring at 36'
	37						* HNu acting "jumpy". HS results may be overestimated. Grouted boring on 10-25-95.
	38						
	39						
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8615

SHEET 1 OF 5 SHEETS

1. COMPANY NAME	Woodward-Clyde
2. DRILLING SUBCONTRACTOR	Southwest Engineering
PROJECT	Cannon AFB Phase III RFI App. I SWMUS 86-90
4. LOCATION	Cannon AFB, New Mexico
5. NAME OF DRILLER	Alex Sanchez
6. MANUFACTURER'S DESIGNATION OF DRILL	CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4.25" I.D. HSA; 3" stainless steel split spoon
8. HOLE LOCATION	Site SD-11
9. SURFACE ELEVATION	4268.28
10. DATE STARTED	10-20-95 / 1100
11. DATE COMPLETED	10-20-95 / 1255
12. OVERBURDEN THICKNESS	N/A
15. DEPTH GROUNDWATER ENCOUNTERED	N/A
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	N/A
14. TOTAL DEPTH OF HOLE	34.9 feet
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
2	✓		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Bittely

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	4" Asphalt					START 10-20-95 1100
	1	~~Hef~~ SR CL, stiff, dry to moist reddish brown, ~~clayey silt~~ SR ~~or~~ silty clay with occasional fine to coarse gravel (FILL) and fine grained sand	BZ=ND HS=ND	CAN086 -8615 -0001	CAN086 -8615 -0001	10	
	2	CL, stiff, dry to moist, red, low plastic, silty clay	~~IA<10ppm~~ SR ~~<100ppm~~ SR ~~for~~ SR			7 8 8	18"/24" Collected geotech from 2'-3'.
	3						
	4		BZ=BH=ND HS=ND IA<10 ppm <100 ppm for TPH	CAN086 -8615		3 7	
	5						19"/24"

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90

HOLE NO. 8615

HTW DRILLING LOG

HOLE NO. 8615

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelsohn

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5	CL SR ~~ML~~, stiff, dry, light red or reddish brown, ~~clayey~~ silty clay ~~silt~~ with trace to ~~some~~ ~~very~~ fine-grained sand		-0004		8	Collected geotech from 5'-6'.
						8	
	6	becomes clayey silt, ML					
	7						
	8						
	9		BZ=ND HS=ND			4	
						6	
	10	SR ML/~~SR~~-SM/~~SR~~, loose to medium dense, dry, light red, ~~very fine to~~ fine-grained sand with ~~trace to some~~ silt				8	19"/24"
						7	← Caliche chunk in tip
	11						
	12						
		SR ML, stiff, dry, light red, clayey silt with ~~trace very~~ fine-grained sand	BZ=ND during drilling				
	13						
	14		BZ=ND HS=ND			5	

HTW DRILLING LOG

HOLE NO. 8615

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelly

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15	becomes red				9 11 13	18"/24"
	16						
	17						
	18						
	19		BZ=BH=ND HS=ND			12	
	20	~~Becomes~~ SR				16 19	18"/24"
	21	SR ~~ML~~ SM / SP-SM / ~~SR~~, medium dense, dry, red, ~~very fine to~~ fine grained sand with silt				23	
	22	~~becomes light red~~ SR					
	23						
	24						

HTW DRILLING LOG

HOLE NO. 8615

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR: Jim M. Littlely

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24					4	
			BZ=BH=ND HS=ND IA<10ppm <100ppm for TPH			8	
	25					10	18"/24"
		becomes light red, slightly coarser				17	
	26						
	27						
	28						
	29					JR ~~4~~ 13	
			BZ=BH=ND HS=ND IA<10ppm <100ppm for TPH		CAN086 -8615 -0029	JR ~~8~~ 16	17"/24"
	30					JR ~~10~~ 17	
						JR ~~12~~ 19	
	31						
	32						
	33	becomes dense, cemented					

HTW DRILLING LOG

HOLE NO. 8615

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelly

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ=BH=ND IA<10ppm <100ppm for TPH		CAN086 -8615 -0034	44	14"/14"
						50/5"	STOP 10-20-95 1255
	35						Bottom of boring at 34.9 feet. Grouted boring 10-25-95.
	36						
	37						
	38						
	39						
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8616

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
SHEET 1 OF 5 SHEETS	
3. PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90	4. LOCATION: Cannon AFB, New Mexico
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4267.94
	10. DATE STARTED: 10-21-95 / 0810 — 11. DATE COMPLETED: 10-21-95 / 0950
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 34.9 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Gottlieb

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	CL, medium stiff, dry to moist, reddish brown, low plastic silty clay with occasional fine to coarse gravel (FZLL) and fine grained sand	BZ=ND HS=ND		CAN086 -8616 -0000	6	START 10-21-95 0810
	1	CL, medium stiff, dry to moist, red, low plastic silty clay				7	20"/24"
						7	
						6	
	2						
	3						
	4	ML/SM, medium stiff, dry, light red or reddish brown, clayey silt with ~~trace to~~ some ~~very~~ fine grained sand	BZ=BH=ND HS=ND			4	
	5					8	17"/24"

JR

HTW DRILLING LOG

HOLE NO. 8616

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5					8	
						10	
	6						
	7						
		JR ~~becomes CL with white blotches~~					
	8						
	9					5	
			BZ=BH=ND HS=ND			8	
	10	some white blotches				9	16"/24"
		some CL present				7	
	11						
	12						
	13						
	14					3	

HTW DRILLING LOG

HOLE NO. 8616

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Hitchcock

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15		BZ= BH=ND HS= ND			5 4 7	15"/24"
	16						
	17						
	18						
	19	JR ~~ML~~ SM/SP-SM/~~SR~~, medium dense, dry, red, ~~very fine grained~~ ~~to~~ fine grained sand with silt	BZ=ND HS=ND			5	
	20	JR ~~ML~~ SM/SP-SM/~~SR~~, medium dense, dry, light red, ~~very fine to~~ fine grained sand with ~~trace~~ ~~to~~ some silt	IA<10ppm <100ppm for TPH			12 16 50/3"	15"/21"
	21						
	22						
	23	becomes pink with increasing fine-grained sand content					
	24						

HTW DRILLING LOG

HOLE NO. 8616

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelsohn

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24	~~becomes lighter in color~~ JR	BZ=BH=ND HS=ND			10	10"/11"
						50/5"	
	25						
	26						
	27						
	28						
	29		BZ=BH=ND HS=ND IA<10ppm <100ppm For TPH		CAN086 -8616 -0029	28	10"/10"
						50/4"	
	30						
	31						
	32						
	~~33~~						
	33						

HTW DRILLING LOG

HOLE NO. 8616

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ=BH=ND HS=ND IA<10ppm <100ppm For TPH		CAN086 -8616 -0034	33 50/5"	11"/11" STOP 10-21-95 0950
	35						Bottom of boring at 34.9'. Grouted boring 10-25-95.
	36						
	37						
	38						
	39						
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8617

SHEET 1 OF 5 SHEETS

1. COMPANY NAME: Woodward - Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90	4. LOCATION: Cannon AFB, New Mexico
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" Stainless steel split spoon; 2" Stainless steel split spoon	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4268.22
	10. DATE STARTED: 10-21-95 / 1030 — 11. DATE COMPLETED: 10-21-95 / 1220
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 35 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
1	✓		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Stitely

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	JR ~~MH~~CL, stiff, dry, reddish brown, ~~clayey silt or~~ silty clay with occasional fine to coarse gravel (FILL) and fine-grained sand	BZ=ND HS=ND		CAN086 -8617 -0000	15	START 10-21-95 1030
						28	
	1	CL, stiff, dry to moist, red, low plastic, silty clay				18	18"/24"
						10	
	2						
	3						
	4	JR ~~fsm~~ ML, stiff, dry, light red, clayey silt with ~~trace of very~~ fine-grained sand	BZ=BH=ND HS=ND			15	
						13	14"/24"
	5						

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90 — HOLE NO. 8617

HTW DRILLING LOG

HOLE NO. 8617

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Hitterly

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5					7	
						6	
	6						
	7						
	8						
	9					6	
			B2=BH=ND	CAN086		6	
			HS=ND	-8617			14"/24"
	10			-0009		6	
						6	
	11						
	12						
	13	SR ~~SM~~/SP-SM/~~SR~~, loose to medium dense, dry, red-light red, ~~very fine to~~ fine grained sand with ~~trace to some~~ silt					
	14					7	

HTW DRILLING LOG

HOLE NO. 8617

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelly

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
			BZ=BH=ND HS=ND			9	
	15					9	17"/24"
						11	
	16						
	17						
	18						
		becomes more red with less silt					
	19					9	
			BZ=BH=ND HS=ND			15	
	20	becomes less red				24	17"/24"
						30	
	21						
	22						
		becomes light red or pink, dense, with more fine-grained sand content, cemented					
	23						
	24						

HTW DRILLING LOG

HOLE NO. 8617

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittelsy

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24		BZ=BH=ND HS=ND			50	8"/8"
						50/2"	
	25						
	26						
	27						
	28						
	29		BZ=BH=ND IA<10ppm <100 ppm for TPH		CAN086 -8617 -0029	10	6"/10"
						50/4"	
	30					50	4"/6" (2" S.S.)
	31						
	32						
	33						

HTW DRILLING LOG

HOLE NO. 7 8618 JR

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Hitchcock

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ=BH=ND HS=ND IA<10 ppm <100 ppm for TPH		CAN086 -8617 -0034	34 50	11"/12" - STOP 10-21-95 1220
	35						Bottom of boring at 35.0'. Grouted boring 10-25-95.
	36						
	37						
	38						
	39						
	40						
	41						
	42						

HTW DRILLING LOG

HOLE NO. 8618

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
SHEET 1 OF 5 SHEETS	
PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90	4. LOCATION: Cannon AFB, New Mexico
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4268.44
	10. DATE STARTED: 10-23-95 / 1515 — 11. DATE COMPLETED: 10-23-95 / 1700
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 36 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			Jon M. Gottlieb

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SR ~~ML~~/CL, stiff, dry, reddish brown, ~~clayey silt or~~ silty clay with occasional fine to coarse gravel (FILL) and fine grained sand	BZ=BH=ND HS=ND		CAN086	10	START 10-23-95 1515
					-8618	17	
	1				-0000	14	20/24"
		CL, stiff, dry to moist, red, low plastic, silty clay			(duplicate)	11	
	2						
	3						
	4		BZ=BH=ND HS=ND IA<10ppm <100ppm for TPH			12	
	5					7	17"/24"

HTW DRILLING LOG

HOLE NO. 8618

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Gittly

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5	SM ML, medium stiff, dry, light red or reddish brown, clayey silt with ~~trace to~~ some ~~very~~ fine-grained sand				6 8	
	6						
	7						
	8						
		SR					
	9	SM ~~ML~~/SP-SM/~~SP~~, loose to medium dense, dry, red to light red, ~~very fine to~~ fine-grained sand with ~~trace to some~~ silt	BZ=BH=ND HS=ND			7 5	
	10	with white blotches				7	16"/24"
	11	becoming light red				7	
		SR					
	12	SM ML, stiff, dry, light red or pink, clayey silt with ~~trace of very~~ fine-grained sand					
	13						
		SR					
	14	SM ~~ML~~/SP-SM/~~SP~~, dry, medium dense, red, ~~very fine to~~ fine grained sand with some silt				6	

HTW DRILLING LOG

HOLE NO. 8618

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15		BZ = ND HS = ND			12	14"/24"
						14	
						16	
	16						
		SR SM ~~ML~~, stiff, dry, red, clayey silt with ~~trace to~~ some ~~very~~ fine-grained sand					
	17						
	18						
	19						
			BZ = ND HS = ND			7	
			~~VA<10ppm~~ SR ~~<100ppm~~ SR ~~for TPH~~ SR			31	14"/18"/~~24"~~
	20	sand content increasing				50	
		SR				~~[illegible]~~ SR	
	21	SM ~~ML~~ / SP-SM / SP, ~~medium dense~~ SR ~~to~~ dense, dry, light red or pink, ~~very fine grained~~ ~~to~~ fine grained sand with some silt					
	22						
	23	becomes whitish, cemented, coarser					
	24						

HTW DRILLING LOG

HOLE NO. 8618

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Slittely

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24		B2=BH=ND IA<10ppm <100ppm for TPH			44	7"/9"
						50/3"	
	25						
	26						
	27						
	28						
	29		B2=BH=ND IA<10ppm <100ppm for TPH		CAN086-8618-0029 (USACE-MRD split)	44	8"/8"
						50/2"	
	30					50/3"	2"/3"
	31						
	32						
	33	becomes medium dense, red finer-grained with trace to some silt					

HTW DRILLING LOG

HOLE NO. 8618

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ = ND IA<10ppm <100ppm for TPH		CAN086 -8618 -0034	~~12~~ 12 ~~26~~	
						26	19" ~~24~~"/24" SP
	35					33	
						32	STOP 10-23-95 1700
	36						Bottom of boring at 36.0'. Grouted boring 10-25-95.
	37						
	38						
	39						
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO. 8619

1. COMPANY NAME: Woodward-Clyde	2. DRILLING SUBCONTRACTOR: Southwest Engineering
SHEET 1 OF 5 SHEETS	
PROJECT: annon AFB Phase III RFI App. I SWMUs 86-90	4. LOCATION: Cannon AFB, New Mexico
5. NAME OF DRILLER: Alex Sanchez	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4.25" I.D. HSA; 3" stainless steel split spoon	8. HOLE LOCATION: Site SD-11
	9. SURFACE ELEVATION: 4268.61
	10. DATE STARTED: 10-24-95 | 0755 — 11. DATE COMPLETED: 10-24-95 | 0940
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 35 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	8240	TAL	8270 SVOCs	418.1 TPH		N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Backfilled with cement-bentonite grout	✓			J. M. Stitely

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SR ~~MH~~ CL, stiff, dry, reddish brown, clayey ~~silt or~~ silty clay, with occasional fine to coarse gravel (FILL) and fine grained sand	BZ=ND HS=ND		CAN086-8619-0000	14	START 10-24-95 0755
	1					33	20"/24"
		CL, very stiff, dry to moist, red, low plastic, silty clay				37	
					(USACE-MRD split)	19	
	2						
	3						
	4	SR ML/SM, stiff, dry, light red-reddish brown clayey silt with ~~trace very~~ fine-grained sand	BZ=BH=ND HS=ND IA<10ppm <100ppm for TPH			4	
	5					16	15"/24"

PROJECT: Cannon AFB Phase III RFI App. I SWMUs 86-90 — HOLE NO. 8619

HTW DRILLING LOG

HOLE NO. 8619

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR Jon M. Dittely

SHEET 2 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	5					15	
						20	
	6						
	7						
	8	becomes medium stiff					
	9					10	
			BZ = ND HS = ND			10	
	10					8	
						7	
	11						
	12						
		becomes red					
	13						
	14					5	

HTW DRILLING LOG

HOLE NO. 8619

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Stitely

SHEET 3 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15		BZ = ND HS = ND IA < 10 ppm < 100 ppm for TPH			10	22"/24"
						9	
		SR					
	16	~~ML~~ SM/SP-SM/SP, loose to medium dense, red, dry, ~~very fine to~~ fine-grained Sand with silt				11	
	17						
	18	becomes light red, medium dense					
	19					17	
			BZ = BH = ND HS = ND			30	
	20					32	19"/24"
						34	
	21						
	22						
	23	becomes dense, cemented, coarser, more whitish					
	24						

HTW DRILLING LOG

HOLE NO. 8619

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Kitchely

SHEET 4 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	24		B2=BH=ND			36	7"/9"
						50/3"	
	25						
	26						
	27						
	28						
	29		B2=ND HS=ND IA<10ppm ~100 ppm for TPH		CAN086 -8619 -0029	62	10"/12"
						59	
	30						
	31						
	32						
	33						

HTW DRILLING LOG

HOLE NO. 8619

PROJECT Cannon AFB Phase III RFI App. I SWMUs 86-90

INSPECTOR J. M. Hitchcock

SHEET 5 OF 5 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34		BZ=BH=ND IA<10 ppm <100 ppm for TPH		CAN086-8619-0034	27 8"/12" 62	← line on hydraulic ram came loose during driving 34' to 34'6" - sample interval was not impacted STOP 10-24-95 0940
	35						Bottom of boring at 35.0'. Grouted boring 10-25-95.
	36						
	37						
	38						
	39						
	40						
	41						
	42						
	43						

APPENDIX B.2

SAMPLE COLLECTION FIELD SHEETS - SOIL

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Stitely
Date: 10-18-95
Time: 1530

Type of Sample: Surface: ✓ Subsurface: _____
Type of Soil Cover: None
Depth Interval: 0' - 3½'
Sample Identification: CAN086-8611-0000

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel
USCS Abbreviation CL
Color dark brown to reddish brown
Staining dark gray - petroleum - mottled at 2.5' - 3.5'
Odor petroleum odor at 2.5'-3.5'

Containers	Number	Preservatives
4oz glass	2	4°C
16oz glass	1	4°C

QA/QC Samples Collected: Field duplicate: CAN086-8611-8661 (Time=1005)

Comments: VOCs, SVOCs, TPH, TAL metals; Sample collected from two spoons driven at 0'-2' and 2'-3½'.

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Gittelly Time: 1600

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 4' - 6'

Sample Identification: CAN086-8611-0004

Soil type (i.e. sand silt clay) Silty clay with fine sand & occasional fine to coarse gravel

USCS Abbreviation CL

Color reddish brown mottled with gray

Staining petroleum - gray (mottled)

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: Field duplicate: CAN086-8611-8662 (Time = 1045)

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Glittly Time: 1610

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 7'-8'

Sample Identification: CAN086-8611-0007

Soil type (i.e. sand silt clay) silty clay with fine sand and occasional fine to coarse gravel

USCS Abbreviation CL

Color reddish brown mottled with gray

Staining petroleum-gray (mottled)

Odor petroleum odor

Containers	Number	Preservatives
2" x 6" tube	1	4°C

QA/QC Samples Collected: N/A

Comments: Microbial plate count, including heterotrophic and petroleum hydrocarbon degrading bacteria and pseudomonas

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Stittle Time: 1625

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 9'-11'

Sample Identification: CAN086-8611-0009

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel

USCS Abbreviation CL

Color gray mottled with reddish brown

Staining petroleum - gray

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: USACE-MRD field split: CAN086-8611-8602

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Hottly Time: 1635

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 11'-12'

Sample Identification: CAN086-8611-0011

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel

USCS Abbreviation CL

Color gray mottled with reddish brown

Staining gray- petroleum (mottled)

Odor petroleum odor

Containers	Number	Preservatives
2"x6" tube	1	4°C

QA/QC Samples Collected: N/A

Comments: Microbial plate count, including heterotrophic and petroleum hydrocarbon degrading bacteria and pseudomonas

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Blitterly Time: 1650

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 14'- 15.3'

Sample Identification: CAN086-8611-0014

Soil type (i.e. sand silt clay) fine-grained Sand with silt

USCS Abbreviation SM / SP-SM

Color light red

Staining gray-petroleum mottled with light red

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Hottly

Date: 10-18-95
Time: 1650

Type of Sample: Surface: _____ Subsurface: ✓
Type of Soil Cover: None
Depth Interval: 15.3' - 16.3'
Sample Identification: CAN086-8611-0016

Soil type (i.e. sand silt clay) fine-grained sand with silt
USCS Abbreviation SM/SP-SM
Color ~~light red~~ 5R grayish white
Staining petroleum-stained (mottled)
Odor petroleum odor

Containers	Number	Preservatives
2"×6" tube	1	4°C

QA/QC Samples Collected: N/A

Comments: Microbial plate count, including heterotrophic and petroleum hydrocarbon degrading bacteria and pseudomonas

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Blittly

Date: 10-19-95

Time: 1010

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 39'-40'

Sample Identification: CAN086-8611-0039

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color light reddish brown

Staining none

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Hottly

Date: 10-19-95
Time: 1020

Type of Sample: Surface: _____ Subsurface: ✓
Type of Soil Cover: None
Depth Interval: 40'-41'
Sample Identification: CAN086-8611-0040

Soil type (i.e. sand silt clay) fine-grained sand with silt
USCS Abbreviation SM / SP-SM
Color light reddish brown
Staining none
Odor petroleum odor

Containers	Number	Preservatives
2"×6" tube	1	4°C

QA/QC Samples Collected: N/A

Comments: Microbial plate count, including heterotrophic and petroleum hydrocarbon degrading bacteria and pseudomonas

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J. M. Flitty Time: 1100

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 49'- 50.5'

Sample Identification: CAN086- 8611- 0049

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J. M. Hottly Time: 1110

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 50.5' - 51.5'

Sample Identification: CAN086- 8611- 0051

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/ SP-SM

Color red

Staining none

Odor none

Containers	Number	Preservatives
2"×6" tube	1	4°C

QA/QC Samples Collected: N/A

Comments: Microbial plate count, including heterotrophic and petroleum hydrocarbon degrading bacteria and pseudomonas

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Flittly

Date: 10-19-95
Time: 1145

Type of Sample: Surface: _____ Subsurface: ✓
Type of Soil Cover: None
Depth Interval: 59'- 60.1'
Sample Identification: CAN086- 8611- 0059

Soil type (i.e. sand silt clay) fine-grained sand with silt
USCS Abbreviation SM/SP-SM
Color red to light red
Staining none
Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Slitty

Date: 10-19-95

Time: 1220

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 69' - 70.3'

Sample Identification: CAN086-8611-0069

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SP-SM

Color red to light red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J.M. Slottly Time: 1230

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 70.3' - 71.3'

Sample Identification: CAN086-8611-0071

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SP-SM

Color red to light red

Staining none

Odor none

Containers	Number	Preservatives
2"×6" tube	1	4°C

QA/QC Samples Collected: N/A

Comments: Microbial plate count, including heterotrophic and petroleum hydrocarbon degrading bacteria and pseudomonas

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Slittely Time: 0820

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0'-3'

Sample Identification: CAN086-8612-0000

Soil type (i.e. sand silt clay) silty clay w/ fine sand, occasional fine to coarse gravel

USCS Abbreviation CL

Color dark brown to reddish brown

Staining None

Odor None

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: USACE-MRD field split: CAN086-8612-8601

Comments: VOCs, SVOCs, TPH, TAL metals; Collect soil from two split spoons driven 0'-2' and 2'-4'; VOCs taken from upper interval (0'-2')

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Slitterly

Date: 10-18-95

Time: 0840

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 9'-11'

Sample Identification: CAN086-8612-0009

Soil type (i.e. sand silt clay) fine grained sand with silt

USCS Abbreviation SM / SP-SM

Color light red or reddish brown

Staining None

Odor Petroleum odor

Containers	Number	Preservatives
4oz glass	2	4°C
16oz glass	1	4°C

QA/QC Samples Collected: none

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. [illegible] Time: 0850

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 14'-16'

Sample Identification: CAN086-8612-0014

Soil type (i.e. sand silt clay) fine grained sand with silt

USCS Abbreviation SM / SP-SM

Color light red

Staining None

Odor slight - petroleum odor

Containers	Number	Preservatives
4oz glass	2	4°C
16oz glass	1	4°C

QA/QC Samples Collected: none

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Hitchcock Time: 0910

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 19'-20'

Sample Identification: CAN086-8612-0019

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color light red

Staining none

Odor slight- petroleum odor

Containers	Number	Preservatives
4oz glass	2	4°C
16oz glass	1	4°C

QA/QC Samples Collected: none

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Stitely Time: 1410

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 29'-30.4'

Sample Identification: CAN086-8612-0029

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color light red

Staining none

Odor none

Containers	Number	Preservatives
4oz glass	2	4°C
16oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: Jim M. Slittely Time: 1430

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34'-35.3'

Sample Identification: CAN086-8612-0034

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: none

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Stitely Time: 1250

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0'-2'

Sample Identification: CAN086-8613-0000

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel

USCS Abbreviation CL

Color dark brown to reddish brown

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: extra MS/MSD volume: CAN086-8613-6000

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Glittenberg

Date: 10-19-95

Time: 1545

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 14'-16'

Sample Identification: CAN086-8613-0014

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color gray

Staining petroleum-stained

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: Field duplicate: CAN086-8613-8663 (Time=1250)

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J. M. Flitterly Time: 1615

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 24'-26'

Sample Identification: CAN086-8613-0024

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color gray

Staining petroleum-stained

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Blittly

Date: 10-19-95

Time: 1655

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34' - 35.4'

Sample Identification: CAN086-8613-0034

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color light reddish brown

Staining none

Odor petroleum odor

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Klitsch

Date: 10-20-95

Time: 0900

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 49'-50.3'

Sample Identification: CAN086-8613-0049

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-20-95

Samplers' Signature: J. M. Flittner Time: 1010

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 64'- 64.8'

Sample Identification: CAN086- 8613- 0064

Soil type (i.e. sand silt clay) fine-grained Sand with silt

USCS Abbreviation SM / SP-SM

Color red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-17-95

Samplers' Signature: J. M. [illegible] Time: 1255

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0' - 2'

Sample Identification: CAN086-8614-0000

Soil type (i.e. sand silt clay) silty clay ~~clayey silt~~ (CL ~~ML~~) w/ fine sand, occasional fine to coarse gravel SR

USCS Abbreviation ~~ML~~ CL SR

Color reddish brown

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: none

Comments: 13"/24" sample recovery due to rock in tip

VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Stitely

Date: 10-17-95
Time: 1320

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 9' - 11'

Sample Identification: CAN086-8614-0009

Soil type (i.e. sand silt clay) ~~very fine to~~ JR fine grained sand with silt
USCS Abbreviation SM ~~JRL~~ / SP-SM / ~~JR~~ JR
Color pink or light red
Staining none
Odor none

Containers	Number	Preservatives
4oz glass	2	4°C
16oz "	1	4°C

QA/QC Samples Collected: None

Comments: Sample selected based on headspace and immunoassay result (ND) photometer reading relative to other samples at the boring.
VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Whitely

Date: 10-17-95
Time: 1415

Type of Sample: Surface: _____ Subsurface: ✓
Type of Soil Cover: None
Depth Interval: 29'-31'
Sample Identification: CAN086-8614-0029

Soil type (i.e. sand silt clay) ~~Very fine to~~ SR fine-grained sand with some silt
USCS Abbreviation SM~~ML~~/SP-SM/SR SR
Color pink
Staining none
Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: 2nd from bottom sample; VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-17-95

Samplers' Signature: Jan M. Slitherly Time: 1435

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34'-36'

Sample Identification: CAN086-8614-0034

Soil type (i.e. sand silt clay) very fine to fine grained sand with some silt

USCS Abbreviation ML/SP-SM/SP

Color reddish brown

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: Bottom Sample; VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-20-95

Samplers' Signature: J. M. Blitty Time: 1115

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: Asphalt

Depth Interval: 1'-3'

Sample Identification: CAN086 - 8615 - 0001

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel

USCS Abbreviation CL

Color reddish brown & red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals; Sample was collected at 1'-3' instead of 0'-2' due to asphalt surface.

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-20-95

Samplers' Signature: J. M. Klitsch Time: 1240

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: Asphalt

Depth Interval: 29'-31'

Sample Identification: CAN086-8615-0029

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color light red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-20-95

Samplers' Signature: J. M. Flitty Time: 1255

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: Asphalt

Depth Interval: 34'-34.9'

Sample Identification: CAN086-8615-0034

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color light red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-21-95

Samplers' Signature: J. M. Flitty Time: 0830

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0'-2'

Sample Identification: CAN086-8616-0000

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel

USCS Abbreviation CL

Color reddish brown / red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-21-95

Samplers' Signature: J. M. Slittly Time: 0940

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 29'-29.8'

Sample Identification: CAN086-8616-0029

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color pink or light red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-21-95

Samplers' Signature: J. M. Whitely Time: 0950

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34'-34.9'

Sample Identification: CANO86-8616-0034

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color light red or pink

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Flitty

Date: 10-21-95
Time: 1040

Type of Sample: Surface: ✓ Subsurface: _____
Type of Soil Cover: None
Depth Interval: 0'-2'
Sample Identification: CAN086-8617-0000

Soil type (i.e. sand silt clay) silty clay with fine sand & occasional fine to coarse gravel
USCS Abbreviation CL
Color reddish brown / red
Staining none
Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Slittly

Date: 10-21-95

Time: 1155

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 29'-30.3'

Sample Identification: CAN086-8617-0029

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color light red or pink

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-21-95

Samplers' Signature: J. M. Glittly Time: 1220

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34'- 35'

Sample Identification: CAN086- 8617- 0034

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color light red or pink

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Slittly

Date: 10-23-95

Time: 1525

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0'-2'

Sample Identification: CAN086-8618-0000

Soil type (i.e. sand silt clay) silty clay with fine sand + occasional fine to coarse gravel

USCS Abbreviation: CL

Color: reddish brown / red

Staining: none

Odor: none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: Field duplicate: CAN086-8618-8664 (Time=1435)

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-23-95

Samplers' Signature: J. M. Whitely Time: 1645

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 27'- 29.7'

Sample Identification: CAN086- 8618- 0029

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM / SP-SM

Color whitish red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: USACE-MRD field split : CAN086-8618-8604

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-23-95

Samplers' Signature: J. M. Blitty Time: 1700

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34'-36'

Sample Identification: CAN086-8618-0034

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-24-95

Samplers' Signature: J. M. Flittly Time: 0805

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0'-2'

Sample Identification: CAN086-8619-0000

Soil type (i.e. sand silt clay) silty clay with fine sand + occasional fine to coarse gravel

USCS Abbreviation CL

Color reddish brown / red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: USACE-MRD field split: CAN086-8619-8605

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-24-95

Samplers' Signature: J. M. Whitley Time: 0920

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 29'-30'

Sample Identification: CAN086 - 8619 - 0029

Soil type (i.e. sand silt clay) fine-grained Sand with silt

USCS Abbreviation Sm / SP-SM

Color whitish red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-24-95

Samplers' Signature: J. M. Flittner Time: 0940

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 34' - 35'

Sample Identification: CAN086-8619-0034

Soil type (i.e. sand silt clay) fine-grained Sand with silt

USCS Abbreviation SM / SP-SM

Color whitish red

Staining none

Odor none

Containers	Number	Preservatives
4 oz glass	2	4°C
16 oz glass	1	4°C

QA/QC Samples Collected: None

Comments: VOCs, SVOCs, TPH, TAL metals

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Stitely Time: 1530

Type of Sample: Surface: ✓ Subsurface: _____

Type of Soil Cover: None

Depth Interval: 0'-3.5'

Sample Identification: CAN086-8611-0000

Soil type (i.e. sand silt clay) silty clay with fine sand + occasional fine to coarse gravel

USCS Abbreviation CL

Color dark brown to reddish brown

Staining gray-petroleum mottled ≥ 2.5'

Odor petroleum odor

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J. M. Stittly Time: 1040

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 44'- 45.4'

Sample Identification: CAN086- 8611- 0044

Soil type (i.e. sand silt clay) fine-grained Sand with silt

USCS Abbreviation SM/SP-SM

Color light reddish brown

Staining none

Odor petroleum odor

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J. M. Stitely Time: 1220

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 69'- 70.3'

Sample Identification: CAN086-8611-0069

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SP-SM

Color red to light red

Staining none

Odor none

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-18-95

Samplers' Signature: J. M. Stitely Time: 1410

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 29'- 30.4'

Sample Identification: CAN086-8612-0029

Soil type (i.e. sand silt clay) fine-grained sand, cemented (caliche)

USCS Abbreviation SP-SM

Color pink or light red

Staining none

Odor none

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-19-95

Samplers' Signature: J. M. Stitely Time: 1615

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 24'-26'

Sample Identification: CAN086-8613-0024

Soil type (i.e. sand silt clay) fine-grained sand with silt

USCS Abbreviation SM/SP-SM

Color gray

Staining petroleum - stained

Odor petroleum odor

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:
Samplers' Signature: J. M. Stitely

Date: 10-20-95
Time: 1115

Type of Sample: Surface: _____ Subsurface: ✓
Type of Soil Cover: Asphalt
Depth Interval: 2'-3'
Sample Identification: CAN086-8615-0001

Soil type (i.e. sand silt clay) silty clay
USCS Abbreviation CL
Color red
Staining none
Odor none

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification:

Samplers' Signature: J. M. Stitely

Date: 10-20-95

Time: 1125

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: Asphalt

Depth Interval: 5'-6'

Sample Identification: CAN086- 8615- 0004

Soil type (i.e. sand silt clay) silty clay with fine sand

USCS Abbreviation CL

Color light red

Staining none

Odor none

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

Field Sampling Data Sheet for Soil (Surface or Subsurface) Samples

Location Identification: Date: 10-21-95

Samplers' Signature: J. M. Stitely Time: 1105

Type of Sample: Surface: _____ Subsurface: ✓

Type of Soil Cover: None

Depth Interval: 9'-11'

Sample Identification: CAN086-8617-0009

Soil type (i.e. sand silt clay) ~~fine-grained~~ clayey silt with fine sand

USCS Abbreviation ML/SM

Color light red

Staining none

Odor none

Containers	Number	Preservatives
16 oz glass	1	N/A

QA/QC Samples Collected: N/A

Comments: Particle size analysis (ASTM D422), Moisture content (ASTM D2216), dry prep (ASTM D421)

APPENDIX B.3

SAMPLE COLLECTION FIELD SHEETS - WATER

WATER SAMPLE COLLECTION FIELD SHEET

SITE NAME Cannon AFB App. I SWMUs 86-90 PROJECT NO. C3M11MM

SAMPLE NO. CAN086-86W9-2001 WELL NO. Base Well No. 9

DATE/TIME COLLECTED 10-24-95 / 1400 PERSONNEL JMR, DG, SRC

SAMPLE METHOD AND DEPTH Direct collection from sample port at wellhead

SAMPLE MEDIA (Circle 1): (Groundwater) Surface Water

SAMPLE SPLIT (Circle 1): (Yes) No USACE-MRD SPLIT SAMPLE NUMBER CAN086-86W9-8601

FIELD DUPLICATE (Circle 1): Yes (No) MS/MSD extra volume ~~DUPLICATE~~ SAMPLE NUMBER CAN086-86W9-7001

Sample Container	Preservative	Analysis Requested
3-40 ml VOA vials	4°C, HCl	8240 VOCs
2-1l amber	4°C	8270 SVOCs
2-1l amber	4°C	8080 Pest/PCBs
2-1l amber	4°C	8150 Herbicides
2-1l amber	4°C, H_2SO_4	418.1 TPH
1-1l poly	4°C, HNO_3	Total TAL metals

WELL PURGING

Date 10-24-95

HNu/OVA Measurements N/A

Background N/A

Well Head N/A

Breathing Zone N/A

Time Started 1322

Time Completed ~1329

Well Depth (TOC) 381'

Depth to Water (TOC) 264'

Water Column Length 117'

6 1/8" Casing 1.53 gal/ft

Volume of Water in Well 180 gal

Casing Volumes to Purge 3

Minimum Water to Purge 540 gal

Comments Well discharging at ~ 300 gpm; Well ran continuously during purging & sampling

FIELD MEASUREMENTS

Time	Amount Purged (gal)	pH	Temp. (°F) ~~(°C)~~	Conductivity (μMHOS/cm)	Color	Odor	Turbidity (NTUs)
1322	0	7.50	65.2	6.52	clear	none	1.00
1325	600	7.71	66.7	6.12	clear	none	0.38
1327	1500	7.77	66.7	6.12	clear	none	3.14
1329	2100	7.76	66.7	6.15	clear	none	2.03

FIELD EQUIPMENT AND CALIBRATION

	Instrument Model	Calibration
Water Level Indicator	N/A	N/A
Conductivity Meter	HYDAC 910	N/A
pH Meter	HYDAC 910	Before 4.0 / 7.0 After

Comments Turbidity meter: H.F. Scientific DRT-15

WATER SAMPLE COLLECTION FIELD SHEET

SITE NAME Cannon AFB App. I SWMUs 86-90 PROJECT NO. C3M11MM

SAMPLE NO. CAN086-86W9-8691 WELL NO. Base Well No. 9

DATE/TIME COLLECTED 10-24-95 / 1400 PERSONNEL JMR, DG, SRC

SAMPLE METHOD AND DEPTH Trip blank vial supplied by lab

SAMPLE MEDIA (Circle 1): Groundwater Surface (Water)

SAMPLE SPLIT (Circle 1): Yes (No) SPLIT SAMPLE NUMBER

FIELD DUPLICATE (Circle 1): Yes (No) DUPLICATE SAMPLE NUMBER

Sample Container	Preservative	Analysis Requested
2-40 ml VOA Vials	4°C, HCl	8240 VOCs

WELL PURGING

Date

HNu/OVA Measurements

Background

Well Head

Breathing Zone

Time Started

Time Completed

Well Depth (TOC)

Depth to Water (TOC)

Water Column Length

___" Casing

Volume of Water in Well

Casing Volumes to Purge

Minimum Water to Purge

Comments

FIELD MEASUREMENTS

Time	Amount Purged (gal)	pH	Temp. (°C)	Conductivity (μMHOS/cm)	Color	Odor	Turbidity

FIELD EQUIPMENT AND CALIBRATION

Instrument Model	Calibration
Water Level Indicator	
Conductivity Meter	
pH Meter	Before ____ After ____

Comments

WATER SAMPLE COLLECTION FIELD SHEET

SITE NAME Cannon AFB App. I SWMUs 86-90

PROJECT NO. C3M11MM

SAMPLE NO. CAN086-86W9-8692

WELL NO. Base Well No. 9

DATE/TIME COLLECTED 10-24-95 / 1400

PERSONNEL JMR, DG, SRC

SAMPLE METHOD AND DEPTH Trip blank vial supplied by lab

SAMPLE MEDIA (Circle 1): Groundwater Surface Water

SAMPLE SPLIT (Circle 1): Yes No

SPLIT SAMPLE NUMBER

FIELD DUPLICATE (Circle 1): Yes No

DUPLICATE SAMPLE NUMBER

Sample Container	Preservative	Analysis Requested
2 - 40 ml VOA Vials	4°C, HCl	8240 VOCs

(Trip blank to USACE-MRD lab for field split)

WELL PURGING

Date

HNu/OVA Measurements

Background

Well Head

Breathing Zone

Time Started

Time Completed

Well Depth (TOC)

Depth to Water (TOC)

Water Column Length

___" Casing

Volume of Water in Well

Casing Volumes to Purge

Minimum Water to Purge

Comments

FIELD MEASUREMENTS

Time	Amount Purged (gal)	pH	Temp. (°C)	Conductivity (μMHOS/cm)	Color	Odor	Turbidity

FIELD EQUIPMENT AND CALIBRATION

	Instrument Model	Calibration
Water Level Indicator		
Conductivity Meter		Before ____ After ____
pH Meter		

Comments

APPENDIX B.4

CHAIN-OF-CUSTODY FORMS

Woodward-Clyde
101 South 108th Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF CUSTODY RECORD

Project Name: Cannon AFB Phase III RFI App. I SVMVs-96
Project No.: C3M11MM12
Project Location: Cannon AFB, New Mexico
Project Manager: Steve Cox
Sampler(s): Jon Rutherling, Dan Gable

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	ASTM-D421	ASTM-D422 *	ASTM-D2216 **									Remarks
10-18-95	1410		X	CAN086-8612-0027	Soil	1	16 oz glass	X	X	X									
"	1430		X	CAN086-8611-0000	"	1	"	X	X	X									
10-17-95	1040		X	CAN086-8611-0044	"	1	"	X	X	X									
"	1220		X	CAN086-8611-0067	"	1	"	X	X	X									
"	1415		X	CAN086-8613-0024	"	1	"	X	X	X									
10-20-95	1115		X	CAN086-8615-0001	"	1	"	X	X	X									
"	1125		X	CAN086-8615-0004	"	1	"	X	X	X									
10-21-95	1105		X	CAN086-8617-0009	"	1	"	X	X	X									

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-25-95	1200	Method of Shipment: Federal Express	* Full sieve with hydrometer - particle size analysis ** Moisture content
Received by:			Airbill No.: 4115 326 2150	
Relinquished by:			Lab Address: 201-812-1818 Woodward-Clyde Geotechnical Laboratory 45H Commerce Way Totowa, NJ 07512	NOTE: Composite all soil samples for contaminant pesticides hydrocarbons.
Received for Laboratory by:				

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No. 111150

Woodwa[illegible]e
101 South 108 A[illegible]ue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]ODY RECORD

Project Name: Cannon AFB Phase III RFI App. I SWMUs 86-70

Project No.: C3M11MM/2

Project Location: Cannon AFB, NM

Project Manager: Steve Cox

Sampler(s): Jon Ritterling, Dan Galda

Analytical Parameters: Total Plate Count*

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	Total Plate Count*										Remarks
10-16-95	1610		X	CAN086-SS11-0007	Soil	1	6"x3" tube	X										
"	1635		X	CAN086-SS11-0011	"	1	"	X										
"	1640		X	CAN086-SS11-0016	"	1	"	X										
10-17-95	1020		X	CAN086-SS11-0040	"	1	"	X										
"	1110		X	CAN086-SS11-0051	"	1	"	X										
"	1230		X	CAN086-SS11-0071	"	1	"	X										

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-19-95	11:00	Method of Shipment: Federal Express	* Includes heterotrophic bacteria, petroleum hydrocarbon degrading bacteria, + pseudomonas
Received by:			Airbill No.: 415 326 2816	
Relinquished by:			Lab Address: BBC Laboratory, 3220 S. Cullane Street, Tempe, AZ [illegible]	
Received for Laboratory by:				

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CHAIN OF CUSTODY RECORD

Project Name: Cannon AFB Phase III RFI App. I SVMVS 54.70

Project No.: C3M11MM 12

Project Location: Cannon AFB, New Mexico

Project Manager: Steve Cox

Sampler(s): Joe Rittenhouse, Don Galde

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	8080 Pest/PCBs	8150 Herbicides	418.1 TPH	Total TAL Metals *					Remarks
10.24.95	1400		X	CAN086-SBW7-2001	Water	3	40ml VOA	X										
"	"		X	" " "	"	2	1l amber		X									
"	"		X	" " "	"	2	"			X								
"	"		X	" " "	"	2	"				X							
"	"		X	" " "	"	2	"					X						
"	"		X	" " "	"	1	1l poly						X					
"	"		X	CAN086-SBW7-7001	"	3	40ml VOA	X										AVS/AVSD for above
"	"		X	" " "	"	2	1l amber		X									" "
"	"		X	" " "	"	2	"			X								" "
"	"		X	" " "	"	2	"				X							" "
"	"		X	" " "	"	2	"					X						" "
"	"		X	" " "	"	1	1l poly						X					" "
"	"		X	CAN086-SBW7-8671	"	2	40ml VOA	X										trip blank

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-24-95	1700	Method of Shipment: Federal Express	* 6010 + 7060, 7740, 7471, 7421, 7841
Received by:			Airbill No.: 415 326 2761	
Relinquished by:			Lab Address: Quanterra, 4955 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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Woodwa[illegible]e

101 South 108 A[illegible]ue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]ODY RECORD

Project Name: Cannon AFB Phase III RFI App. I SWMUs 56-70

Project No.: C3M11MM12

Project Location: Cannon AFB, New Mexico

Project Manager: Steve Cox

Sampler(s): Jon Rittorling, Dan Galde

Analytical Parameters: 8240 VOCs; 8270 SVOCs; 8080 Pest/PCBs; 8150 Herbicides; 418.1 TPH; Total TAL Metals*

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	8080 Pest/PCBs	8150 Herbicides	418.1 TPH	Total TAL Metals*					Remarks
10-24-95	1400		X	CAN086-56W7-8601	Water	3	40ml VOA	X										
"	"		X	" " "	"	2	1 l amber		X									
"	"		X	" " "	"	2	"			X								
"	"		X	" " "	"	2	"				X							
"	"		X	" " "	"	2	"					X						
"	"		X	" " "	"	1	1 l poly						X					
"	"		X	CAN086-56W7-8672	"	2	40ml VOA	X										trip blank

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-24-95	1500	Method of Shipment: Federal Express	* 6010 + 7060, 7740, 7471, 1421, 7841
Received by:			Airbill No.: 4 153262772	
Relinquished by:			Lab Address: USACE - MRD lab, 420 S. 18th St., Omaha, NE 68102	
Received for Laboratory by:				

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CHAIN OF CUSTODY RECORD

Project Name: Cannon AFB Phase III RFI App. I Sites 56-70

Project No.: C3MMMM | 2

Project Location: Cannon AFB, New Mexico

Project Manager: Steve Cox

Sampler(s): Jon Pitterling, Dan Galde

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	Total TPH	Total TAL Metals*								Remarks
10-23-95	1435		X	CAN086-8618-8664	Soil	2	4oz glass	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1525		X	CAN086-8618-0000	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1645		X	CAN086-8618-0029	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1700		X	CAN086-8618-0034	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
10-24-95	0805		X	CAN086-8617-0000	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	0920		X	CAN086-8617-0029	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	0940		X	CAN086-8617-0034	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: M. Pittelly	10-24-95	1500	Method of Shipment: Federal Express	* 6010 + 7060, 1746, 1471, 1421, 7841
Received by:			Airbill No.: 4153262761	
Relinquished by:			Lab Address: Quanterra, 4955 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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CHAIN OF CUSTODY RECORD

Project Name: Kirtland AFB Phase III RFI App. I SV MWs FY 96	Project No.: 13M11MM12
Project Location: Kirtland AFB, New Mexico	Project Manager: Steve Cox
Sampler(s): Jon Rittenhouse, Dan Galde	

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	418.1 TPH	Total TAL Metals*							Remarks
10-24-95	1215		X	CANOOS-0504-0028	Soil	2	4oz glass	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	1235		X	CANOOS-0504-0033	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: Jon M. Rittenhouse	10-24-95	1500	Method of Shipment: Federal Express	* 6010 + 7060, 7740, 7471, 7421, 7841
Received by:			Airbill No.: 415 326 2761	
Relinquished by:			Lab Address: Quanterra, 4955 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF CUSTODY RECORD

Project Name: Offutt AFB Phase III RFI App. I Sites 56-70

Project No.: 13411 MA 12

Project Location: Offutt AFB, Nebraska

Project Manager: Steve Cox

Sampler(s): Jon Richardson, Dan Gulde

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	HSL TPH	Total TAL Metals*	Remarks
10-23-96	1645		X	CAN056-8616-8604	Soil	2	4oz glass	X				
"	"		X	" " "	"	1	16oz "		X	X	X	
10-24-96	0905		X	CAN056-8617-8605	"	2	4oz "	X				
"	"		X	" " "	"	1	16oz "		X	X	X	

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-24-96	1100	Method of Shipment: Federal Express	* 6010 + 1060, 1740, 1411, 1401, 7441
Received by:			Airbill No.: 4153262772	TAMS # 3646
Relinquished by:			Lab Address: USACE MRD Lab, 420 S. 18th St., Omaha, NE 68102 (402-341-3448)	
Received for Laboratory by:				

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No. 111151

Woodwa[illegible]de

101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]ODY RECORD

Project Name: [illegible] AFB Phase III ICJ Area I Stockpile [illegible]

Project No.: 13M11MA/2

Project Location: [illegible], NM

Project Manager: Steve Cox

Sampler(s): Steve [illegible], Dan Galde

Analytical Parameters: 8260 VOCs; 8270 SVOCs; 418.1 TPH; Total TAL Metals*

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8260 VOCs	8270 SVOCs	418.1 TPH	Total TAL Metals*							Remarks
10-21-95	0830		X	CAN086-8616-0000	Soil	2	4oz glass	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	0940		X	CAN086-8616-0029	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	0950		X	CAN086-8616-0034	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	1040		X	CAN086-8617-0000	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	1155		X	CAN086-8617-0029	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							Containers not 100% full
"	1220		X	CAN086-8617-0034	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [illegible]	10-23-95	1200	Method of Shipment: Federal Express	* 6010 + 7060, 7740, 7471, 7421, 7841
Received by:			Airbill No.: 4153262783	
Relinquished by:			Lab Address: Quanterra, 4955 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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CHAIN OF CUSTODY RECORD

Project Name: [illegible] AFB Phase III PSI App. I SWMU, SE-70

Project No.: 13M11MA12

Project Location: [illegible], NM

Project Manager: Steve Cox

Sampler(s): Jim Pettibing, Dan Calde

Analytical Parameters: 8240 VOCs; 8270 SVOCs; 418.1 TPH; TCLP TAL Metals*

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	418.1 TPH	TCLP TAL Metals*								Remarks
10-21-95	[illegible]		X	CAN056-5613-5663	Soil	2	4oz glass	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	[illegible]		X	CAN056-5613-0014	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1415		X	CAN056-5613-0024	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1715		X	CAN056-5613-~~0034~~ 0034 SR	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
10-20-95	0900		X	CAN056-5613-0049	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1010		X	CAN056-5613-0064	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								
"	1115		X	CAN056-[illegible] 0001	"	2	4oz "	X											
"	"		X	" " "	"	1	16oz "		X	X	X								

Signatures	Date	Time
Relinquished by: [illegible]	10-20-95	1500
Received by:		
Relinquished by:		
Received for Laboratory by:		

Shipping Details:
Method of Shipment: 415 326 2805
Airbill No.: Federal Express
Lab Address: [illegible] 5th, Arvada, CO 80002

Special Instructions: * 1010 + 1060, 1110, 1411, 1021, 7041

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Woodwa[illegible]le

101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]ODY RECORD

[illegible] of [illegible]

Project Name	Project No.
[illegible] III IFI Appx. I Sites 86-70	[illegible] 12
Project Location	**Project Manager**
[illegible] NAS NAS	Steve Cox
Sampler(s)	
[illegible] Bowling, Dr. Cole	

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	TPH	TN	*						Remarks
[illegible]	1046		X	[illegible] - 0615 - 0029	Soil	2	4oz glass	X										
"	"		X		"	1	16oz "		X	X	X							
"	[illegible]		X	[illegible] - 0615 - 0034	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [illegible]	10 20 95	1600	Method of Shipment: Federal Express	* 1069, 1070, 1070, 1071, 1071, 1071
Received by:			Airbill No.: 415 326 [illegible]	
Relinquished by:			Lab Address: [illegible] [illegible] Kwan St. Arvada, CO 80002	
Received for Laboratory by:				

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No. 111140

Woodwa[illegible]e
101 South 108 A[illegible]e, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]ODY RECORD

Project Name: [illegible] AFB Phase III RFI App. I Sum[illegible], 86-70

Project No.: C3M11MA[illegible] /2

Project Location: [illegible] AFB, NM

Project Manager: Steve Cox

Sampler(s): Jo[illegible] R[illegible], Da[illegible] Galde

Analytical Parameters: 8240 VOCs; [illegible] SVOCs; 418.1 TPH; Total TAL Metals *

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	[illegible] SVOCs	418.1 TPH	Total TAL Metals *							Remarks
6-19-95	0920		X	CANO86-[illegible]612-0000	Soil	2	4oz glass	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	[illegible]46		X	CANO86-[illegible]612-0007	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	[illegible]0		X	CANO86-[illegible]612-0014	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	[illegible]10		X	CANO86-[illegible]612-0019	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	1105		X	CANO86-[illegible]611-[illegible]661	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	1115		X	CANO86-[illegible]611-[illegible]663	"	2	4oz "	X										
"	"		X	" " "	"	1	16oz "		X	X	X							
"	1250		X	CANO86-[illegible]613-0000	"	2	4oz "	X										MS/MSD → [illegible] CANO86-[illegible]613-[illegible]
"	"		X	" " "	"	1	16oz "		X	X	X							MS/MSD → "

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [illegible]	6-19-95	1500	Method of Shipment: Federal Express	* 6010 + 7060, 7140, 7471, 7421, 7741
Received by:			Airbill No.: 415 526 2520	NOTE: Treat CANO86-8613-0000 + CANO86-[illegible]613-6000 [illegible] single w/ extra volume for MS/MSD
Relinquished by:			Lab Address: Quanterra, 4765 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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CHAIN OF CUSTODY RECORD

Page 1 of 3

Project Name	Project No.
Cannon AFB Phase III RFI App. I Sites 86-90	C3M11A1A1/2
Project Location	**Project Manager**
Cannon AFB, NM	Steve Cox
Sampler(s) Jon Ritterling, Dan Galde	

Analytical Parameters: 8240 VOCs; 8260 SVOCs; 418.1 TPH; Total TAL Metals*

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8260 SVOCs	418.1 TPH	Total TAL Metals*								Remarks
10-16-95	1350		X	CANOSK-5613-6000	Soil	2	4 oz glass	X											[illegible]
"	"		X	" " "	"	1	16 oz "		X	X	X								"
"	1410		X	CANOSK-5612-0027	"	2	4 oz "	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								
"	1430		X	CANOSK-5612-0034	"	2	4 oz "	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								
"	1530		X	CANOSK-5611-0000	"	2	4 oz "	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								
"	1600		X	CANOSK-5611-0004	"	2	4 oz "	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								
"	1620		X	CANOSK-5611-0007	"	2	4 oz "	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								
"	1640		X	CANOSK-5611-0014	"	2	4 oz "	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-17-95	11:00	Method of Shipment: Federal Express	* 6010 + 1060, 7740, 7471, 7421, 7841
Received by:			Airbill No. 415 326 2820	
Relinquished by:			Lab Address: Quantera, 11445 Pierce St., Arvada, CO 80002	
Received for Laboratory by:				

Custody.frm/jdg 3-09-92

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No. 111136

Woodward-Clyde

101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF CUSTODY RECORD

Project Name: Camden AFB Phase III RFI - Appendix IX-90 Studies

Project No.: C3N111N1 / 2

Project Location: Camden AFB, NAI

Project Manager: Steve Cox

Sampler(s): Jon Rutherford, Don Gable

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	418.1 TPH	Total TAL Metals*							Remarks
10-17-95	1010		X	CAN086-8611-0039	Soil	2	4 oz glass	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							
"	1100		X	CAN086-8611-0049	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							
"	1145		X	CAN086-8611-0059	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							
"	1320		X	CAN086-8611-0069	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-17-95	1100	Method of Shipment: Federal Express	* 6010 + 7060, 7740, 7471, 7421, 7841
Received by:			Airbill No.: 415 3262820	
Relinquished by:			Lab Address: Quanterra, 4955 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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111137

Woodward-Clyde

101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF CUSTODY RECORD

Project Name: Cannon AFB Phase III RFI App. SWMUs at 70

Project No.: C3411MM 12

Project Location: Cannon AFB, NM

Project Manager: Steve Cox

Sampler(s): Jo Rutherling, Dan Gable

Analytical Parameters: 8240 VOCs, 8270 SVOCs, 418.1 TPH, Total TAL Metals*

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	418.1 TPH	Total TAL Metals*	Remarks
10-19-95	~~1000~~ 1625	SMR	X	CAN086-~~8613~~-~~8604~~ 8611-8607	Soil	2	4oz glass	X				
"	"		X	" " "	"	1	16oz "		X	X	X	
10-19-95	0920		X	CAN086-8611-8603	"	2	4oz "	X				
"	"		X	" " "	"	1	16oz "		X	X	X	

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [signature]	10-19-95	1500	Method of Shipment: Federal Express	*6010 + 1060, 1110, 7471, 1421, 7841
Received by:			Airbill No.: 4153262831	LIMS # 3646
Relinquished by:			Lab Address: USACE MRD lab, 420 S. 18th St., Omaha, NE 68102	
Received for Laboratory by:				

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Woodward[illegible]e

101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]DY RECORD

P[illegible] 1 of 1

Project Name: Cannon AFB App. I Sites 76-90

Project No.: C3A111AM 12

Project Location: Cannon AFB, NM

Project Manager: Steve Cox

Sampler(s): Jon Rutherford, Dan Galde

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8270 SVOCs	418.1 TPH	Total TAL Metals								Remarks
10-18-95	0820		X	CAN086-8612-8601	Soil	2	4 oz glass	X											
"	"		X	" " "	"	1	16 oz "		X	X	X								

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: [illegible]	10-18-95	1200	Method of Shipment: Federal Express	* 6010 + 7060, 7740, 7841, 7421, 7841
Received by:			Airbill No.: 2835136640	LIMS # 3646
Relinquished by:			Lab Address: USACE - MRD Laboratory, 420 S. 18th St., Omaha, NE 68102	
Received for Laboratory by:				

Custody.frm/jdg 3-09-92

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Woodward[illegible]e

101 South 108 Avenue, Omaha, NE 8154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF [illegible]ODY RECORD

P[illegible] 1 of 1

Project Name	Project No.
[illegible] AFB Ap[illegible] [illegible], 86-90	[illegible] / 2
Project Location	**Project Manager**
[illegible] AFB, NM	Steve Cox

Sampler(s) Jon Rutherling Da Gatde

Analytical Parameters: 8240 VOCs; 8010 SVOCs; GRO + TPH; Total TAL Metals

Sample Date	Sample Time	Type Comp.	Type Grab	Sample Identification	Matrix	Containers No.	Containers Type	8240 VOCs	8010 SVOCs	GRO + TPH	Total TAL Metals							Remarks
10-11-95	1255		X	CAN086-[illegible]614-0000	Soil	2	4 oz glass	X										
"	"		X	" " "	"	1	16 oz glass		X	X	X							
"	1320		X	CAN086-[illegible]614-0009	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							
"	1415		X	CAN086-[illegible]614-0029	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							
"	1435		X	CAN086-[illegible]614-0034	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							
10-18-95	0120		X	CAN086-[illegible]612-0000	"	2	4 oz "	X										
"	"		X	" " "	"	1	16 oz "		X	X	X							

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by: J. M. Rutherling	10-18-95	1200	Method of Shipment: Federal Express	* [illegible]
Received by:			Airbill No. 5679177814	
Relinquished by:			Lab Address: Quanterra, 1765 Yarrow St., Arvada, CO 80002	
Received for Laboratory by:				

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APPENDIX B.5

WELL NO. 9 - DRILLER'S LOG AND WELL REGISTRATION

DEMV
Mr Rollins

FORMATION LOG

Cannon Air Force Base, New Mexico

Contract #DACA47-69-C-0109

Test Stand

Well #9

		Drilling Time
0 - 4'	Top Soil	30 Min.
4 - 65	Clay & Caliche	30 Min.
65 - 120	Sand	15 Min
120 - 150	Sand	10 Min.
150 - 160	Sand	3 Min.
160 - 180	Sand & Sandrock	7 Min.
180 - 210	Sand, Sandrock & Clay	11 Min.
210 - 240	Sand and gravel	19 Min.
240 - 260	Sand & Sand rock	6 Min.
260 -270	Sand & Gravel	5 Min.
270 - 280	Sand and gravel w/ some clay	3 Min.
280 - 303.	Sand and gravel and clay layers	6 Min.
303 - 330	Clean coarse sand & gravel	12 Min.
330 - 342	Ditto	8 Min.
342 - 344	Rock - put on rock bit	3 Min.
344 - 360	Sand & gravel - tight	21 Min.
360 - 380	Ditto	25 Min.
380 - 385	Red Bed	10 Min.

CASING & SCREEN LOG

0 - 320' 7" 6-5/8" O.D. x ¼" wall blank casing
320 7" - 370' 6-5/8" O.D. Roscoe Moss corrosion resistant well screen, full flo pattern, with 1/8" openings, 2 - 20 ft. lengths and 1 - 10 ft. length
370 - 385' 6-5/8" O.D. x ¼" wall blank casing.
-2 - 0' 2 ft. 7" stick-up above ground.

Total casing and screen set - 387 feet, 7 inches

Casing guides set every 50 feet.

1½" black steel gage line welded to casing from ground surface to 371

GRAVEL

14 yards #1 Smith Sand & Gravel

5 yards Sanders, 3/16" x 3/8"

IMPORTANT — READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM.

Declaration of Owner of Underground Water Right

WELL 9 CURRY COUNTY WATER BASIN
BASIN NAME

Declaration No. ~~CG-909~~ Date received September 20, 1993

STATEMENT

1. Name of Declarant 27 CES/CE
   Mailing Address 111 Engineers Way, Cannon AFB NM 88103-5136
   County of Curry, State of New Mexico
2. Source of water supply Shallow
   (artesian or shallow water aquifer)
3. Describe well location under one of the following subheadings:
   a. S.E. ¼ S.E. ¼ S.W. ¼ of Sec. 19 Twp. 2N Rge. 35E N.M.P.M., in Curry County.
   b. Tract No. _____ of Map No. _____ of the _____
   c. X = _____ feet, Y = _____ feet, N. M. Coordinate System _____ Zone _____
   On land owned by U.S. AIR FORCE Grant _____
4. Description of well: date drilled AUG 69 driller WACCO depth 381 feet; outside diameter of casing 6 5/8 inches; original capacity 214 gal. per min.; present capacity 160 gal. per min.; pumping lift 260 feet; static water level 264 feet (above) (below) land surface; make and type of pump 6" PIERCESS
   make, type, horsepower, etc., of power plant 20 HP TURBINE
   Fractitional or percentage interest claimed in well 100%
5. Quantity of water appropriated and beneficially used 88,800 (acre feet per acre) ~~(acre feet per annum)~~ 272.52
   for MUNICIPAL purposes.
6. Acreage actually irrigated N/A acres, located and described as follows (describe only lands actually irrigated):

Subdivision	Sec.	Twp.	Range	Acres Irrigated	Owner

(Note: location of well and acreage actually irrigated must be shown on plat on reverse side.)

7. Water was first applied to beneficial use AUG (month) 27 (day) 69 (year) and since that time has been used fully and continuously on all of the above described lands or for the above described purposes except as follows: _____

8. Additional statements or explanations _____

'93 SEP 20 PM 4 42

APPENDIX B.6

IMMUNOASSAY FIELD DATA SHEETS

Data for PETRO RISC® Soil Test

Operator: D. Galde Date: 10-95 Location: Cannon AFB SD-11

Sample ID	ΔOD Standards	OD sample 10 ppm	Interpretation	OD sample 100 ppm	Interpretation	Comments
8614 ~~0~~ 4-6 10-17	-0.13	0.42		0.36		
8614 9-11	"	0.09		0.27		
8614 14-16	"	0.30		0.27		
8614 19-21	"	0.24		0.14		
8614 24-26	"	.27		.22		
8614 29-31	"	.31		.29		
8614 34-36	"	0.42 ~~0.67~~ SR		0.17		
8612 24-26 10-18	-0.10	.36		0.23		
8612 29-31	"	0.10		0.27		
8612 34-36	-0.10	0.43		0.45		
8612 4-6	-0.07	0.19		0.35		
8612 9-11	"	-0.61		-0.50		
8612 14-16	"	-0.75		-0.75		
8612 19-21	"	-0.50		-0.40		

Data for PETRO RISC® Soil Test

Operator: D. Galde Date: 10-95 Location: Cannon AFB SD-11

Sample ID	ΔOD	OD sample	Interpretation	OD sample	Interpretation	Comments
8611 10-18	Standards	10 ppm		100 ppm		
4-6	-0.07	-0.74		-0.56		
8611 9-11		-0.77		-0.75		
8611 14-16		-0.78		-0.76		
8611 19-21		-0.77		-0.75		
8611 24-26		-0.78		-0.77		
8611 29-31 10-19	-0.21	-0.59		-0.57		
8611 34-36	"	-0.60		-0.59		
8611 39-41	-0.07	-0.80		-0.84		
8611 44-46	-0.07	-0.81		-0.82		
8611 49-51	-0.07	-0.22		0.17 *		
8611 54-61	-0.07	0.00		0.63		
8611 69-71	-0.07	0.06		0.83		
8613 4-6	-0.01	-0.38		0.00		
8613 11-13	"	-0.34		-0.48		
8613 14-16	"	-0.47		-0.49		

Data for PETRO RISC® Soil Test

Operator: D. Gabbe Date: 10-95 Location: Cannon AFB SD-11

Sample ID	ΔOD Standards	OD sample 10 ppm	Interpretation	OD sample 100 ppm	Interpretation	Comments
8613 19-21 10-19	-0.01	-0.48		-0.46		
8613 24-24	"	-0.51		-0.51		
8613 27-31	"	-0.49		-0.48		
8613 34-35	"	-0.51		-0.48		
8613 39-41 10-20	-0.03	-0.41		-0.22		
8613 47-51	"	0.62		0.51		
8613 65	"	0.38		0.56		
8615 4-4	0.00	0.26		0.43		
8615 24-24	"	0.31		0.33		
8615 29-31	"	0.34		0.42		
8615 34-36	"	0.22		0.25		
8616 19-21 10-21	-0.00	0.43		0.48		
8614 29-31	"	0.42		0.53		
8614 34-36	"	0.39		0.27		

Data for PETRO RISC® Soil Test

Operator: D. Galde Date: 10-95 Location: Cannon AFB SD-11

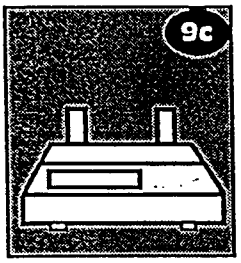
Sample ID	ΔOD	OD sample	Interpretation	OD sample	Interpretation	Comments
	Standards	10 ppm		100 ppm		
8617 10-21 29-31	-0.03 SR ~~-0.00~~	0.04 SR ~~-0.22~~		~~0~~.01 SR ~~-0.22~~		re-test with new standard
8617 34-36	-0.03 SR ~~-0.00~~	0.01 SR ~~-0.23~~		0.29 SR ~~-0.26~~		re-test " " "
8618 10-23 29-31	-0.02	0.38		0.23		
8618 34-36	"	0.27		0.27		
8619 10-24 29-31	-0.06	0.29		0.38		
8619 34-36	"	0.29		0.27		
~~8618~~ 5'	-0.01	0.17		0.19		
8618 15'	"	0.25		0.33		
8619 5'		0.39		0.33		
8615 ~~10~~ 5'		0.07		0.01		
8619 15'		0.02		0.11		
8618 25'		0.08		0.11		
BLANK		0.15		0.23		

PHASE FOUR

INTERPRETATION

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

SELECT DARKER STANDARD



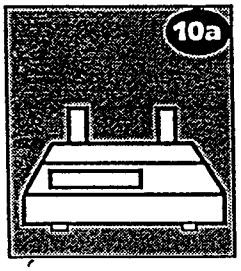
9a Wipe outside of all antibody coated tubes.

9b Place both **Standard** tubes in photometer.

9c Switch tubes until the photometer reading is negative or zero. Record reading. If reading is greater than - 0.3 in magnitude, results are outside of QC limits. Retest the sample(s).

9d Remove and discard tube in right well. The tube in the left well is the darker standard.

INTERPRET RESULTS



10a Place **10 ppm** tube in right well of photometer and record reading.

If photometer reading is **negative** or zero, petroleum hydrocarbons are present.

If photometer reading is **positive**, concentration of petroleum hydrocarbons is less than **10 ppm**.

See table on page 13 for specific detection levels.

10b Place **100 ppm** tube in right well of photometer and record reading shown on display.

If photometer reading is **negative** or zero, petroleum hydrocarbons are present.

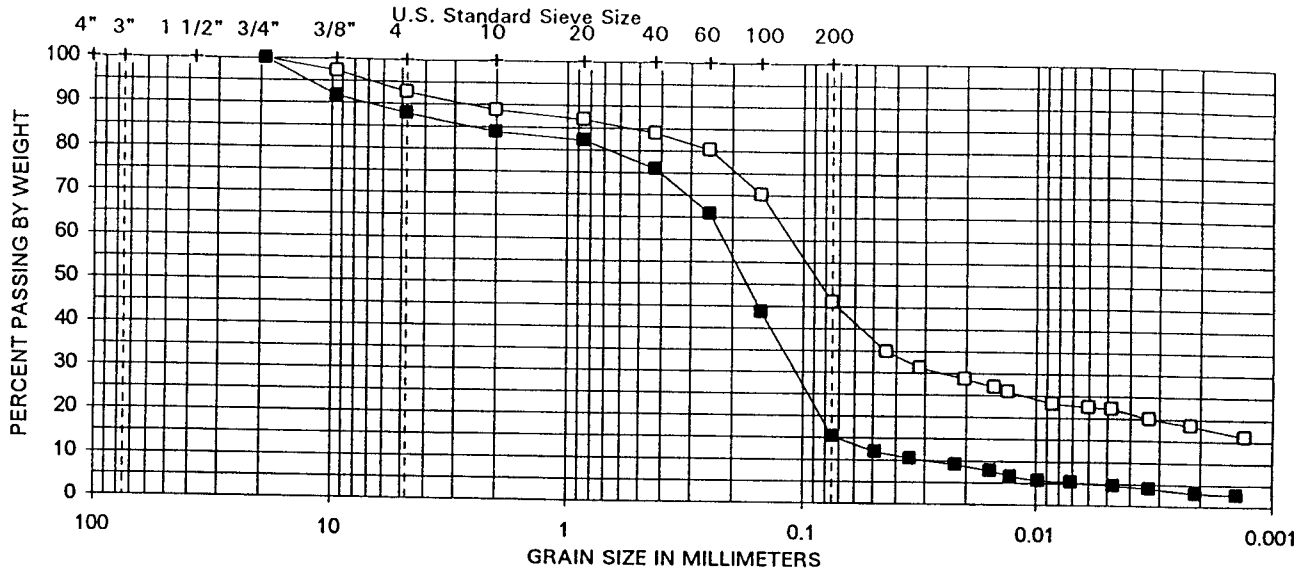
If photometer reading is **positive**, concentration of gasoline or petroleum fuel is less than **100 ppm**.

APPENDIX B.7

GRAIN SIZE DISTRIBUTION CURVES

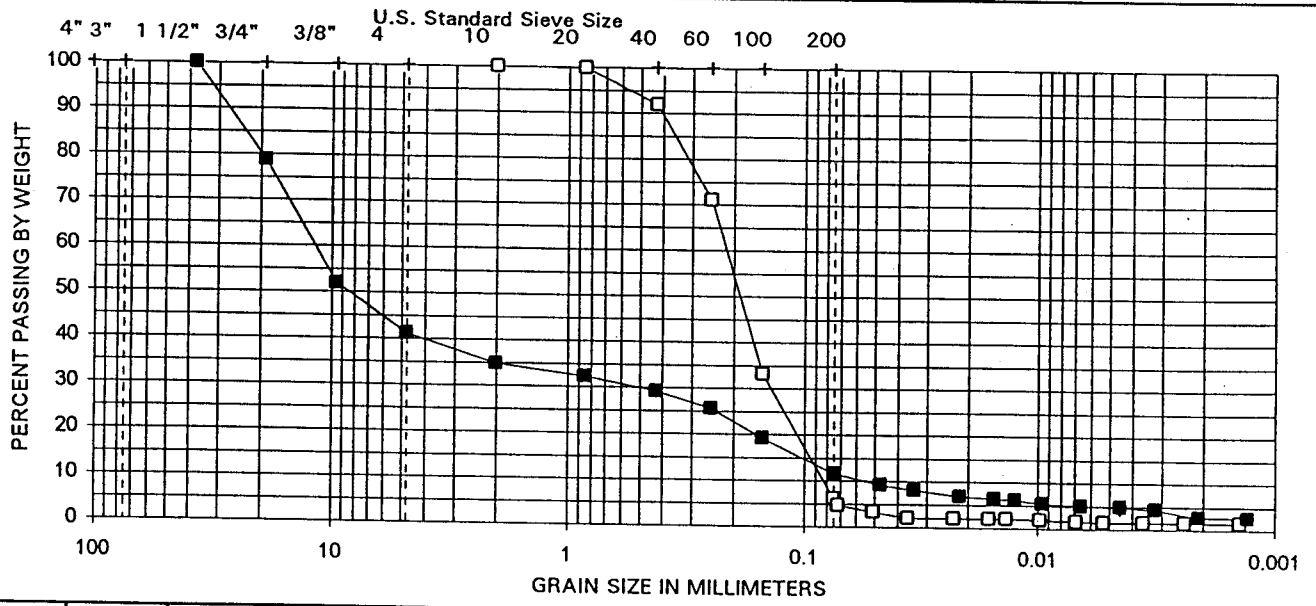
PARTICLE-SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



BORING	SAMPLE	DEPTH (FT)	SYMBOL	DESCRIPTION	w (%)	LL	PL
CAN086-8611-0000			□	SC, dark brown silty clayey c-f SAND, trace f. gravel.	11.4	29	15
CAN086-8611-0044			■	SM, brown c-f SAND, some f. gravel and silt.	9.3	---	---

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

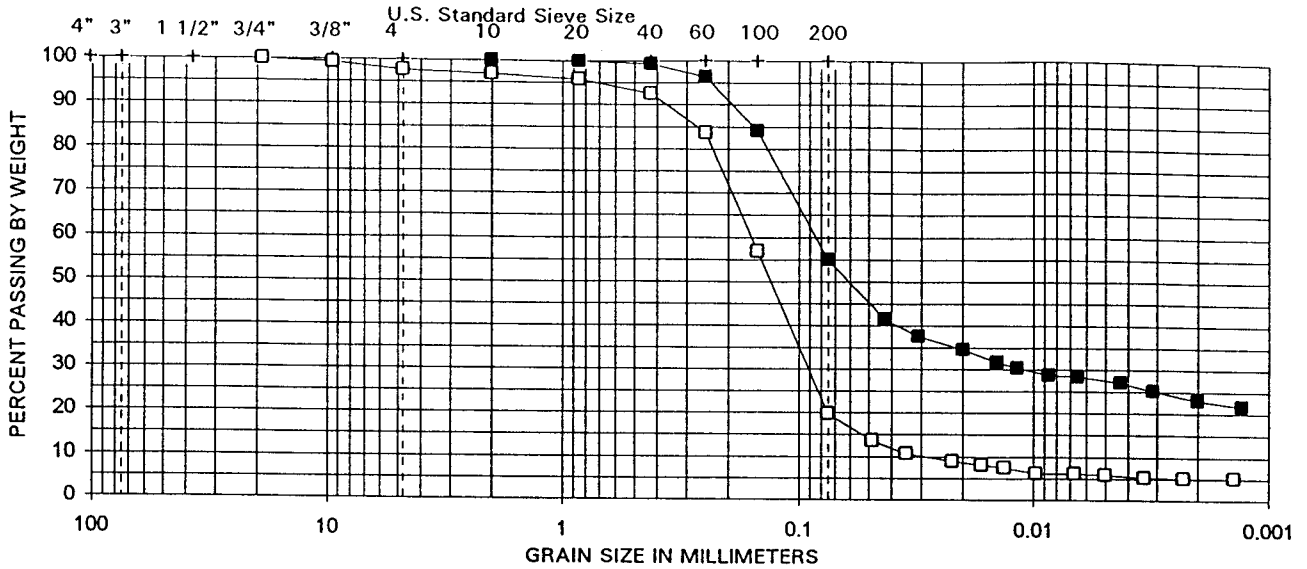


BORING	SAMPLE	DEPTH (FT)	SYMBOL	DESCRIPTION	w (%)	LL	PL
CAN086-8611-0069			□	SP-SM, reddish brown f. SAND, trace m. sand and silt.	3.7	---	---
CAN086-8612-0029			■	GP-GM, light brown c-f sandy GRAVEL, trace silt; calcareous	11.0	---	---
				material.			

File: SIEV1A.XLS Project No.: C3M11MM/2 Plotted by: CMJ Reviewed by: AT Date: 11/22/95

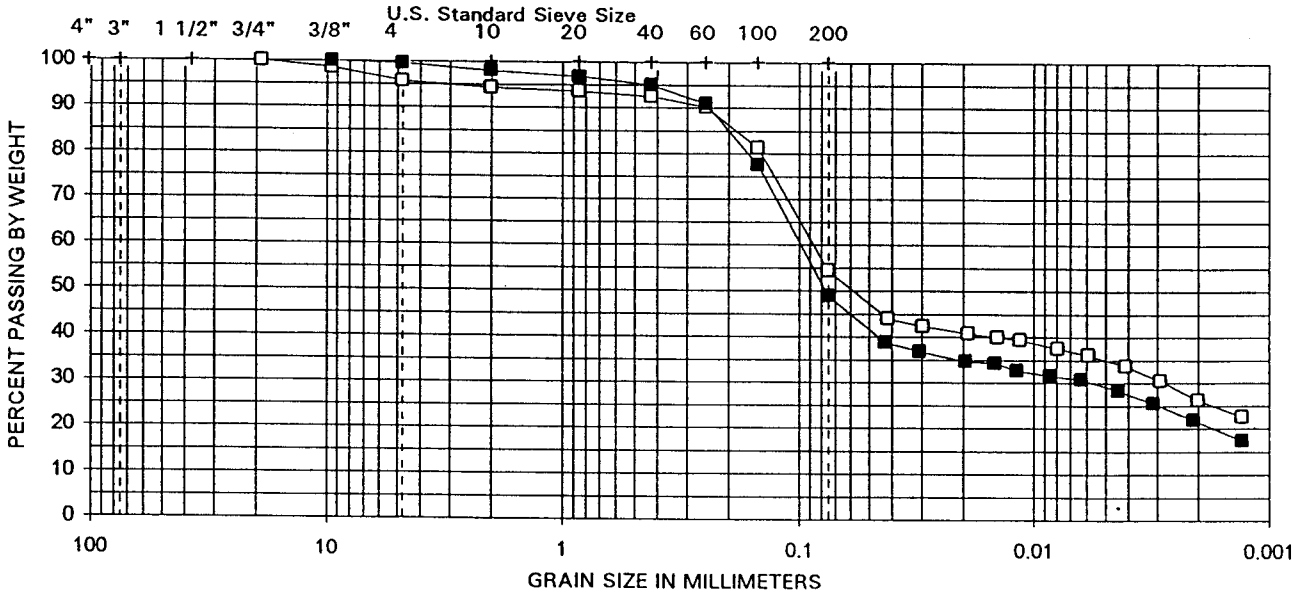
PARTICLE-SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



BORING	SAMPLE	DEPTH (FT)	SYMBOL	DESCRIPTION	w (%)	LL	PL
CAN086-8613-0024			□	SM, reddish brown f. SAND, some silt, trace f. gravel to	7.7	---	---
				m. sand.			
CAN086-8615-0001			■	CL, dark brown medium plastic f. sandy silty CLAY.	13.2	32	15

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



BORING	SAMPLE	DEPTH (FT)	SYMBOL	DESCRIPTION	w (%)	LL	PL
CAN086-8615-0004			□	CL, brown medium plastic f. sandy silty CLAY, trace f. gravel	11.4	26	13
				to m. sand.			
CAN086-8617-0009			■	SM, light brown silty f. SAND, trace c-m sand.	10.3	---	NP

File: SIEV1B.XLS Project No.: C3M11MM/2 Plotted by: CMJ Reviewed by: 11 Date: 11/22/95

APPENDIX C

SURVEY REPORT

SURVEY RESULTS - Appendix I SWMUs 86-90 (Phase III RFI)

Point Number	Northing (ft)	Easting (ft)	Elevation (ft)	Boring Number
3	1229489.68	808434.00	4268.22	8617
4	1229459.87	808440.26	4267.94	8616
5	1229440.01	808420.86	4268.19	8614
6	1229471.23	808421.77	4267.87	8613
7	1229498.54	808419.48	4268.28	8615
8	1229462.41	808401.10	4267.04	8611
9	1229487.11	808373.65	4268.61	8619
10	1229462.29	808377.76	4267.85	8612
11	1229436.55	808374.24	4268.44	8618

APPENDIX D

BACKGROUND AND RISK-BASED CONCENTRATIONS

APPENDIX D PART 1

BACKGROUND CONCENTRATIONS OF METALS AND PAHS IN SOILS

TABLE OF CONTENTS

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APPENDIX D	BACKGROUND SOILS DATA	D-1
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D.2	BASE-WIDE SOILS	D-1
D.3	TYPICAL PAH CONCENTRATIONS IN SOIL	D-3
D.4	REFERENCES	D-3

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TABLE D-1 ELEMENTAL CONCENTRATIONS IN U.S. SOILS
TABLE D-2 BACKGROUND ELEMENTAL CONCENTRATIONS IN SOIL SAMPLES COLLECTED AT OFF-SITE AREAS AND ALONG THE SANITARY SEWER LINE
TABLE D-3 BACKGROUND ELEMENTAL CONCENTRATIONS (mg/kg) IN SOILS COLLECTED AT LANDFILL NO. 2
TABLE D-4 BACKGROUND ELEMENTAL CONCENTRATIONS IN SOIL SAMPLES COLLECTED FROM PERIMETER AREAS
TABLE D-5 SUMMARY OF BACKGROUND ELEMENTAL CONCENTRATIONS IN SOIL
TABLE D-6 TYPICAL PAH CONCENTRATIONS IN SOIL

APPENDIX D
BACKGROUND SOILS DATA

This section discusses regional background soils data and base-wide background soils data. Section D.1 describes data for the conterminous United States, the western United States, and the Clovis, New Mexico region. Section D.2 discusses background soil samples that were collected from off-site areas, along the sanitary sewer, at Landfill No. 2 (SWMU No. 82), and four background samples collected during the IRP investigation (Walk, Haydel & Associates 1990).

D.1 REGIONAL SOILS

Table D-1 presents a summary of data from a United States Geological Survey (USGS) study of naturally occurring concentrations of elements in soils in the United States (USGS 1984). For the USGS study, a soil sample was collected at each study site; study sites were approximately 80 kilometers apart along routes of travel by USGS personnel. Table D-1 presents the arithmetic mean concentration from all samples collected in the United States, the arithmetic mean concentration for samples collected in the western United States (west of the 96th meridian), and concentrations of metals in soil collected in the Clovis, New Mexico region.

There is little difference between mean concentrations of elements in Western United States soils compared to soils from the United States as a whole, except that mean calcium concentration appears higher in Western soils. Concentrations from the Clovis, New Mexico region are generally comparable to concentrations elsewhere, although reported concentrations of some of the major mineral-forming elements (e.g., Al, Fe, Mg) appear to be relatively low compared to mean concentrations for the Western United States.

D.2 BASE-WIDE SOILS

The following data and discussion of base-wide background concentrations have been adopted from a draft report "Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, Clovis, NM" (W-C 1994).

Tables D-2 through D-4 show the analytical results for background soil samples collected during previous investigations at various locations on and near Cannon AFB. Table D-2 shows the results from 2 off-site samples (OFS) and from 14 samples collected along the sanitary sewer line during the 1991 Remedial Investigation of 18 SWMUs (W-C 1992). Table D-3 shows the results from samples collected at uncontaminated areas near Landfill No. 2 (W-C 1993). Table D-4 shows the results from 4 background surface soil samples collected during a Remedial Investigation conducted by Walk, Haydel & Associates (1990).

The following criteria were used to establish that the sampling locations were not impacted by Base activities and are appropriate for evaluating background conditions:

- Metals concentrations were within levels for this region
- No organic target analytes were detected in the samples
- No visible signs of contamination were present at the boring locations
- Subsurface samples were dry

Results from the 37 background samples were pooled to calculate arithmetic mean concentrations of each element and 95 percent tolerance limits for background concentrations (defined for this report as the mean plus or minus two standard deviations). These summary statistics are shown in Table D-5. The 95 percent tolerance limits describe the concentration range in which background concentrations will occur with 95 percent confidence. The upper tolerance limit of the background data are used in determining whether metals detected at the RFI sites evaluated in this report exceed background levels. Table D-5 also includes metals concentrations reported for the Clovis, New Mexico region (USGS 1984). These values are also used to compare to RFI site data.

It is interesting to compare the concentrations reported for the Clovis New Mexico region sample (USGS 1984) to the Cannon AFB background range (Table D-5). The Clovis region reported levels for magnesium and calcium are low compared to Cannon AFB background range, but the levels for aluminum, manganese, potassium, and sodium are high compared to Cannon AFB background levels. The Clovis New Mexico sample is also high compared to Cannon AFB background levels. The Clovis New Mexico sample is also high in chromium, nickel, vanadium, and zinc when compared to the Cannon background range. These differences undoubtedly reflect local variation in mineral content (for example, high calcium

is characteristic of soil conditions at Cannon AFB due to the presence of caliche (Klein and Hurlbut 1985), which may not have affected the sample collected for the USGS study.

D.3 TYPICAL PAH CONCENTRATIONS IN SOIL

PAHs are natural products of degradation of woody organic matter, and they are the products of incomplete combustion of fuels. Therefore, the presence of PAHs in soil may be the result of site-related contamination, deposition from combustion sources (e.g., automobile exhaust), or natural decay products of vegetable matter (e.g., leaves). Table D-6 presents typical levels of PAHs in soils from various settings and locations.

D.4 REFERENCES

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TABLE D-1

ELEMENTAL CONCENTRATIONS IN U.S. SOILS (mg/kg)[1]

Element	Arithmetic Mean		Reported Levels in Clovis, NM Region
	Conterminous United States	Western United States	
Aluminum	72,000	74,000	50,000
Antimony	0.67	0.62	<1
Arsenic	7.2	7.0	6.5
Barium	580	670	500
Beryllium	0.92	0.97	1 - 1.5
Cadmium	---	---	---
Calcium	24,000	33,000	7,900 - 12,000
Chromium	54	56	30
Cobalt	9.1	9.0	3 - 5
Copper	25	27	20
Iron	26,000	26,000	100 - 10,000
Lead	19	20	15
Magnesium	9,000	10,000	2,000 - 3,000
Manganese	550	480	500
Mercury	0.089	0.065	0.032
Nickel	19	19	15
Potassium	15,000	18,000	16,000
Selenium	0.39	0.34	0.15 - 0.20
Silver	---	---	---
Sodium	12,000	12,000	7,000
Thallium	---	---	---
Vanadium	80	88	30 - 50
Zinc	60	65	45

(1) Source: USGS 1984

TABLE D-2

BACKGROUND ELEMENTAL CONCENTRATIONS (mg/kg)
IN SOIL SAMPLES COLLECTED AT OFF-SITE AREAS AND ALONG THE SANITARY SEWER LINE [1]
CANNON AFB, NEW MEXICO

Boring No.	OFS-1	OFS-2	9805	9805	9807	9819	9823	9826	9827	9828	9829	9834	9836	9841	9842	9843
Depth (ft-bgs)	0	0	11	14	11	12	14	15	17	14	16	10	10	06	07	08
Aluminum	8670	8830	4910	8240	9370	5490	8810	8810	4280	4610	5120	5180	7790	6000J	4000J	4030
Antimony	5U	5U	5.1UJ	5.2UJ	5.2UJ	5.5UJ	5.3UJ	5.2UJ	5.1UJ	5.2UJ	5.3UJ	5.1UJ	5.1J	5.1UJ	5.2UJ	4.9UJ
Arsenic	1.8J	1.9J	1.1J	1.4J	1.8J	0.95J	1.3J	1.3J	0.67J	0.7J	0.85J	1J	0.76J	1.2J	1J	1.3J
Barium	67.2	62.3	140	1200	351	856	136J	79.1J	111J	70.4J	231J	241	14.9J	442J	67.1J	334J
Beryllium	0.49J	0.44U	0.44U	0.64J	0.46U	0.47U	0.47U	0.45U	0.45U	0.45U	0.46U	0.54J	0.77J	0.56J	0.45U	0.43U
Cadmium	0.87U	0.87U	0.88U	0.91U	0.91U	0.95U	0.93U	1.1	0.89U	0.9U	0.92U	0.89U	0.89U	0.89U	0.91U	0.86U
Calcium	2220	1910	101000J	40600J	62100J	154000	121000	57700	78500	51800	157000	89800J	4900	124000J	131000J	172000J
Chromium	8.6	8.7	5.1	7.6	8.3	4.6	5.7	6.3	4	4.5	4.1	4.8	8	6.2	4.5	4.8
Cobalt	2.7J	2.7J	2J	3.9J	3.3J	1.4J	3.2J	3J	1.3J	2.5J	2.5J	3.1J	3J	3.1J	3.3J	2.5J
Copper	18.3	15.3	6.6	6.8	9.3	4J	7.2	9.2U	2.8J	4.1J	4.4J	7.7U	5.4J	7U	6.5U	7U
Iron	7860	8010	3720	6390	7240	2750	5240	5950	3940	5390	4540	4600	7960	5900J	4040J	3930J
Lead	5.7	10	3.5J	6.5J	5.8J	1.5	5.6J	4.2J	3.9J	5.3J	4.1J	4.5J	5.8	5.8	5.6	5.4
Magnesium	1390	1410	2460	4410	4420	18300	5580	3950	3830	3030	4300	4420	4080	3070	2680	2830
Manganese	150	172	63.2	128	138	24.9	64.1	80.8	43.3	91	85.7	97.7	71.4	99.2J	54.4	62.4J
Mercury	0.11U	0.11U	0.11U	0.11U	0.11U	0.12U	0.12U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U
Nickel	6.9J	6.7J	3.8J	6.9J	8.2J	4.5J	5J	5.7J	4.4J	5.8J	5.8J	7.9J	7.5J	6.3J	5.9J	5.2J
Potassium	1760	1930	1150	1890	2100	986J	2060	2080	1300	1360	1570	1710	2770	1410	1020J	866J
Selenium	0.22U	0.22U	0.22UJ	0.23J	0.23UJ	0.24UJ	2.3UJ	0.22UJ	0.22UJ	0.23UJ	0.23UJ	0.22UJ	0.22UJ	0.22UJ	0.23UJ	0.2UJ
Silver	0.87U	0.87U	0.88U	0.91U	0.91U	0.95U	0.93U	0.9U	0.89U	0.9U	0.92U	0.89U	0.89U	0.89U	0.91U	0.86U
Sodium	286U	288U	290U	384U	301U	313U	307U	297U	295U	297U	302U	295U	615J	295U	532J	452J
Thallium	0.22	0.22U	0.22UJ	0.23UJ	0.23UJ	0.24UJ	0.23UJ	0.22UJ	0.22UJ	0.23UJ	0.23UJ	0.22UJ	0.22UJ	0.22UJ	0.23UJ	0.21UJ
Vanadium	17.7	17.6	8.5J	19.5	20.5	23.6	16.3	17.6	16.2	19.7	16.4	20.5	28.3	19.5	13.5	12.6
Zinc	18.6	21.4	10.3	17.4	19.5	5.5	13.3	14.4	7.9	11.6	11.3	10.7U	16.4	13.4	9.9U	9.6

[1] Woodward-Clyde 1992.

Ft-bgs = Feet below ground surface.

J = Estimated value below reporting limit or estimated based on data quality criteria.

U = Nondetect. Value shown is the reporting limit.

TABLE D-3

BACKGROUND ELEMENTAL CONCENTRATIONS (mg/kg) IN SOILS COLLECTED AT LANDFILL NO. 2 [1] CANNON AFB, NEW MEXICO

Boring No.	8201								
Depth (ft-bgs)	0	14	18	24	28	40	52	64	74
Aluminum	11000	7290	7030	5640	6590	4820	4100	1940	1410
Antimony	6.9 U	13.1 U	12.8 U	12.9 U	6.4 U	6.3 U	6.3 U	6.2 U	6.1 U
Arsenic	6	3.1	3.6	2 J	2.1	1.8 J	1.9	1.6	1.2
Barium	98.8	99	119	130	110	34	46.4	20.9	25.3
Beryllium	0.7	0.39 J	0.45	0.43	0.17 J	0.17 J	0.21	0.21 U	0.2 U
Cadmium	0.58 U	1.1 U	1.1 U	1.1 U	0.54 U	0.53 U	0.53 U	0.51 U	0.51 U
Calcium	2970	13100 J	169000 J	120000 J	87000 J	18700	24200	5870	13500
Chromium	11.4	6	6.2	6.2	8.4	8.5	6.3	4.5	3.9
Cobalt	5.3	3.9	2.8	3.6	1.8	2	1.8	1.3	1.1
Copper	10.1	4.4 U	4.3 U	4.3 U	2.3 U	2.6 U	2.1 U	2.1 U	2 U
Iron	11000	5630	4400	3550	4080	3770	3630	2110	1820
Lead	16.1 J	6 J	4.3 J	2.6 J	2.5 J	2.6 J	2.4 J	1.9 J	1.5 J
Magnesium	1850 J	5210 J	5450 J	6250 J	9050 J	6400 J	4670 J	1580 J	892 J
Manganese	216	99.6	55.5	46.7	35.6	39.4	47.6	23.3	25.6
Mercury	0.12 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.1 U	0.1 U
Nickel	9.8	6.6 J	4.2 J	4.6 J	4 J	4.2	3 J	1.5 J	1.8 J
Potassium	2140	2120	1720	1050 J	1260	1050	890	397 J	302 J
Selenium	1.2 U	2.2 U	2.1 U	1.1 U	1.1 U	1.1 U	1.1 U	0.51 U	0.51 U
Silver	1.2 U	2.2 U	2.1 U	0.93 J	1.1 U	1.1 U	1.1 U	0.51 J	1 U
Sodium	576 U	1090 U	1060 U	1080 U	537 U	267 J	526 U	513 U	508 U
Thallium	0.58 U	0.55 U	1.1 U	1.1 U	1.1 U	0.53 U	0.53 U	0.51 U	0.51 U
Vanadium	21.5	13.2	14.2	12.2	15.5	12.6	14.7	7.9	5.2
Zinc	27.5	15.2 U	11.4 U	8.8 U	11.2 U	10.5 U	8.3 U	4.8 U	4.3 U

[1] Woodward-Clyde 1993b.
Ft-bgs = Feet below ground surface
U = Not detected. Value shown is reporting limit.
J = Estimated value below reporting limit or estimated based on data quality criteria.

TABLE D-3

BACKGROUND ELEMENTAL CONCENTRATIONS (mg/kg) IN SOILS COLLECTED AT LANDFILL NO. 2 (1) CANNON AFB, NEW MEXICO

Boring No.					8202			
Depth (ft-bgs)	14	18	24	28	40	52	64	74
Aluminum	4750	7810	5500	4950	4090	3680	1460	1850
Antimony	6.3 U	6.5 U	13 U	12.8 U	6.2 U	6.3 U	6.1 U	6.1 U
Arsenic	1.3 J	1.2 J	1.3 J	1.2 J	0.74 J	0.96 J	0.83 J	1 J
Barium	87.6	132	186	133	30.7	43.8	14.5	15.6
Beryllium	0.35	0.51	0.52	0.28	0.24	0.23	0.2 U	0.17
Cadmium	0.53 U	0.54 U	1.1 U	1.1 U	0.52 U	0.53 U	0.51 U	0.51 U
Calcium	41800 J	94800 J	167000 J	124000 J	17300	27600 J	6780	1490
Chromium	4.6	7.9	5.1	15.4	7.8	6.1	4.9	4.1
Cobalt	2.9	2.4	2.2 U	2.1 U	0.98	1.8	1 U	0.85
Copper	2.9 U	2.8 U	4.3 U	4.3 U	2.1 U	2.1 U	2 U	2 U
Iron	4930	5050	3280	4080	4160	3740	2170	2770
Lead	2.3 J	3.7 J	1.9 J	1.8 J	2.5 J	2.3 J	1.1 J	1.8 J
Magnesium	2570 J	7520 J	11800 J	10300 J	3450 J	4040 J	918 J	1250 J
Manganese	84.2	59.3	29.1	39.8	44.6	49.7	22.4	31.8
Mercury	0.11 U	0.11 U	0.11 U	0.11 U	0.1 U	0.11 U	0.1 U	0.1 U
Nickel	3.9	4.3	3	7.6	2.7	2.8	4.1 U	1.3
Potassium	1580	1790	926	960	1060	720	354	442
Selenium	1.1 U	1.1 U	1.1 U	1.1 U	1 U	1.1 U	1 U	0.51 U
Silver	1.1 U	1.1 U	2.2 U	2.1 U	1 U	1.1 U	1 U	1 U
Sodium	529 U	544 U	1090 U	1070 U	518 U	526 U	507 U	510 U
Thallium	0.14 J	1.1 U	1.1 U	1.1 U	1 U	1.1 U	0.51 U	0.51 U
Vanadium	11.6	14.3	12.2	11.7	9.9	14.7	5.4	7.3
Zinc	11.4 U	12.6 U	6.9 U	7.7 U	7.9 U	6.8 U	4.3 U	5.1 U

(1) Woodward-Clyde 1993b.
Ft-bgs = Feet below ground surface
U = Not detected. Value shown is reporting limit.
J = Estimated value below reporting limit or estimated based on data quality criteria.

TABLE D-4

BACKGROUND ELEMENTAL CONCENTRATIONS (mg/kg) IN SOIL SAMPLES COLLECTED FROM PERIMETER AREAS [1] CANNON AFB, NEW MEXICO

Sample No. Depth (Ft-bgs)	BKGD-1 0.5	BKGD-2 0.5	BKGD-3 0.5	BKGD-4 0.5
Arsenic	<17	<15.8	28	17
Barium	52.6	350.9	90.3	44.8
Cadmium	3.1	4.2	3.6	2.7
Chromium	11.5	11.6	12.9	9
Lead	19.1	29.8	46	28
Mercury	<0.1	<0.1	<0.1	<0.1
Selenium	<48.1	58.0	123.9	50.1
Silver	<2	<2	<2	<2

[1] Walk, Haydel & Associates 1990
Ft-bgs Feet below ground surface

TABLE D-5

SUMMARY OF BACKGROUND ELEMENTAL CONCENTRATIONS IN SOIL (mg/kg) [1] CANNON AFB, NEW MEXICO

Element	Mean ($\bar{x}$)	Standard Deviation (SD)	95% Tolerance Limits ($\bar{x}$)±2SD	Reported Level in Clovis, NM Region[2]
Aluminum	5,700	2,420	860 - 10,540	50,000
Antimony	*	*	*	<1
Arsenic	3.5	6.0	0 - 15.5	6.5
Barium	166	238	0 - 642	500
Beryllium	0.41	0.16	0.09 - 0.73	1 - 2
Cadmium	*	*	*	---
Calcium	69,200	58,600	0 - 186,400	7,900 - 18,000
Chromium	6.98	2.78	1.42 - 12.5	30
Cobalt	2.5	1.0	0.5 - 4.5	3 - 7
Copper	*	*	*	20
Iron	4,780	1,970	840 - 8,720	100 - 15,000
Lead	7.12	9.35	0 - 25.8	15
Magnesium	4,650	3,570	0 - 11,790	2,000 - 5,000
Manganese	72.0	46.0	0 - 164	500
Mercury	*	*	*	0.032 - 0.082
Nickel	5.0	2.0	1.0 - 9.0	15
Potassium	1,360	606	148 - 2,572	16,000
Selenium	*	*	*	0.15 - 0.30
Silver	*	*	*	---
Sodium	514	264	0 - 1,042	7,000
Thallium	*	*	*	---
Vanadium	14.9	5.20	4.50 - 25.3	30 - 70
Zinc	11.3	5.29	0.72 - 21.9	45

(1) 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).

(2) USGS 1984

* Data insufficient to calculate mean or upper tolerance limit due to a large number of nondetects.

TABLE D-6

TYPICAL PAH CONCENTRATIONS IN SOILS
(mg/kg)

Chemical	Soil Concentration	Location	Reference
Acenaphthene	0.002	Rural soils	ATSDR 1990
	0.006	Agricultural soils	ATSDR 1990
Acenaphthylene	0.005	Agricultural soils	ATSDR 1990
Anthracene	0.011 - 0.013	Agricultural soils	ATSDR 1990
Benz (a) anthracene	0.005 - 0.02	Rural soils	ATSDR 1990
	0.056 - 0.11	Agricultural soils	ATSDR 1990
	0.169 - 59	Urban soils	ATSDR 1990
Benzo (a) pyrene	0.004	Rural areas	Barnett 1976
	0.4	Industrial areas	
	up to 1	Non-polluted areas	Edwards 1983
	> 100	Near known sources	
	650	Near coal-tar pitch disposal site, Germany	Lee and Grant 1981
	0.0004	Near recreation area, USSR	Harrison et al. 1975
	0.0015 - 0.004	Forest soils	
	0.002 - 1.3	Rural soils	ATSDR 1990
	0.0046 - 0.9	Agricultural soils	ATSDR 1990
	0.165 - 0.22	Urban soils	ATSDR 1990
Benzo (b) fluoranthene	0.02 - 0.03	Rural soils	ATSDR 1990
	0.058 - 0.22	Agricultural soils	ATSDR 1990
	15 - 62	Urban soils	ATSDR 1990
Benzo (e) pyrene	0.053 - 0.13	Agricultural soils	ATSDR 1990
	0.06 - 14	Urban soils	ATSDR 1990
Benzo (g,h,i) perylene	0.01 - 0.07	Rural soils	ATSDR 1990
	0.066	Agricultural soils	ATSDR 1990
	0.9 - 47	Urban soils	ATSDR 1990
Benzo (k) fluoranthene	0.01 - 0.11	Rural soils	ATSDR 1990
	0.058 - 0.25	Agricultural soils	ATSDR 1990
	0.3 - 26	Urban soils	ATSDR 1990
Chrysene	0.0383	Rural soils	ATSDR 1990
	0.078 - 0.12	Agricultural soils	ATSDR 1990
	0.251 - 0.64	Urban soils	ATSDR 1990
Fluoranthene	0.06	0 - 2 cm depth, prior to burn at a slash burn site, OR	Sullivan and Mix 1985
	0.36	0 - 2 cm depth, 103 days after burn at a slash burn site, OR	
	0.08	0 - 2 cm depth, 365 days after burn at a slash burn site, OR	
	0.03	2 - 5 cm depth, 105 days after burn at a slash burn site, OR	
	Not detected	2 -5 cm depth, 365 days after burn at a slash burn site, OR	
	0.0003 - 0.04	Rural soils	ATSDR 1990
	0.12 - 0.21	Agricultural soils	ATSDR 1990
	0.2 - 166	Urban soils	ATSDR 1990

TABLE D-6

TYPICAL PAH CONCENTRATIONS IN SOILS (mg/kg)

Chemical	Soil Concentration	Location	Reference
Fluorene	0.0097	Agricultural soils	ATSDR 1990
Indeno (1,2,3-cd) pyrene	0.01 - 0.015	Rural soils	ATSDR 1990
	0.063 - 0.1	Agricultural soils	ATSDR 1990
	8 - 61	Urban soils	ATSDR 1990
Phenanthrene	0.05	0 - 2 cm depth, prior to burn at a slash burn site, OR	Sullivan and Mix 1985
	0.98	0 - 2 cm depth, 103 days after burn at a slash burn site, OR	
	Not detected	0 - 2 cm depth, 365 days after burn at a slash burn site, OR	
	0.13	2 - 5 cm depth, 105 days after burn at a slash burn site, OR	
	Not detected	2 -5 cm depth, 365 days after burn at a slash burn site, OR	
	0.03	Rural soils	ATSDR 1990
	0.048 - 0.14	Agricultural soils	ATSDR 1990
Pyrene	0.001 - 0.0197	Rural soils	ATSDR 1990
	0.099 - 0.15	Agricultural soils	ATSDR 1990
	0.145 - 147	Urban soils	ATSDR 1990

APPENDIX D PART 2

REGION III RISK-BASED CONCENTRATIONS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

March 7, 1995

SUBJECT: Risk-Based Concentration Table, January - June 1995

FROM: Roy L. Smith, Ph.D., Senior Toxicologist
Technical Support Section (3HW13)

TO: RBC Table Mailing List

Attached is the EPA Region III Risk-Based Concentration (RBC) table, which we have distributed quarterly to all interested parties since 1991. Please see below for some important announcements concerning changes in the Table and administrative issues with our mailing list.

Major Changes in this Issue of the RBC

1. IRIS and HEAST have matured, and EPA has revised them at a decreasing rate over the last few years. Lately, each quarterly RBC update has been virtually the same as its predecessor. Meanwhile, the mailing list for the RBC table has expanded exponentially and the quarterly mailings have become a substantial burden to the Region. Upon reflection, we've decided to change to semi-annual distribution. We think this change will extend our ability to keep producing the RBC table, while having little effect on the table's usefulness. (For example, there have been *no* changes to toxicity constants in IRIS or HEAST in the three months since the 4th quarter table was published.)

2. The RBC table now includes soil screening levels (SSLs) for protection of groundwater and air. Most of the new entries were taken directly from EPA/OSWER's newly proposed SSL guidance document. We've added some additional SSLs based on the same proposed methodology. Sources of SSLs are noted in the table. SSLs incorporate all the same exposure assumptions as RBCs, plus many additional assumptions needed for inter-media extrapolation. SSLs are therefore distinct from RBCs, and should be used only in the framework proposed in the OSWER document. If you have not yet seen this proposal, you can obtain it from NTIS (703-487-4650, as document numbers 9355.4-1, PB95-963530, or EPA540/R-94/105).

Administrative Issues

Our situation on the administrative front can be summarized in one word--"HELP"!! The RBC mailing list now includes more than 1300 recipients and we are experiencing significant problems with our current "delivery system." We would appreciate your suggestions for making our future mailings more efficient. We are also exploring the possibility of providing access to the RBC through an electronic bulletin board and would like your feedback on that idea. In the meantime, we will be examining our current mailing list and limiting future mailings to one individual per organization; we need your help in distributing the RBC within your organization if there are others who would like copies.

2. A single contaminant contributes nearly all of the health risk;

3. Volatilization or leaching of that contaminant from soil is expected not to be significant;

4. The exposure scenarios used in the RBC table are appropriate for the site;

5. The fixed risk levels used in the RBC table are appropriate for the site; and

6. Risk to ecological receptors is expected not to be significant;

the risk-based concentrations would probably be protective as no-action levels or cleanup goals. However, to the extent that a site deviates from this description, as most do, the RBCs would not necessarily be appropriate.

To summarize, the table should generally not be used to (1) set cleanup or no-action levels at CERCLA or RCRA Corrective Action sites, (2) substitute for EPA guidance for preparing baseline risk assessments, or (3) determine if a waste is hazardous under RCRA.

Attachment

EPA Region III Risk-Based Concentration Table

Background Information

Roy L. Smith, Ph.D.
Senior Toxicologist
February 9, 1995

Development of Risk-Based Concentrations

General

Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

Exposure variables	Value	Symbol
General:		
Carcinogenic potency slope oral (risk per mg/kg/d):	*	CPSo
Carcinogenic potency slope inhaled (risk per mg/kg/d):	*	CPSi
Reference dose oral (mg/kg/d):	*	RfDo
Reference dose inhaled (mg/kg/d):	*	RfDi
Target cancer risk:	1e-06	TR
Target hazard quotient:	1	THQ
Body weight, adult (kg):	70	BWa
Body weight, age 1-6 (kg):	15	BWc
Averaging time carcinogens (d):	25550	ATc
Averaging time non-carcinogens (d):	ED*365	ATn
Inhalation, adult (m3/d):	20	IRAa
Inhalation, child (m3/d):	12	IRAc
Inhalation factor, age-adjusted (m3-y/kg-d):	11.66	IFAadj
Tap water ingestion, adult (L/d):	2	IRWa
Tap water ingestion, age 1-6 (L/d):	1	IRWc
Tap water ingestion factor, age-adjusted (L-y/kg-d):	1.09	IFWadj
Fish ingestion (g/d):	54	IRF
Soil ingestion, adult (mg/d):	100	IRSa
Soil ingestion, age 1-6 (mg/d):	200	IRSc
Soil ingestion factor, age adjusted (mg-y/kg-d):	114.29	IFSadj
Residential:		
Exposure frequency (d/y):	350	EFr
Exposure duration, total (y):	30	EDtot
Exposure duration, age 1-6 (y):	6	EDc
Volatilization factor (L/m3):	0.5	K

Exposure variables	Value	Symbol
Occupational:		
Exposure frequency (d/y):	250	EFo
Exposure duration (y):	25	EDo
Fraction of contaminated soil ingested (unitless)	0.5	FC

*: Contaminant-specific toxicological constants. The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3) HEAST alternative method, (4) EPA Superfund Health Risk Technical Support Center, (5) withdrawn from IRIS or HEAST, and (6) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable. The EPA Superfund Health Risk Technical Support Center, part of the Chemical Mixtures Branch of ECAO-Cincinnati, develops provisional RfDs and CPSs on request for contaminants not in IRIS or HEAST. These provisional values are labeled "E = EPA-ECAO provisional" in the table. It is possible they may be obsolete. If one of the "E" constants is important to a Superfund risk assessment, consider requesting, through a Regional risk assessor, a new provisional value.

Age-adjusted factors

Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

Air inhalation

$$IFAadj \ \frac{m^3 \cdot y}{kg \cdot d} = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

Tap water ingestion

$$IFWadj \ \frac{L \cdot y}{kg \cdot d} = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

Soil ingestion

$$IFSadj \ \frac{mg \cdot y}{kg \cdot d} = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

Residential water

Volatilization terms were calculated only for compounds with a mark in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (K, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable

oral RfDs for both volatile and non-volatile compounds. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

Carcinogens

$$RBC\ \frac{\mu g}{L} = \frac{TR \cdot ATc \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot ([K \cdot IFAadj \cdot CPSi] + [IFWadj \cdot CPSo])}$$

Non-carcinogens

$$RBC\ \frac{\mu g}{L} = \frac{THQ \cdot BWa \cdot ATn \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot EDtot \cdot \left(\frac{K \cdot IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

Ambient air

Oral potency slopes and references were used where inhalation values were not available. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

Carcinogens

$$RBC\ \frac{\mu g}{m^3} = \frac{TR \cdot ATc \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot IFAadj \cdot CPSi}$$

Non-carcinogens

$$RBC\ \frac{\mu g}{m^3} = \frac{THQ \cdot RfDi \cdot BWa \cdot ATn \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot EDtot \cdot IRAa}$$

Edible fish

All RBCs were based on adult exposure.

Carcinogens

$$RBC\ \frac{mg}{kg} = \frac{TR \cdot BWa \cdot ATc}{EFr \cdot EDtot \cdot \frac{IRF}{1000\ \frac{g}{kg}} \cdot CPSo}$$

Non-carcinogens

$$RBC\ \frac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFr \cdot EDtot \cdot \frac{IRF}{1000\ \frac{g}{kg}}}$$

Commercial/industrial soil ingestion

RBCs were based on adult occupational exposure, including an assumption that only 50% of total soil ingestion is work-related.

Carcinogens

$$RBC\ \frac{mg}{kg} = \frac{TR\ BWa\ ATc}{EFo\ EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}} \cdot FC \cdot CPSo}$$

Non-carcinogens

$$RBC\ \frac{mg}{kg} = \frac{THQ\ RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}} \cdot FC}$$

Residential soil ingestion

RBCs for carcinogens were based on combined childhood and adult exposure; RBCs for non-carcinogens were based on childhood exposure only.

Carcinogens

$$RBC\ \frac{mg}{kg} = \frac{TR \cdot ATc}{EFr \cdot \frac{IFSadj}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

Non-carcinogens

$$RBC\ \frac{mg}{kg} = \frac{THQ\ RfDo \cdot BWc \cdot ATn}{EFr \cdot EDc \cdot \frac{IRSc}{10^6\ \frac{mg}{kg}}}$$

Development of Soil Screening Levels

General

In December 1994 the EPA Office of Solid Waste and Emergency Response proposed Soil Screening Guidance (Document 9355.4-1, PB95-963530, EPA540/R-94/101, available through NTIS at 703-487-4650). This draft document provides (1) a framework in which soil screening levels are to be used, (2) a detailed methodology for calculating soil screening levels, and (3) soil screening levels for 107 substances.

Consistent with this new guidance, the risk-based concentration table now includes two columns of generic soil screening levels (SSLs). OSWER's 107 proposed soil screening levels have been added verbatim. In addition, the proposed SSL methodology has been used to calculate soil screening levels for more substances, which are also included in the

new table. The table clearly distinguishes the OSWER SSLs from the "unofficial" ones.

These SSLs provide reasonable maximum estimates of transfers of contaminants from soil to other media. One column contains soil concentrations protective of groundwater quality; the other contains soil concentrations protective of air quality. "Protective" is defined in the same terms as the risk-based concentrations for tap water and air -- that residential contact scenarios will yield a fixed upper bound risk of 10^{-6} or a fixed hazard quotient of 1 (whichever occurs at the lower concentration).

OSWER's SSLs should be used only within the framework proposed in the guidance document. The additional SSLs included in the RBC table are intended for the same uses (although they obviously carry less weight than the formally proposed numbers).

The SSLs are based on the following assumptions:

Input variables	Value	Symbol*
Surface soil moisture content (g/g)	0.1	W_s
Vadose zone soil moisture content (kg/kg)	0.2	W_v
Surface soil bulk density (g/cm^3)	1.5	ρ_{bs}
Vadose zone soil bulk density (kg/L)	1.5	ρ_{bv}
Surface soil particle density (g/cm^3)	2.65	ρ_{ss}
Vadose zone soil particle density (g/cm^3)	2.65	ρ_{sv}
Total surface soil porosity (L pore /L soil)	0.43	N_s
Total vadose zone soil porosity (L pore/L soil)	0.43	N_v
Air-filled surface soil porosity (L air/L soil)	0.28	θ_{as}
Water-filled surface soil porosity (L water/L soil)	0.15	θ_{ws}
Air-filled vadose zone soil porosity (L air/L soil)	0.13	θ_{av}
Water-filled vadose zone soil porosity (L water/L soil)	0.30	θ_{wv}
Organic carbon fraction of surface soil (g/g)	0.006	FOC_s
Organic carbon fraction of vadose zone soil (g/g)	0.002	FOC_v
Dispersion factor for 0.5 acres (g/m^{2}s per kg/m^3)	35.1	Q/C
Particulate emission factor (m^3/kg)	6.79e+08	PEF
Exposure interval (s)	9.50e+08	T
Dilution-attenuation factor (unitless)	10	DAF

*: Symbols were adjusted, variables were rearranged, and derived and chemical-specific variables were omitted for simplicity and clarity. Presentation of the input variables in a single table using the same terms as in the OSWER SSL document would have been confusing. The terms used here are generally similar to OSWER's, and can easily be compared with the SSL guidance document.

With two exceptions described in the following section, SSL calculations were based on the same algorithms presented in the OSWER draft SSL guidance document. For details of the calculations (and for general background information on SSLs), I strongly recommend

consulting that document. The "unofficial" SSLs were developed under the following conditions:

Soil Screening Levels for Inhalation

Inhaled reference doses and potency slopes were used if available. If inhalation values were not available, oral RfDs and potency slopes were substituted. SSLs were calculated only for substances for which aqueous solubility, Koc, Henry's Law constant, and diffusivity in air were available. SSLs were calculated only for substances for which a volatilization factor could be calculated. This was done because OSWER's large proposed particulate emission factor rendered it pointless to estimate SSLs for particulate emissions alone. The final calculated SSL shown in the RBC table is the smaller of the risk-based SSL and the soil saturation concentration. All calculated SSLs were rounded to 2 significant figures.

The OSWER risk algorithms for inhalation were revised in order to be consistent with the rest of the RBC table. Only calculated SSLs were affected by this; SSLs proposed by OSWER are presented verbatim. Calculated SSLs for inhalation of carcinogens were based on an integrated lifetime exposure rather than adult exposure. SSLs for inhalation of noncarcinogens were based on adult exposure for 350 days per year rather than 365 days per year. The following algorithms were used to calculate inhalation SSLs:

Carcinogens

$$SSL \ \frac{mg}{kg} = \frac{TR \cdot ATc}{EFr \cdot IFAadj \cdot \left(\frac{1}{VF} + \frac{1}{PEF}\right) \cdot CPSi}$$

Non-carcinogens

$$SSL \ \frac{mg}{kg} = \frac{THQ \cdot BWa \cdot ATn \cdot RfDi}{EFr \cdot EDtot \cdot IRAa \cdot \left(\frac{1}{VF} + \frac{1}{PEF}\right)}$$

Soil Screening Levels for Groundwater Use

All algorithms were as proposed by OSWER. MCLs were used as target groundwater concentrations if available. If MCLs were unavailable the risk-based concentration in the "tap water" column of the RBC table was used as the target groundwater concentration. All SSLs for groundwater are based on a dilution-attenuation factor (DAF) of 10. Since these SSLs scale linearly with DAF, the SSLs for DAF=1 would be ten times lower. They were omitted to conserve space. All groundwater SSLs were rounded to 2 significant figures and capped at unity.

Sources: I=IRIS H=HEAST A=HEAST alternate W=Withdrawn from IRIS or HEAST E=EPA-ECAO Regional Support provisional value O=Other EPA documents.

Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration.

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Acephate	30560191	4.00E-03 I		8.70E-03 I			7.7 C	0.72 C	0.36 C	660 C	73 C		
Acetaldehyde	75070		2.57E-03 I		7.70E-03 I		94 N	0.81 C					
Acetochlor	34256821	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Acetone	67641	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	62000 E	8 E
Acetone cyanohydrin	75865	7.00E-02 H	4.00E-02 A				2600 N	150 N	95 N	140000 N	5500 N		
Acetonitrile	75078	6.00E-03 I	1.43E-02 A				220 N	52 N	8.1 N	12000 N	470 N		
Acetophenone	98862	1.00E-01 I	5.71E-06 W			☒	0.042 N	0.021 N	140 N	200000 N	7800 N		
Acifluorfen	62476599	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Acrolein	107028	2.00E-02 H	5.71E-06 I				730 N	0.021 N	27 N	41000 N	1600 N		
Acrylamide	79061	2.00E-04 I		4.50E+00 I	4.55E+00 I		0.015 C	0.0014 C	0.0007 C	1.3 C	0.14 C		
Acrylic acid	79107	5.00E-01 I	1.00E-03 I				18000 N	3.7 N	680 N	1E+06 N	39000 N		
Acrylonitrile	107131	1.00E-03 H	5.71E-04 I	5.40E-01 I	2.38E-01 I		0.12 C	0.026 C	0.0058 C	11 C	1.2 C		
Alachlor	15972608	1.00E-02 I		8.00E-02 H			0.84 C	0.078 C	0.039 C	72 C	8 C		
Alar	1596845	1.50E-01 I					5500 N	550 N	200 N	310000 N	12000 N		
Aldicarb	116063	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N	570 S	0.036 M
Aldicarb sulfone	1646884	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Aldrin	309002	3.00E-05 I		1.70E+01 I	1.71E+01 I		0.004 C	0.00037 C	0.00019 C	0.34 C	0.038 C	0.5 E	0.005 E
Ally	74223646	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Allyl alcohol	107186	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Allyl chloride	107051	5.00E-02 W	2.86E-04 I				1800 N	1 N	68 N	100000 N	3900 N		
Aluminum	7429905	1.00E+00 E					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Aluminum phosphide	20859738	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		
Amdro	67485294	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Ametryn	834128	9.00E-03 I					330 N	33 N	12 N	18000 N	700 N		
m-Aminophenol	591275	7.00E-02 H					2600 N	260 N	95 N	140000 N	5500 N		
4-Aminopyridine	504245	2.00E-05 H					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
Amitraz	33089611	2.50E-03 I					91 N	9.1 N	3.4 N	5100 N	200 N		
Ammonia	7664417		2.86E-02 I				1000 N	100 N					
Ammonium sulfamate	7773060	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Aniline	62533		2.86E-04 I	5.70E-03 I			10 N	1 N	0.55 C	1000 C	110 C	45 N	0.031 N
Antimony and compounds	7440360	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		
Antimony pentoxide	1314609	5.00E-04 H					18 N	1.8 N	0.68 N	1000 N	39 N		
Antimony potassium tartrate	304610	9.00E-04 H					33 N	3.3 N	1.2 N	1800 N	70 N		
Antimony tetroxide	1332316	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
Antimony trioxide	1309644	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
Apollo	74115245	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Aramite	140578	5.00E-02 H		2.50E-02 I	2.49E-02 I		2.7 C	0.25 C	0.13 C	230 C	26 C		
Arsenic	7440382	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N	380 E	15 E
Arsenic (as carcinogen)	7440382			1.75E+00 I	1.51E+01 I		0.038 C	0.00041 C	0.0018 C	3.3 C	0.37 C	380 E	15 E
Arsine	7784421		1.43E-05 I				0.52 N	0.052 N					
Assure	76578148	9.00E-03 I					330 N	33 N	12 N	18000 N	700 N		
Asulam	3337711	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		

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Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration.

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Atrazine	1912249	3.50E-02 I		2.22E-01 H			0.3 C	0.028 C	0.014 C	26 C	2.9 C		
Avermectin B1	65195553	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		
Azobenzene	103333			1.10E-01 I	1.08E-01 I		0.61 C	0.058 C	0.029 C	52 C	5.8 C		
Barium and compounds	7440393	7.00E-02 I	1.43E-04 A				2600 N	0.52 N	95 N	140000 N	5500 N	350000 E	32 E
Baygon	114261	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Bayleton	43121433	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Baythroid	68359375	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Benefin	1861401	3.00E-01 I					11000 N	1100 N	410 N	610000 N	23000 N		
Benomyl	17804352	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Bentazon	25057890	2.50E-03 I					91 N	9.1 N	3.4 N	5100 N	200 N		
Benzaldehyde	100527	1.00E-01 I				☒	610 N	370 N	140 N	200000 N	7800 N		
Benzene	71432		1.71E-03 E	2.90E-02 I	2.90E-02 I	☒	0.36 C	0.22 C	0.11 C	200 C	22 C	0.5 E	0.02 E
Benzenethiol	108985	1.00E-05 H					0.37 N	0.037 N	0.014 N	20 N	0.78 N		
Benzidine	92875	3.00E-03 I		2.30E+02 I	2.35E+02 I		0.00029 C	0.00003 C	0.00001 C	0.025 C	0.0028 C	1.3 C	1.100E-06 C
Benzoic acid	65850	4.00E+00 I					150000 N	15000 N	5400 N	1E+06 N	310000 N	320 S	280 E
Benzotrichloride	98077			1.30E+01 I			0.0052 C	0.00048 C	0.00024 C	0.44 C	0.049 C	0.012 C	0.000073 C
Benzyl alcohol	100516	3.00E-01 H					11000 N	1100 N	410 N	610000 N	23000 N		
Benzyl chloride	100447			1.70E-01 I		☒	0.062 C	0.037 C	0.019 C	34 C	3.8 C	0.5 C	0.00036 C
Beryllium and compounds	7440417	5.00E-03 I		4.30E+00 I	8.40E+00 I		0.016 C	0.00075 C	0.00073 C	1.3 C	0.15 C	690 E	180 E
Bidrin	141662	1.00E-04 I					3.7 N	0.37 N	0.14 N	200 N	7.8 N		
Biphenthrin (Talstar)	82657043	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
1,1-Biphenyl	92524	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N	9000 S	110 N
Bis(2-chloroethyl)ether	111444			1.10E+00 I	1.16E+00 I	☒	0.0092 C	0.0054 C	0.0029 C	5.2 C	0.58 C	0.3 E	0.0003 E
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 I		7.00E-02 H	3.50E-02 H	☒	0.26 C	0.18 C	0.045 C	82 C	9.1 C		
Bis(chloromethyl)ether	542881			2.20E+02 I	2.17E+02 I	☒	0.00005 C	0.00003 C	0.00001 C	0.026 C	0.0029 C	0.00004 C	1.000E-07 C
Bis(2-chloro-1-methylethyl)ether				7.00E-02 W	7.00E-02 W		0.96 C	0.089 C	0.045 C	82 C	9.1 C		
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 I		1.40E-02 I			4.8 C	0.45 C	0.23 C	410 C	46 C	210 E	11 E
Bisphenol A	80057	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Boron (and borates)	7440428	9.00E-02 I	5.71E-03 H				3300 N	21 N	120 N	180000 N	7000 N		
Boron trifluoride	7637072		2.00E-04 H				7.3 N	0.73 N					
Bromodichloromethane	75274	2.00E-02 I		6.20E-02 I		☒	0.17 C	0.1 C	0.051 C	92 C	10 C	1800 E	0.3 E
Bromoethene	593602				1.10E-01 H	☒	0.096 C	0.057 C					
Bromoform (tribromomethane)	75252	2.00E-02 I		7.90E-03 I	3.85E-03 I	☒	2.4 C	1.6 C	0.4 C	720 C	81 C	46 E	0.5 E
Bromomethane	74839	1.40E-03 I	1.43E-03 I			☒	8.7 N	5.2 N	1.9 N	2900 N	110 N	2 E	0.1 E
4-Bromophenyl phenyl ether	101553	5.80E-02 O					2100 N	210 N	78 N	120000 N	4500 N		
Bromophos	2104963	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
Bromoxynil	1689845	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Bromoxynil octanoate	1689992	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
1,3-Butadiene	106990				9.80E-01 I	☒	0.011 C	0.0064 C				0.0013 C	0.000072 C
1-Butanol	71363	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	9700 E	8 E
Butyl benzyl phthalate	85687	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N	530 E	68 E
Butylate	2008415	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		

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Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration.

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sec-Butylbenzene	135988	1.00E-02 E				☒	61 N	37 N	14 N	20000 N	780 N	80 S	0.27 N
tert-Butylbenzene	104518	1.00E-02 E				☒	61 N	37 N	14 N	20000 N	780 N		
Butylphthalyl butylglycolate	85701	1.00E+00 I					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Cacodylic acid	75605	3.00E-03 H					110 N	11 N	4.1 N	6100 N	230 N		
Cadmium and compounds	7440439	5.00E-04 I			6.30E+00 I		18 N	0.00099 C	0.68 N	1000 N	39 N	920 E	6 E
Caprolactam	105602	5.00E-01 I					18000 N	1800 N	680 N	1E+06 N	39000 N		
Captafol	2425061	2.00E-03 I		8.60E-03 H			7.8 C	0.73 C	0.37 C	670 C	74 C		
Captan	133062	1.30E-01 I		3.50E-03 H			19 C	1.8 C	0.9 C	1600 C	180 C		
Carbaryl	63252	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	0.34 S	23 N
Carbofuran	1563662	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Carbon disulfide	75150	1.00E-01 I	2.86E-03 H			☒	21 N	10 N	140 N	200000 N	7800 N	11 E	14 E
Carbon tetrachloride	56235	7.00E-04 I	5.71E-04 E	1.30E-01 I	5.25E-02 I	☒	0.16 C	0.12 C	0.024 C	44 C	4.9 C	0.2 E	0.03 E
Carbosulfan	55285148	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Carboxin	5234684	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Chloral	75876	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Chloramben	133904	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Chloranil	118752			4.03E-01 H			0.17 C	0.016 C	0.0078 C	14 C	1.6 C		
Chlordane	57749	6.00E-05 I		1.30E+00 I	1.29E+00 I		0.052 C	0.0049 C	0.0024 C	4.4 C	0.49 C	10 E	2 E
Chlorimuron-ethyl	90982324	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Chlorine	7782505	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Chlorine dioxide	10049044		5.71E-05 I				2.1 N	0.21 N					
Chloroacetaldehyde	107200	6.90E-03 O					250 N	25 N	9.3 N	14000 N	540 N		
Chloroacetic acid	79118	2.00E-03 H					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Chloroacetophenone	532274		8.57E-06 I				0.31 N	0.031 N					
4-Chloroaniline	106478	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N	1200 S	0.3 E
Chlorobenzene	108907	2.00E-02 I	5.71E-03 A			☒	39 N	21 N	27 N	41000 N	1600 N	94 E	0.6 E
Chlorobenzilate	510156	2.00E-02 I		2.70E-01 H	2.70E-01 H		0.25 C	0.023 C	0.012 C	21 C	2.4 C		
p-Chlorobenzoic acid	74113	2.00E-01 H					7300 N	730 N	270 N	410000 N	16000 N		
4-Chlorobenzotrifluoride	98566	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N	86 N	7.5 N
2-Chloro-1,3-butadiene	126998	2.00E-02 A	2.00E-03 H			☒	14 N	7.3 N	27 N	41000 N	1600 N		
1-Chlorobutane	109693	4.00E-01 H				☒	2400 N	1500 N	540 N	820000 N	31000 N		
Chlorodibromomethane	124481	2.00E-02 I		8.40E-02 I		☒	0.13 C	0.075 C	0.038 C	68 C	7.6 C	1900 E	0.2 E
Chlorodifluoromethane	75456		1.43e+01 I			☒	87000 N	52000 N					
Chloroethane	75003	4.00E-01 E	2.86E+00 I			☒	8600 N	10000 N	540 N	820000 N	31000 N	2600 S	33 N
2-Chloroethyl vinyl ether	110758	2.50E-02 O				☒	150 N	91 N	34 N	51000 N	2000 N		
Chloroform	67663	1.00E-02 I		6.10E-03 I	8.05E-02 I	☒	0.15 C	0.078 C	0.52 C	940 C	100 C	0.2 E	0.3 E
Chloromethane	74873			1.30E-02 H	6.30E-03 H	☒	1.4 C	0.99 C	0.24 C	440 C	49 C	0.063 C	0.0066 C
4-Chloro-2,2-methylaniline hydrochloride	3165933			4.60E-01 H			0.15 C	0.014 C	0.0069 C	12 C	1.4 C		
4-Chloro-2-methylaniline	95692			5.80E-01 H			0.12 C	0.011 C	0.0054 C	9.9 C	1.1 C		
beta-Chloronaphthalene	91587	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N	2.8 S	140 N
o-Chloronitrobenzene	88733			2.50E-02 H		☒	0.42 C	0.25 C	0.13 C	230 C	26 C		
p-Chloronitrobenzene	100005			1.80E-02 H		☒	0.59 C	0.35 C	0.18 C	320 C	35 C		

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2-Chlorophenol	95578	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N	53000 E	2 E
2-Chloropropane	75296		2.86E-02 H			☒	170 N	100 N				22 N	0.64 N
Chlorothalonil	1897456	1.50E-02 I		1.10E-02 H			6.1 C	0.57 C	0.29 C	520 C	58 C		
o-Chlorotoluene	95498	2.00E-02 I				☒	120 N	73 N	27 N	41000 N	1600 N	1200 N	5.6 N
Chlorpropham	101213	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Chlorpyrifos	2921882	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Chlorpyrifos-methyl	5598130	1.00E-02 H					370 N	37 N	14 N	20000 N	780 N		
Chlorsulfuron	64902723	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Chlorthiophos	60238564	8.00E-04 H					29 N	2.9 N	1.1 N	1600 N	63 N		
Chromium III and compounds	16065831	1.00E+00 I	5.71E-07 W				37000 N	0.0021 N	1400 N	1E+06 N	78000 N		
Chromium VI and compounds	7440473	5.00E-03 I			4.20E+01 I		180 N	0.00015 C	6.8 N	10000 N	390 N	140 E	19 E
Coal tar	8001589				2.20E+00 W			0.0028 C					
Cobalt	7440484	6.00E-02 E					2200 N	220 N	81 N	120000 N	4700 N		
Coke Oven Emissions	8007452				2.17E+00 I			0.0029 C					
Copper and compounds	7440508	3.71E-02 H					1400 N	140 N	50 N	76000 N	2900 N		
Crotonaldehyde	123739	1.00E-02 W		1.90E+00 H	1.90E+00 W		0.035 C	0.0033 C	0.0017 C	3 C	0.34 C		
Cumene	98828	4.00E-02 I	2.57E-03 H				1500 N	9.4 N	54 N	82000 N	3100 N	81 N	65 N
Cyanides:													
Barium cyanide	542621	1.00E-01 W					3700 N	370 N	140 N	200000 N	7800 N		
Calcium cyanide	592018	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Copper cyanide	544923	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Cyanazine	21725462	2.00E-03 H		8.40E-01 H			0.08 C	0.0075 C	0.0038 C	6.8 C	0.76 C		
Cyanogen	460195	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Cyanogen bromide	506683	9.00E-02 I					3300 N	330 N	120 N	180000 N	7000 N		
Cyanogen chloride	506774	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Free cyanide	57125	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Hydrogen cyanide	74908	2.00E-02 I	8.57E-04 I				730 N	3.1 N	27 N	41000 N	1600 N		
Potassium cyanide	151508	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Potassium silver cyanide	506616	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Silver cyanide	506649	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Sodium cyanide	143339	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Zinc cyanide	557211	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Cyclohexanone	108941	5.00E+00 I				☒	30000 N	18000 N	6800 N	1E+06 N	390000 N		
Cyclohexlamine	108918	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Cyhalothrin/Karate	68085858	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Cypermethrin	52315078	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Cyromazine	66215278	7.50E-03 I					270 N	27 N	10 N	15000 N	590 N		
Dacthal	1861321	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Dalapon	75990	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Danitol	39515418	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
DDD	72548			2.40E-01 I			0.28 C	0.026 C	0.013 C	24 C	2.7 C	37 S	0.7 E
DDE	72559			3.40E-01 I			0.2 C	0.018 C	0.0093 C	17 C	1.9 C	10 S	0.5 E

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DDT	50293	5.00E-04 I		3.40E-01 I	3.40E-01 I		0.2 C	0.018 C	0.0093 C	17 C	1.9 C	80 E	1 E
Decabromodiphenyl ether	1163195	1.00E-02 I				☒	61 N	37 N	14 N	20000 N	780 N		
Demeton	8065483	4.00E-05 I					1.5 N	0.15 N	0.054 N	82 N	3.1 N		
Diallate	2303164			6.10E-02 H		☒	0.17 C	0.1 C	0.052 C	94 C	10 C		
Diazinon	333415	9.00E-04 H					33 N	3.3 N	1.2 N	1800 N	70 N	5400 S	2.8 N
Dibenzofuran	132649	4.00E-03 E					150 N	15 N	5.4 N	8200 N	310 N	120 S	120 N
1,4-Dibromobenzene	106376	1.00E-02 I				☒	61 N	37 N	14 N	20000 N	780 N		
1,2-Dibromo-3-chloropropane	96128		5.71E-05 I	1.40E+00 H	2.42E-03 H	☒	0.048 C	0.21 N	0.0023 C	4.1 C	0.46 C	1.9 N	0.00061 M
1,2-Dibromoethane	106934		5.71E-05 H	8.50E+01 I	7.70E-01 I	☒	0.00075 C	0.0081 C	0.00004 C	0.067 C	0.0075 C	0.0058 C	0.00018 M
Dibutyl phthalate	84742	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	100 E	120 E
Dicamba	1918009	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
1,2-Dichlorobenzene	95501	9.00E-02 I	4.00E-02 A			☒	270 N	150 N	120 N	180000 N	7000 N	300 E	6 E
1,3-Dichlorobenzene	541731	8.90E-02 O				☒	540 N	320 N	120 N	180000 N	7000 N		
1,4-Dichlorobenzene	106467		2.29E-01 I	2.40E-02 H		☒	0.44 C	0.26 C	0.13 C	240 C	27 C	7700 E	1 E
3,3'-Dichlorobenzidine	91941			4.50E-01 I			0.15 C	0.014 C	0.007 C	13 C	1.4 C	52 S	0.01 E
1,4-Dichloro-2-butene	764410				9.30E+00 H	☒	0.0011 C	0.00067 C					
Dichlorodifluoromethane	75718	2.00E-01 I	5.71E-02 A			☒	390 N	210 N	270 N	410000 N	16000 N	37 N	7.5 N
1,1-Dichloroethane	75343	1.00E-01 H	1.43E-01 A			☒	810 N	520 N	140 N	200000 N	7800 N	980 E	11 E
1,2-Dichloroethane (EDC)	107062		2.86E-03 E	9.10E-02 I	9.10E-02 I	☒	0.12 C	0.069 C	0.035 C	63 C	7 C	0.3 E	0.01 E
1,1-Dichloroethylene	75354	9.00E-03 I		6.00E-01 I	1.75E-01 I	☒	0.044 C	0.036 C	0.0053 C	9.5 C	1.1 C	0.04 E	0.03 E
1,2-Dichloroethylene (cis)	156592	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	1500 E	0.2 E
1,2-Dichloroethylene (trans)	156605	2.00E-02 I				☒	120 N	73 N	27 N	41000 N	1600 N	3600 E	0.3 E
1,2-Dichloroethylene (mixture)	540590	9.00E-03 H				☒	55 N	33 N	12 N	18000 N	700 N		
2,4-Dichlorophenol	120832	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N	4800 S	0.5 E
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 I				☒	61 N	37 N	14 N	20000 N	780 N	7000 S	1.7 M
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
1,2-Dichloropropane	78875		1.14E-03 I	6.80E-02 H		☒	0.16 C	0.092 C	0.046 C	84 C	9.4 C	11 E	0.02 E
2,3-Dichloropropanol	616239	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
1,3-Dichloropropene	542756	3.00E-04 I	5.71E-03 I	1.75E-01 H	1.30E-01 H	☒	0.077 C	0.048 C	0.018 C	33 C	3.7 C	0.1 E	0.001 E
Dichlorvos	62737	5.00e-04 I	1.43E-04 I	2.90E-01 I			0.23 C	0.022 C	0.011 C	20 C	2.2 C	3.5 C	0.00072 C
Dicofol	115322			4.40E-01 W			0.15 C	0.014 C	0.0072 C	13 C	1.5 C		
Dicyclopentadiene	77736	3.00E-02 H	5.71E-05 A			☒	0.42 N	0.21 N	41 N	61000 N	2300 N		
Dieldrin	60571	5.00E-05 I		1.60E+01 I	1.61E+01 I		0.0042 C	0.00039 C	0.0002 C	0.36 C	0.04 C	2 E	0.001 E
Diesel emissions			1.43E-03 I				52 N	5.2 N					
Diethyl phthalate	84662	8.00E-01 I					29000 N	2900 N	1100 N	1E+06 N	63000 N	520 E	110 E
Diethylene glycol, monobutyl ether	112345		5.71E-03 H				210 N	21 N					
Diethylene glycol, monoethyl ether	111900	2.00E+00 H					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Diethylforamide	617845	1.10E-02 H					400 N	40 N	15 N	22000 N	860 N		
Di(2-ethylhexyl)adipate	103231	6.00E-01 I		1.20E-03 I			56 C	5.2 C	2.6 C	4800 C	530 C		
Diethylstilbestrol	56531			4.70E+03 H			0.00001 C	1E-06 C	7E-07 C	0.0012 C	0.00014 C		
Difenzoquat (Avenge)	43222486	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Diflubenzuron	35367385	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		

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1,1-Difluoroethane	75376		1.14E+01 I			☒	69000 N	42000 N					
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Dimethipin	55290647	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Dimethoate	60515	2.00E-04 I					7.3 N	0.73 N	0.27 N	410 N	16 N		
3,3'-Dimethoxybenzidine	119904			1.40E-02 H			4.8 C	0.45 C	0.23 C	410 C	46 C		
Dimethylamine	124403		5.71E-06 W				0.21 N	0.021 N					
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 H			0.12 C	0.011 C	0.0054 C	9.9 C	1.1 C		
2,4-Dimethylaniline	95681			7.50E-01 H			0.09 C	0.0083 C	0.0042 C	7.6 C	0.85 C		
N-N-Dimethylaniline	121697	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
3,3'-Dimethylbenzidine	119937			9.20E+00 H			0.0073 C	0.00068 C	0.00034 C	0.62 C	0.069 C	29 C	0.00039 C
N,N-Dimethylformamide	68122	1.00E-01 H	8.57E-03 I				3700 N	31 N	140 N	200000 N	7800 N		
1,1-Dimethylhydrazine	57147			2.60E+00 W	3.50E+00 W		0.026 C	0.0018 C	0.0012 C	2.2 C	0.25 C		
1,2-Dimethylhydrazine	540738			3.70E+01 W	3.70E+01 W		0.0018 C	0.00017 C	0.00009 C	0.15 C	0.017 C		
2,4-Dimethylphenol	105679	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N	5400 S	3 E
2,6-Dimethylphenol	576261	6.00E-04 I					22 N	2.2 N	0.81 N	1200 N	47 N		
3,4-Dimethylphenol	95658	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Dimethyl phthalate	131113	1.00E+01 H					370000 N	37000 N	14000 N	1E+06 N	780000 N	1600 E	1200 E
Dimethyl terephthalate	120616	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
1,2-Dinitrobenzene	528290	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
1,3-Dinitrobenzene	99650	1.00E-04 I					3.7 N	0.37 N	0.14 N	200 N	7.8 N		
1,4-Dinitrobenzene	100254	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
2,4-Dinitrophenol	51285	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N	360 N	0.1 E
Dinitrotoluene mixture				6.80E-01 I			0.099 C	0.0092 C	0.0046 C	8.4 C	0.94 C		
2,4-Dinitrotoluene	121142	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N	120 S	0.2 E
2,6-Dinitrotoluene	606202	1.00E-03 H					37 N	3.7 N	1.4 N	2000 N	78 N	370 S	0.1 E
Dinoseb	88857	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
di-n-Octyl phthalate	117840	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N	1000000 S	1000000 E
1,4-Dioxane	123911			1.10E-02 I			6.1 C	0.57 C	0.29 C	520 C	58 C		
Diphenamid	957517	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Diphenylamine	122394	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
1,2-Diphenylhydrazine	122667			8.00E-01 I	7.70E-01 I		0.084 C	0.0081 C	0.0039 C	7.2 C	0.8 C		
Diquat	85007	2.20E-03 I					80 N	8 N	3 N	4500 N	170 N		
Direct black 38	1937377			8.60E+00 H			0.0078 C	0.00073 C	0.00037 C	0.67 C	0.074 C		
Direct blue 6	2602462			8.10E+00 H			0.0083 C	0.00077 C	0.00039 C	0.71 C	0.079 C		
Direct brown 95	16071866			9.30E+00 H			0.0072 C	0.00067 C	0.00034 C	0.62 C	0.069 C		
Disulfoton	298044	4.00E-05 I					1.5 N	0.15 N	0.054 N	82 N	3.1 N		
1,4-Dithiane	505293	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Diuron	330541	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Dodine	2439103	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Endosulfan	115297	6.00E-03 I					220 N	22 N	8.1 N	12000 N	470 N	1 S	3 E
Endothall	145733	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		

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Endrin	72208	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N	16 S	0.4 E
Epichlorohydrin	106898	2.00E-03 H	2.86E-04 I	9.90E-03 I	4.20E-03 I		6.8 C	1 N	0.32 C	580 C	65 C		
1,2-Epoxybutane	106887		5.71E-03 I				210 N	21 N					
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Ethion	563122	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
2-Ethoxyethanol acetate	111159	3.00E-01 A					11000 N	1100 N	410 N	610000 N	23000 N		
2-Ethoxyethanol	110805	4.00E-01 H	5.71E-02 I				15000 N	210 N	540 N	820000 N	31000 N		
Ethyl acrylate	140885			4.80E-02 H			1.4 C	0.13 C	0.066 C	120 C	13 C		
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Ethyl ether	60297	2.00E-01 I				☒	1200 N	730 N	270 N	410000 N	16000 N		
Ethyl methacrylate	97632	9.00E-02 H					3300 N	330 N	120 N	180000 N	7000 N		
Ethyl acetate	141786	9.00E-01 I					33000 N	3300 N	1200 N	1E+06 N	70000 N		
Ethylbenzene	100414	1.00E-01 I	2.86E-01 I			☒	1300 N	1000 N	140 N	200000 N	7800 N	260 E	5 E
Ethylene cyanohydrin	109784	3.00E-01 H					11000 N	1100 N	410 N	610000 N	23000 N		
Ethylene diamine	107153	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Ethylene glycol	107211	2.00E+00 I					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Ethylene glycol, monobutyl ether	111762		5.71E-03 H				210 N	21 N					
Ethylene oxide	75218			1.02E+00 H	3.50E-01 H		0.066 C	0.018 C	0.0031 C	5.6 C	0.63 C		
Ethylene thiourea (ETU)	96457	8.00E-05 I		1.19E-01 H			0.57 C	0.053 C	0.027 C	48 C	5.4 C		
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 I					0.37 N	0.037 N	0.014 N	20 N	0.78 N		
Ethylnitrosourea	759739			1.40E+02 W			0.00048 C	0.00005 C	0.00002 C	0.041 C	0.0046 C		
Ethylphthalyl ethyl glycolate	84720	3.00E+00 I					110000 N	11000 N	4100 N	1E+06 N	230000 N		
Express	10120	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
Fenamiphos	22224926	2.50E-04 I					9.1 N	0.91 N	0.34 N	510 N	20 N		
Fluometuron	2164172	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Fluoride	7782414	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Fluoridone	59756604	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Flurprimidol	56425913	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Flutolanil	66332965	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Fluvalinate	69409945	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Folpet	133073	1.00E-01 I		3.50E-03 I			19 C	1.8 C	0.9 C	1600 C	180 C		
Fomesafen	72178020			1.90E-01 I			0.35 C	0.033 C	0.017 C	30 C	3.4 C		
Fonofos	944229	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Formaldehyde	50000	2.00E-01 I			4.55E-02 I		7300 N	0.14 C	270 N	410000 N	16000 N		
Formic Acid	64186	2.00E+00 H					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Fosetyl-al	39148248	3.00E+00 I					110000 N	11000 N	4100 N	1E+06 N	230000 N		
Furan	110009	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Furazolidone	67458			3.80E+00 H			0.018 C	0.0016 C	0.00083 C	1.5 C	0.17 C		
Furfural	98011	3.00E-03 I	1.43E-02 A				110 N	52 N	4.1 N	6100 N	230 N		
Furium	531828			5.00E+01 H			0.0013 C	0.00013 C	0.00006 C	0.11 C	0.013 C		
Furmecyclox	60568050			3.00E-02 I			2.2 C	0.21 C	0.11 C	190 C	21 C		
Glufosinate-ammonium	77182822	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		

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Glycidaldehyde	765344	4.00E-04 I	2.86E-04 H				15 N	1 N	0.54 N	820 N	31 N		
Glyphosate	1071836	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Haloxyfop-methyl	69806402	5.00E-05 I					1.8 N	0.18 N	0.068 N	100 N	3.9 N		
Harmony	79277273	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
HCH (alpha)	319846			6.30E+00 I	6.30E+00 I		0.011 C	0.00099 C	0.0005 C	0.91 C	0.1 C	0.9 E	0.0004 E
HCH (beta)	319857			1.80E+00 I	1.80E+00 I		0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C	16 E	0.002 E
HCH (gamma) Lindane	58899	3.00E-04 I		1.30E+00 H			0.052 C	0.0048 C	0.0024 C	4.4 C	0.49 C	4.2 C	0.006 E
HCH-technical	608731			1.80E+00 I	1.79E+00 I		0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C		
Heptachlor	76448	5.00E-04 I		4.50E+00 I	4.55E+00 I	☒	0.0023 C	0.0014 C	0.0007 C	1.3 C	0.14 C	0.3 E	0.06 E
Heptachlor epoxide	1024573	1.30E-05 I		9.10E+00 I	9.10E+00 I	☒	0.0012 C	0.00069 C	0.00035 C	0.63 C	0.07 C	1 E	0.03 E
Hexabromobenzene	87821	2.00E-03 I				☒	12 N	7.3 N	2.7 N	4100 N	160 N		
Hexachlorobenzene	118741	8.00E-04 I		1.60E+00 I	1.61E+00 I	☒	0.0066 C	0.0039 C	0.002 C	3.6 C	0.4 C	1 E	0.8 E
Hexachlorobutadiene	87683	2.00E-04 H		7.80E-02 I	7.70E-02 I	☒	0.14 C	0.081 C	0.04 C	73 C	8.2 C	1 E	0.1 E
Hexachlorocyclopentadiene	77474	7.00E-03 I	2.00E-05 H			☒	0.15 N	0.073 N	9.5 N	14000 N	550 N	2 E	10 E
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 I	4.55E+03 I		0.00001 C	1E-06 C	5E-07 C	0.0009 C	0.0001 C		
Hexachloroethane	67721	1.00E-03 I		1.40E-02 I	1.40E-02 I	☒	0.75 C	0.45 C	0.23 C	410 C	46 C	49 E	0.2 E
Hexachlorophene	70304	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 I		1.10E-01 I			0.61 C	0.057 C	0.029 C	52 C	5.8 C		
1,6-Hexamethylene diisocyanate	822060		2.86E-06 I				0.1 N	0.01 N					
n-Hexane	110543	6.00E-02 H	5.71E-02 I			☒	350 N	210 N	81 N	120000 N	4700 N	32 N	13 N
Hexazinone	51235042	3.30E-02 I					1200 N	120 N	45 N	67000 N	2600 N		
Hydrazine, hydrazine sulfate	302012			3.00E+00 I	1.71E+01 I		0.022 C	0.00037 C	0.0011 C	1.9 C	0.21 C		
Hydrogen chloride	7647010		2.00E-03 I				73 N	7.3 N					
Hydrogen sulfide	7783064	3.00E-03 I	2.57E-04 I				110 N	0.94 N	4.1 N	6100 N	230 N		
Hydroquinone	123319	4.00E-02 H					1500 N	150 N	54 N	82000 N	3100 N		
Imazalil	35554440	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Imazaquin	81335377	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Iprodione	36734197	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Isobutanol	78831	3.00E-01 I				☒	1800 N	1100 N	410 N	610000 N	23000 N		
Isophorone	78591	2.00E-01 I		9.50E-04 I			71 C	6.6 C	3.3 C	6000 C	670 C	3400 E	0.2 E
Isopropalin	33820530	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Isopropyl methyl phosphonic acid	1832548	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Isoxaben	82558507	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Kepone	143500			1.80E+01 E			0.0037 C	0.00035 C	0.00018 C	0.32 C	0.035 C		
Lactofen	77501634	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Linuron	330552	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Lithium	7439932	2.00E-02 E					730 N	73 N	27 N	41000 N	1600 N		
Londax	83056996	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Malathion	121755	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Maleic anhydride	108316	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Maleic hydrazide	123331	5.00E-01 I					18000 N	1800 N	680 N	1E+06 N	39000 N		
Malononitrile	109773	2.00E-05 H					0.73 N	0.073 N	0.027 N	41 N	1.6 N		

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Mancozeb	8018017	3.00E-02 H					1100 N	110 N	41 N	61000 N	2300 N		
Maneb	12427382	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Manganese and compounds	7439965	5.00E-03 I	1.43e-05 I				180 N	0.052 N	6.8 N	10000 N	390 N		
Mephosfolan	950107	9.00E-05 H					3.3 N	0.33 N	0.12 N	180 N	7 N		
Mepiquat chloride	24307264	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Mercury (inorganic)	7439976	3.00E-04 H	8.57E-05 H				11 N	0.31 N	0.41 N	610 N	23 N	7 E	3 E
Mercury (methyl)	22967926	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Merphos	150505	3.00E-05 I					1.1 N	0.11 N	0.041 N	61 N	2.3 N		
Merphos oxide	78488	3.00E-05 I					1.1 N	0.11 N	0.041 N	61 N	2.3 N		
Metalaxyl	57837191	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Methacrylonitrile	126987	1.00E-04 I	2.00E-04 A				3.7 N	0.73 N	0.14 N	200 N	7.8 N		
Methamidophos	10265926	5.00E-05 I					1.8 N	0.18 N	0.068 N	100 N	3.9 N		
Methanol	67561	5.00E-01 I					18000 N	1800 N	680 N	1E+06 N	39000 N		
Methidathion	950378	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Methomyl	16752775	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Methoxychlor	72435	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N	41 S	62 E
2-Methoxyethanol acetate	110496	2.00E-03 A					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Methoxyethanol	109864	1.00E-03 H	5.71E-03 I				37 N	21 N	1.4 N	2000 N	78 N		
2-Methoxy-5-nitroaniline	99592			4.60E-02 H			1.5 C	0.14 C	0.069 C	120 C	14 C		
Methyl acetate	79209	1.00E+00 H					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Methyl acrylate	96333	3.00E-02 A					1100 N	110 N	41 N	61000 N	2300 N		
2-Methylaniline hydrochloride	636215			1.80E-01 H			0.37 C	0.035 C	0.018 C	32 C	3.5 C		
2-Methylaniline	95534			2.40E-01 H			0.28 C	0.026 C	0.013 C	24 C	2.7 C		
Methyl chlorocarbonate	79221	1.00E+00 W					37000 N	3700 N	1400 N	1E+06 N	78000 N		
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
2-(2-Methyl-14-chlorophenoxy)propionic aci	93652	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Methylcyclohexane	108872		8.57E-01 H				31000 N	3100 N				60 S	1500 N
Methylene bromide	74953	1.00E-02 A				☒	61 N	37 N	14 N	20000 N	780 N		
Methylene chloride	75092	6.00E-02 I	8.57E-01 H	7.50E-03 I	1.64E-03 I	☒	4.1 C	3.8 C	0.42 C	760 C	85 C	7 E	0.01 E
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 H		1.30E-01 H	1.30E-01 H		0.52 C	0.048 C	0.024 C	44 C	4.9 C		
4,4'-Methylenebisbenzeneamine	101779			2.50E-01 W			0.27 C	0.025 C	0.013 C	23 C	2.6 C		
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611			4.60E-02 I			1.5 C	0.14 C	0.069 C	120 C	14 C		
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 I			☒	0.035 N	0.021 N					
Methyl ethyl ketone	78933	6.00E-01 I	2.86E-01 I			☒	1900 N	1000 N	810 N	1E+06 N	47000 N		
Methyl hydrazine	60344			1.10E+00 W			0.061 C	0.0057 C	0.0029 C	5.2 C	0.58 C		
Methyl isobutyl ketone	108101	8.00E-02 H	2.29E-02 A				2900 N	84 N	110 N	160000 N	6300 N		
Methyl methacrylate	80626	8.00E-02 H					2900 N	290 N	110 N	160000 N	6300 N		
2-Methyl-5-nitroaniline	99558			3.30E-02 H			2 C	0.19 C	0.096 C	170 C	19 C		
Methyl parathion	298000	2.50E-04 I					9.1 N	0.91 N	0.34 N	510 N	20 N	28 S	0.041 N
2-Methylphenol (o-cresol)	95487	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N	12000 S	6 E
3-Methylphenol (m-cresol)	103394	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		

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4-Methylphenol (p-cresol)	106445	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
Methyl styrene (mixture)	25013154	6.00E-03 A	1.14E-02 A			☒	60 N	42 N	8.1 N	12000 N	470 N		
Methyl styrene (alpha)	98839	7.00E-02 A				☒	430 N	260 N	95 N	140000 N	5500 N	8.8 S	7.5 N
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 E	8.57E-01 I			☒	180 N	3100 N	6.8 N	10000 N	390 N		
Metolaclor (Dual)	51218452	1.50E-01 H					5500 N	550 N	200 N	310000 N	12000 N		
Metribuzin	21807649	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Mirex	2385855	2.00E-04 I		1.80E+00 W			0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C		
Molinate	2212671	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Molybdenum	7439987	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Monochloramine	10599903	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Naled	300765	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Naphthylamine	91598			1.30e+02 E			0.00052 C	0.00005 C	0.00002 C	0.044 C	0.0049 C		
Napropamide	15299997	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Nickel refinery dust					8.40E-01 I			0.0075 C					
Nickel and compounds	7440020	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N	6900 E	21 E
Nickel subsulfide	12035722				1.70E+00 I			0.0037 C					
Nitrapyrin	1929824	1.50E-03 W					55 N	5.5 N	2 N	3100 N	120 N		
Nitrate	14797558	1.60E+00 I					58000 N	5800 N	2200 N	1E+06 N	130000 N		
Nitric Oxide	10102439	1.00E-01 W					3700 N	370 N	140 N	200000 N	7800 N		
Nitrite	14797650	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
2-Nitroaniline	88744	6.00E-05 W	5.71E-05 H				2.2 N	0.21 N	0.081 N	120 N	4.7 N		
3-Nitroaniline	99092	3.00E-03 O					110 N	11 N	4.1 N	6100 N	230 N		
4-Nitroaniline	100016	3.00E-03 O					110 N	11 N	4.1 N	6100 N	230 N		
Nitrobenzene	98953	5.00E-04 I	5.71E-04 A			☒	3.4 N	2.1 N	0.68 N	1000 N	39 N	110 E	0.09 E
Nitrofurantoin	67209	7.00E-02 H					2600 N	260 N	95 N	140000 N	5500 N		
Nitrofurazone	59870			1.50E+00 H	9.40E+00 H		0.045 C	0.00067 C	0.0021 C	3.8 C	0.43 C		
Nitrogen dioxide	10102440	1.00E+00 W					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Nitroguanidine	556887	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
4-Nitrophenol	100027	6.20E-02 O					2300 N	230 N	84 N	130000 N	4800 N		
2-Nitropropane	79469		5.71E-03 I		9.40E+00 H		210 N	0.00067 C					
N-Nitrosodi-n-butylamine	924163			5.40E+00 I	5.60E+00 I		0.012 C	0.0011 C	0.00058 C	1.1 C	0.12 C		
N-Nitrosodiethanolamine	1116547			2.80E+00 I			0.024 C	0.0022 C	0.0011 C	2 C	0.23 C		
N-Nitrosodiethylamine	55185			1.50E+02 I	1.51E+02 I		0.00045 C	0.00004 C	0.00002 C	0.038 C	0.0043 C		
N-Nitrosodimethylamine	62759			5.10E+01 I	4.90E+01 I		0.0013 C	0.00013 C	0.00006 C	0.11 C	0.013 C		
N-Nitrosodiphenylamine	86306			4.90E-03 I			14 C	1.3 C	0.64 C	1200 C	130 C	29 C	0.2 E
N-Nitroso di-n-propylamine	621647			7.00E+00 I			0.0096 C	0.00089 C	0.00045 C	0.82 C	0.091 C	0.014 C	0.00002 E
N-Nitroso-N-methylethylamine	10595956			2.20E+01 I			0.0031 C	0.00028 C	0.00014 C	0.26 C	0.029 C		
N-Nitrosopyrrolidine	930552			2.10E+00 I	2.13E+00 I		0.032 C	0.0029 C	0.0015 C	2.7 C	0.3 C		
m-Nitrotoluene	99081	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	460 S	0.42 N
o-Nitrotoluene	88722	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	460 S	0.42 N
p-Nitrotoluene	99990	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	460 S	0.42 N
Norflurazon	27314132	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		

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NuStar	85509199	7.00E-04 I					26 N	2.6 N	0.95 N	1400 N	55 N		
Octabromodiphenyl ether	32536520	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Octamethylpyrophosphoramide	152169	2.00E-03 H					73 N	7.3 N	2.7 N	4100 N	160 N		
Oryzalin	19044883	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Oxadiazon	19666309	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Oxamyl	23135220	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Oxyfluorfen	42874033	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Paclobutrazol	76738620	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Paraquat	1910425	4.50E-03 I					160 N	16 N	6.1 N	9200 N	350 N		
Parathion	56382	6.00E-03 H					220 N	22 N	8.1 N	12000 N	470 N	110 S	3.9 N
Pebulate	1114712	5.00E-02 H					1800 N	180 N	68 N	100000 N	3900 N		
Pendimethalin	40487421	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Pentabromo-6-chloro cyclohexane	87843			2.30E-02 H			2.9 C	0.27 C	0.14 C	250 C	28 C		
Pentabromodiphenyl ether	32534819	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Pentachlorobenzene	608935	8.00E-04 I				☒	4.9 N	2.9 N	1.1 N	1600 N	63 N	570 N	48 N
Pentachloronitrobenzene	82688	3.00E-03 I		2.60E-01 H		☒	0.041 C	0.024 C	0.012 C	22 C	2.5 C		
Pentachlorophenol	87865	3.00E-02 I		1.20E-01 I			0.56 C	0.052 C	0.026 C	48 C	5.3 C	7.9 C	0.2 E
Permethrin	52645531	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Phenmedipham	13684634	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Phenol	108952	6.00E-01 I					22000 N	2200 N	810 N	1E+06 N	47000 N	21000 S	49 E
m-Phenylenediamine	108452	6.00E-03 I					220 N	22 N	8.1 N	12000 N	470 N		
p-Phenylenediamine	106503	1.90E-01 H					6900 N	690 N	260 N	390000 N	15000 N		
Phenylmercuric acetate	62384	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
2-Phenylphenol	90437			1.94E-03 H			35 C	3.2 C	1.6 C	3000 C	330 C		
Phorate	298022	2.00E-04 H					7.3 N	0.73 N	0.27 N	410 N	16 N		
Phosmet	732116	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Phosphine	7803512	3.00E-04 I	8.57E-06 H				11 N	0.031 N	0.41 N	610 N	23 N		
Phosphorus (white)	7723140	2.00E-05 I					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
p-Phthalic acid	100210	1.00E+00 H					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Phthalic anhydride	85449	2.00E+00 I	3.43E-02 H				73000 N	130 N	2700 N	1E+06 N	160000 N		
Picloram	1918021	7.00E-02 I					2600 N	260 N	95 N	140000 N	5500 N		
Pirimiphos-methyl	29232937	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Polybrominated biphenyls		7.00E-06 H		8.90E+00 H			0.0076 C	0.0007 C	0.00035 C	0.64 C	0.072 C		
Polychlorinated biphenyls (PCBs)	1336363			7.70E+00 I			0.0087 C	0.00081 C	0.00041 C	0.74 C	0.083 C		8.2 E
Aroclor 1016	12674112	7.00E-05 I					2.6 N	0.26 N	0.095 N	140 N	5.5 N		
Aroclor 1254	11097691	2.00E-05 I					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
Polychlorinated terphenyls (PCTs)				4.50E+00 E			0.015 C	0.0014 C	0.0007 C	1.3 C	0.14 C		
Polynuclear aromatic hydrocarbons													
Acenaphthene	83329	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N	120 S	200 E
Anthracene	120127	3.00E-01 I					11000 N	1100 N	410 N	610000 N	23000 N	6.8 S	4300 E
Benz[a]anthracene	56553			7.30E-01 E	6.10E-01 E		0.092 C	0.01 C	0.0043 C	7.8 C	0.88 C	27 S	0.7 E

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Benzo[b]fluoranthene	205992			7.30E-01 E	6.10E-01 E		0.092 C	0.01 C	0.0043 C	7.8 C	0.88 C	23 S	4 E
Benzo[k]fluoranthene	207089			7.30E-02 E	6.10E-02 E		0.92 C	0.1 C	0.043 C	78 C	8.8 C		4 E
Benzo[a]pyrene	50328			7.30E+00 I	6.10E+00 W		0.0092 C	0.001 C	0.00043 C	0.78 C	0.088 C	11 S	4 E
Carbazole	86748			2.00E-02 H			3.4 C	0.31 C	0.16 C	290 C	32 C	11 S	0.5 E
Chrysene	218019			7.30E-03 E	6.10E-03 E		9.2 C	1 C	0.43 C	780 C	88 C	3.6 S	1 E
Dibenz[ah]anthracene	53703			7.30E+00 E	6.10E+00 E		0.0092 C	0.001 C	0.00043 C	0.78 C	0.088 C	7.2 S	11 E
Fluoranthene	206440	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N	68 S	980 E
Fluorene	86737	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N	89 S	160 E
Indeno[1,2,3-cd]pyrene	193395			7.30E-01 E	6.10E-01 E		0.092 C	0.01 C	0.0043 C	7.8 C	0.88 C	280 S	35 E
Naphthalene	91203	4.00E-02 W					1500 N	150 N	54 N	82000 N	3100 N	180 S	30 E
Pyrene	129000	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N	56 S	1400 E
Prochloraz	67747095	9.00E-03 I		1.50E-01 I			0.45 C	0.042 C	0.021 C	38 C	4.3 C		
Profluralin	26399360	6.00E-03 H					220 N	22 N	8.1 N	12000 N	470 N		
Prometon	1610180	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Prometryn	7287196	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Pronamide	23950585	7.50E-02 I					2700 N	270 N	100 N	150000 N	5900 N		
Propachlor	1918167	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Propanil	709988	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Propargite	2312358	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Propargyl alcohol	107197	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Propazine	139402	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Propham	122429	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Propiconazole	60207901	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Propylene glycol	57556	2.00E+01 H					730000 N	73000 N	27000 N	1E+06 N	1000000 N		
Propylene glycol, monoethyl ether	52125538	7.00E-01 H					26000 N	2600 N	950 N	1E+06 N	55000 N		
Propylene glycol, monomethyl ether	107982	7.00E-01 H	5.71E-01 I				26000 N	2100 N	950 N	1E+06 N	55000 N		
Propylene oxide	75569		8.57E-03 I	2.40E-01 I	1.29E-02 I		0.28 C	0.49 C	0.013 C	24 C	2.7 C		
Pursuit	81335775	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Pydrin	51630581	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Pyridine	110861	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Quinalphos	13593038	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
Quinoline	91225			1.20E+01 H			0.0056 C	0.00052 C	0.00026 C	0.48 C	0.053 C		
Resmethrin	10463868	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Ronnel	299843	5.00E-02 H					1800 N	180 N	68 N	100000 N	3900 N		
Rotenone	83794	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Savey	78587050	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Selenious Acid	7783008	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Selenium	7782492	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		3 E
Selenourea	630104	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
Sethoxydim	74051802	9.00E-02 I					3300 N	330 N	120 N	180000 N	7000 N		
Silver and compounds	7440224	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Simazine	122349	5.00E-03 I		1.20E-01 H			0.56 C	0.052 C	0.026 C	48 C	5.3 C		

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Sodium azide	26628228	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Sodium diethyldithiocarbamate	148185	3.00E-02 I		2.70E-01 H			0.25 C	0.023 C	0.012 C	21 C	2.4 C		
Sodium fluoroacetate	62748	2.00E-05 I					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
Sodium metavanadate	13718268	1.00E-03 H					37 N	3.7 N	1.4 N	2000 N	78 N		
Strontium, stable	7440246	6.00E-01 I					22000 N	2200 N	810 N	1E+06 N	47000 N		
Strychnine	57249	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Styrene	100425	2.00E-01 I	2.86E-01 I			☒	1600 N	1000 N	270 N	410000 N	16000 N	1400 E	2 E
Systhane	88671890	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
2,3,7,8-TCDD (dioxin)	1746016			1.56E+05 H	1.16E+05 H		4E-07 C	5E-08 C	C	4E-05 C	4E-06 C		
Tebuthiuron	34014181	7.00E-02 I					2600 N	260 N	95 N	140000 N	5500 N		
Temephos	3383968	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Terbacil	5902512	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Terbufos	13071799	2.50E-05 H					0.91 N	0.091 N	0.034 N	51 N	2 N		
Terbutryn	886500	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 I				☒	1.8 N	1.1 N	0.41 N	610 N	23 N	91 N	0.69 N
1,1,1,2-Tetrachloroethane	630206	3.00E-02 I		2.60E-02 I	2.59E-02 I	☒	0.41 C	0.24 C	0.12 C	220 C	25 C		
1,1,2,2-Tetrachloroethane	79345			2.00E-01 I	2.03E-01 I	☒	0.052 C	0.031 C	0.016 C	29 C	3.2 C	0.4 E	0.001 E
Tetrachloroethylene (PCE)	127184	1.00E-02 I		5.20E-02 E	2.03E-03 E	☒	1.1 C	3.1 C	0.061 C	110 C	12 C	11 E	0.04 E
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
p,a,a,a-Tetrachlorotoluene	5216251			2.00E+01 H		☒	0.00053 C	0.00031 C	0.00016 C	0.29 C	0.032 C		
Tetrachlorovinphos	961115	3.00E-02 I		2.40E-02 H			2.8 C	0.26 C	0.13 C	240 C	27 C		
Tetraethyldithiopyrophosphate	3689245	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
Lead (tetraethyl)	78002	1.00E-07 I					0.0037 N	0.00037 N	0.00014 N	0.2 N	0.0078 N	0.00068 N	0.000034 N
Thallic oxide	1314325	7.00E-05 W					2.6 N	0.26 N	0.095 N	140 N	5.5 N		
Thallium													0.4 E
Thallium acetate	563688	9.00E-05 I					3.3 N	0.33 N	0.12 N	180 N	7 N		
Thallium carbonate	6533739	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
Thallium chloride	7791120	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
Thallium nitrate	10102451	9.00E-05 I					3.3 N	0.33 N	0.12 N	180 N	7 N		
Thallium selenite	12039520	9.00E-05 W					3.3 N	0.33 N	0.12 N	180 N	7 N		
Thallium sulfate	7446186	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
Thiobencarb	28249776	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 H					1100 N	110 N	41 N	61000 N	2300 N		
Thiofanox	39196184	3.00E-04 H					11 N	1.1 N	0.41 N	610 N	23 N		
Thiophanate-methyl	23564058	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Thiram	137268	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Tin and compounds		6.00E-01 H					22000 N	2200 N	810 N	1E+06 N	47000 N		
Toluene	108883	2.00E-01 I	1.14E-01 I			☒	750 N	420 N	270 N	410000 N	16000 N	520 E	5 E
Toluene-2,4-diamine	95807			3.20E+00 H			0.021 C	0.002 C	0.00099 C	1.8 C	0.2 C		
Toluene-2,5-diamine	95705	6.00E-01 H					22000 N	2200 N	810 N	1E+06 N	47000 N		
Toluene-2,6-diamine	823405	2.00E-01 H					7300 N	730 N	270 N	410000 N	16000 N		
p-Toluidine	106490			1.90E-01 H			0.35 C	0.033 C	0.017 C	30 C	3.4 C		

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Toxaphene	8001352			1.10E+00 I	1.12E+00 I		0.061 C	0.0056 C	0.0029 C	5.2 C	0.58 C	5 E	0.04 E
Tralomethrin	66841256	7.50E-03 I					270 N	27 N	10 N	15000 N	590 N		
Triallate	2303175	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Triasulfuron	82097505	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
1,2,4-Tribromobenzene	615543	5.00E-03 I				☒	30 N	18 N	6.8 N	10000 N	390 N		
Tributyltin oxide (TBTO)	56359	3.00E-05 I					1.1 N	0.11 N	0.041 N	61 N	2.3 N		
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 H			2.3 C	0.22 C	0.11 C	200 C	22 C		
2,4,6-Trichloroaniline	634935			3.40E-02 H			2 C	0.18 C	0.093 C	170 C	19 C		
1,2,4-Trichlorobenzene	120821	1.00E-02 I	5.71e-02 H			☒	190 N	210 N	14 N	20000 N	780 N	240 E	2 E
1,1,1-Trichloroethane	71556	9.00E-02 W	2.86E-01 W			☒	1300 N	1000 N	120 N	180000 N	7000 N	980 E	0.9 E
1,1,2-Trichloroethane	79005	4.00E-03 I		5.70E-02 I	5.60E-02 I	☒	0.19 C	0.11 C	0.055 C	100 C	11 C	0.8 E	0.01 E
Trichloroethylene (TCE)	79016	6.00E-03 E		1.10E-02 W	6.00E-03 E	☒	1.6 C	1 C	0.29 C	520 C	58 C	3 E	0.02 E
Trichlorofluoromethane	75694	3.00E-01 I	2.00E-01 A			☒	1300 N	730 N	410 N	610000 N	23000 N	790 N	13 N
2,4,5-Trichlorophenol	95954	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	8200 S	120 E
2,4,6-Trichlorophenol	88062			1.10E-02 I	1.09E-02 I		6.1 C	0.57 C	0.29 C	520 C	58 C	150 C	0.05 E
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
1,1,2-Trichloropropane	598776	5.00E-03 I				☒	30 N	18 N	6.8 N	10000 N	390 N	13 N	0.14 N
1,2,3-Trichloropropane	96184	6.00E-03 I		7.00e+00 I		☒	0.0015 C	0.00089 C	0.00045 C	0.82 C	0.091 C	0.00003 C	6.000E-06 C
1,2,3-Trichloropropene	96195	5.00E-03 H				☒	30 N	18 N	6.8 N	10000 N	390 N		
1,1,2-Trichloro-1,2,2- trifluoroethane	76131	3.00E+01 I	8.57E+00 H			☒	59000 N	31000 N	41000 N	1E+06 N	1000000 N	2400 S	3100 N
Tridiphane	58138082	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Triethylamine	121448		2.00E-03 I				73 N	7.3 N					
Trifluralin	1582098	7.50E-03 I		7.70E-03 I			8.7 C	0.81 C	0.41 C	740 C	83 C		
1,2,4-Trimethylbenzene	95636	5.00e-04 E				☒	3 N	1.8 N	0.68 N	1000 N	39 N		
1,3,5-Trimethylbenzene	108678	4.00e-04 E				☒	2.4 N	1.5 N	0.54 N	820 N	31 N	6.8 N	0.26 N
Trimethyl phosphate	512561			3.70E-02 H			1.8 C	0.17 C	0.085 C	150 C	17 C		
1,3,5-Trinitrobenzene	99354	5.00E-05 I					1.8 N	0.18 N	0.068 N	100 N	3.9 N		
Trinitrophenylmethylnitramine	479458	1.00E-02 H					370 N	37 N	14 N	20000 N	780 N		
2,4,6-Trinitrotoluene	118967	5.00E-04 I		3.00E-02 I			2.2 C	0.21 C	0.11 C	190 C	21 C		
Uranium (soluble salts)	7440611	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Vanadium	7440622	7.00E-03 H					260 N	26 N	9.5 N	14000 N	550 N		
Vanadium pentoxide	1314621	9.00E-03 I					330 N	33 N	12 N	18000 N	700 N		
Vanadium sulfate	36907423	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Vernam	1929777	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Vinclozolin	50471448	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Vinyl acetate	108054	1.00E+00 H	5.71E-02 I				37000 N	210 N	1400 N	1E+06 N	78000 N	370 E	84 E
Vinyl bromide	593602		8.57E-04 I			☒	5.2 N	3.1 N				2 N	0.018 N
Vinyl chloride	75014			1.90E+00 H	3.00E-01 H	☒	0.019 C	0.021 C	0.0017 C	3 C	0.34 C	0.002 E	0.01 E
Warfarin	81812	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
m-Xylene	108323	2.00E+00 H	2.00E-01 W			☒	1400 N	730 N	2700 N	1E+06 N	160000 N	950 S	240 N
o-Xylene	95476	2.00E+00 H	2.00E-01 W			☒	1400 N	730 N	2700 N	1E+06 N	160000 N	730 S	150 N

Source: I=IRIS H=HEAST A=HEAST alternate W=Withdrawn from IRIS or HEAST E=EPA-ECAO Regional Support provisional value O=Other EPA documents.

Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration.

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
p-Xylene	106423		8.57E-02 w			☒	520 N	310 N				1000 S	220 N
Xylene (mixed)	1330207	2.00E+00 I				☒	12000 N	7300 N	2700 N	1E+06 N	160000 N	320 E	74 E
Zinc	7440666	3.00E-01 I					11000 N	1100 N	410 N	610000 N	23000 N		42000 E
Zinc phosphide	1314847	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Zineb	12122677	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		

APPENDIX E

RSI CLOSURE REPORT

INDEX LISTING

SECTION 1---Company cover letter

SECTION 2---Narrative of project

SECTION 3---Analyses of lab test

SECTION 4---Disposal Transportation Info

Section 5---Survey prints and one-line drawing

Section 6---Progress photos and closure photos
Pages 1 thru 22

REMEDIATION SERVICES INCORPORATED

September 13, 1994

SEP 23 1994

Closure Report: DACA45-94-B-0100

The completion of Project DACA45-94-B-0100 located at Cannon Air Force Base, Clovis, N.M. has been completed per the terms of the contract as defined by the base Administrative Contracting Officer, Karen Durham-Aquilera.

The company, R.S.I., submits the following attached pages per the contract requirements for the closure report 3.10.

Also we would like to note there were no recordable accidents on this project.

John L. Inglehart
President, R.S.I.

Enclosures

924 N.W. 60TH STREET
OKLAHOMA CITY, OKLAHOMA 73118
Phone (405) 840-4434
Fax (405) 840-9373

4629 S. HARVARD
TULSA, OKLAHOMA 74135
Phone (918) 749-6393
Fax (918) 743-3981

REMEDIATION SERVICES INCORPORATED

R.S.I. representatives reported to Cannon Air Force Base on 7/25/94 for meeting with the Corps representatives to discuss project and tour of site.

Work was begun on 7/26/94 to pump out and clean OWS for demolition. OWS was cleaned and broken up end of the day on 7/31/94. Samples taken, enclosures C & D.

On 8/1/94 stockpile dirt has to be placed onto 80 mil membrane plastic. Membrane arrives 8/2/94 and soil is moved onto membrane. See enclosure I, page 11.

From 8/3 to 8/11/94 R.S.I. continues to remove suspect soil from site and stockpiles. The site excavation has approached 60 feet long, 30 feet wide and 25 feet deep. Soil samples taken, enclosure C, D & I.

On 8/11/94 the Corps insist that the walls of site be sloped to prevent cave in and that an air monitor be brought on-site to monitor fumes within site hole. See enclosure I, page 14.

On 8/12/94 walls are sloped and on 8/13/94 an air monitor is made available. Also Corps stops further hauling of contaminated soil from base, the Corps wants to get results of lead content of soil before they release any further soil for hauling.

On 8/16/94 Lydick Engineering surveys site to figure amount of soil removed from hole. Approximately 186 tons had been hauled off site by this time. Also on 8/16/94 the Corps tells RSI to put all but the concrete from the OWS and related equipment that was removed back into the hole. See enclosure H.

On 8/20/94 backfill and compaction started. See enclosure I, page 15.

On 8/25/94 small compactor is traded out for larger driveable one. On 8/25/94 through 8/27/94 and 8/31/94 through 9/2/94 and 9/7/94 through 9/9/94 backfill and compaction was done. See enclosures I, page 17.

Project completed on 9/9/94 and RSI demobilized and left base. See enclosure I, pages 21 and 22.

924 N.W. 60TH STREET
OKLAHOMA CITY, OKLAHOMA 73118
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4629 S. HARVARD
TULSA, OKLAHOMA 74135
Phone (918) 749-6393
Fax (918) 743-3981

3.10 B

1. The condition of the OWS/UST: concrete walls appeared not sealed nor attached to concrete floor.

2. Soil on the ground surface appeared clean. After removing surface soil (6" - 1 ft.) soil appeared contaminated.

3. No vapor monitoring performed.

4. Site was excavated, soil stockpiled on 80 mil membrane, and approximately 186.28 tons of contaminated soil was taken off site for disposal. See attachments E & F.

5. Soil samples were from stockpiles.

6. Times, dates and preservation methods of soil samples; see attached lab results. Attachments C & D.

7. Backfill of site was done per contract requirements. Both off site soil and site soil were mixed to fill.

8. No ground water was encountered.

3.10

C. See enclosures C & D for analysis report.

D. See enclosures C, D, E, and F for reports.

E. Samples taken by R.S.I.. Samples shipped U.P.S.. See enclosures C, D, E and F.

F. Corps of Engineers directed that site soil be placed back into site excavation.

G. See enclosed site survey print.

H. See enclosed photographs pages 1 - 22.

3.10

C, D

Chain Of Custody/Order Form

Anachem,Inc. 8 Prestige Circle, Suite 104, Allen,Tx 75002 Phone: 214-727-9003 Fax: 214-727-9686

DIESEL RANGE

Report To: JOHN INGLEHART	Bill To: R.S.I.
Company: R.S.I.	Purchase Order #: R94007
Address: 924 NW 60TH	Address: 924 NW 60TH ST.
City,State,Zip: OKC OK 73118	City,State,Zip: OKC OK 73118
Phone: 405 8404434 Fax: 405 8409323	Phone: Fax:

Project Name: CANNON AFB OIL/WATER SEP. REMOVAL

Project Location: Pumpable liquid Sludges City,State:

Date Due: Rush: 0% 50% 100% Sampled By:

Anachem Lab#	Client Sample ID#	Matrix	Date/Time	Presrv/Temp.	TPH	Volatiles	Semi-Vols	TAL Metals (All 8)	As, Ba, Be, Cd, Cr	Co, Cu, Fe, Pb, Mn	Hg, Ni, Se, Ag, Na	Tl, V, Zn	Comments
34483	1CAFBWO		7/26 1130	40C 40C	✓	✓	✓	✓					4 CONTAINERS

Relinquished By	Recv'd By	Transport Method	Date	Time	Analyst
	Thad F	Fed-X	7/28/94	10:00	Fryer

In the event that Anachem determines that a sample is hazardous, client agrees to:

Pay For Sample Disposal ____

Accept Returned Sample ____

Remarks:

Anachem Submission #: 9407-344

008 REV 7/94

Sample information is vital for proper login and reporting.

ANACHEM INC.

8 Prestige Circle, Suite 104 • Allen, Texas 75002
214/727-9003 • FAX # 214/727-9686 • 1-800-966-1186

Customer Name: Remediation Services, Inc.
Date Received: July 28, 1994 at 09:09:02
Date Reported: August 15, 1994
Submission #: 9407000344
Project: CANNON AFB OIL/WATER SEP. REMOVAL

SAMPLES The submission consisted of 1 sample with sample I.D. shown in the attached data table.

TESTS The sample listed in the attached result pages was analyzed for:

* ALUMINUM/Al (EPA 6010)
* ANTIMONY/Sb (EPA 6010)
* ARSENIC/As HYDRIDE (EPA 7061)
* BARIUM/Ba (EPA 6010)
* BERYLLIUM/Be (EPA 6010)
* CADMIUM/Cd (EPA 6010)
* CALCIUM/Ca (EPA 6010)
* CHROMIUM/Cr (EPA 6010)
* COBALT/Co (EPA 6010)
* COPPER/Cu (EPA 6010)
* HYDRIDE DIGESTION
* IRON/Fe (EPA 6010)
* LEAD/Pb (EPA 6010)
* MAGNESIUM/Mg (EPA 6010)
* MANGANESE/Mn (EPA 6010)
* MERCURY DIGESTION (EPA 7470)
* MERCURY/Hg BY COLD VAPOR (EPA 7471)
* MICROWAVE DIGESTION (EPA 3015)
* NICKEL/Ni (EPA 6010)
* POTASSIUM/K (EPA 6010)

Distribution Of Reports
2-John Inglehart of Remediation Services, Inc.
Ph. 405-840-4434 Fax 405-840-9373

Respectfully Submitted,
Anachem,Inc.

C E Newton

C.E. Newton, Ph.D.
Chemist

Submission #: 9407000344 lims

NOTE: Submitted material will be retained for 60 days unless notified or consumed in analysis. Material determined to be hazardous will be returned or a $20 disposal fee will be assessed. Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply to the sample tested and/or inspected, and are not necessarily indicative of the qualitites of apparently identical or similar materials.

ANACHEM INC.

8 Prestige Circle, Suite 104 • Allen, Texas 75002
214/727-9003 • FAX # 214/727-9686 • 1-800-966-1186

Customer Name: Remediation Services, Inc.
Date Received: July 28, 1994 at 09:09:02
Date Reported: August 15, 1994
Submission #: 9407000344
Project: CANNON AFB OIL/WATER SEP. REMOVAL

* SELENIUM/Se HYDRIDE (EPA 7741)
* SEMI-VOLATILES (EPA 8270)
* SILVER/Ag (EPA 6010)
* SODIUM/Na (EPA 6010)
* THALLIUM/Tl (EPA 6010)
* TPH DIESEL-RANGE (MODIFIED 8015)
* VANADIUM/V (EPA 6010)
* VOLATILES (EPA 8260)
* ZINC/Zn (EPA 6010)

Distribution Of Reports
2-John Inglehart of Remediation Services, Inc.
Ph. 405-840-4434 Fax 405-840-9373

Respectfully Submitted,
Anachem,Inc.

James D. Lynch

James D. Lynch, Ph.D.
Chemist

C E Newton

C.E. Newton, Ph.D.
Chemist

Submission #: 9407000344 lims

NOTE: Submitted material will be retained for 60 days unless notified or consumed in analysis. Material determined to be hazardous will be returned or a $20 disposal fee will be assessed. Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply to the sample tested and/or inspected, and are not necessarily indicative of the qualitites of apparently identical or similar materials.

Client Name: Remediation Services, Inc.
Submission #: 9407000344
Project Name: CANNON AFB OIL/WATER SEP. REMOVAL
Report Date: 08/15/94

Sample #: 1CAFBWO

tory ID #: *34483* *Matrix:* *Liquid*
ample Container: *VOA Vial,2xLiter Amber,500ml Plastic*
ampling Location: *PUMPABLE LIQUID SAMPLES*
ampling Date : *07/26/94*
emperature (Celcius):4

LUMINUM / Al (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
luminum	20	0.107	1.07

NTIMONY / Sb (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
ntimony	<0.246	0.0246	0.246

RSENIC / As HYDRIDE (EPA 7061)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
rsenic	<0.012	0.0012	0.012

ARIUM / Ba (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
arium	<0.45	0.045	0.45

ERYLLIUM / Be (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
eryllium	<0.011	0.0011	0.011

ADMIUM / Cd (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
ium	0.05	0.0014	0.014

JM / Ca (EPA 6010)

nalyte	Results(mg/l)	Det.Limit
alcium	77.5	0.001

HROMIUM / Cr (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
hromium	<0.146	0.0146	0.146

OBALT / Co (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
obalt	<0.028	0.0028	0.028

OPPER / Cu (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
opper	<0.046	0.0046	0.046

YDRIDE DIGESTION
ate of Hydride Digestion:8/3/94

ON / Fe (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
on	34.5	0.013	0.13

EAD / Pb (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
ead	<0.424	0.0424	0.424

GNESIUM / Mg (EPA 6010)

	Results(mg/l)	Det.Limit
agnesium	12.4	0.030

Client Name: Remediation Services, Inc.
Submission #: 9407000344
Project Name: CANNON AFB OIL/WATER SEP. REMOVAL
Report Date: 08/15/94

(ANESE / Mn (EPA 6010)

	Results(mg/l)	M.D.L.	P.Q.L.
ia nese	0.545	0.0004	0.004

ERCURY DIGESTION (EPA 7470)
ate of Mercury Digestion:07/28/94

ERCURY / Hg BY COLD VAPOR (EPA 7471)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
lercury	<0.003	0.0003	0.003

ICKEL / Ni (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
ickel	<0.049	0.0049	0.049

OTASSIUM / K (EPA 6010)

nalyte	Results(mg/l)	Det.Limit
otassium	22.3	0.010

ELENIUM / Se HYDRIDE (EPA 7741)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
elenium	<0.010	0.0010	0.010

EMI-VOLATILES (EPA 8270)

nalyte	Results(ug/l)	M.D.L.	P.Q.L.
enol	<7.02	0.702	7.02
s(2-Chloroethyl) ether	<8.37	0.837	8.37
Chlorophenol	<4.07	0.407	4.07
3-Dichlorobenzene	<7.20	0.720	7.20
4-Dichlorobenzene	<7.19	0.719	7.19
Alcohol	<7.90	0.790	7.90
lorobenzene	<8.36	0.836	8.36
Methylphenol	<4.38	0.438	4.38
s(2-Chloroisopropyl) ether	<11.2	1.12	11.2
Methylphenol	<6.72	0.672	6.72
Nitrosodi-n-propylamine	<8.51	0.851	8.51
exachloroethane	<5.15	0.515	5.15
itrobenzene	<8.64	0.864	8.64
ophorone	<10.2	1.02	10.2
Nitrophenol	<6.63	0.663	6.63
4-Dimethylphenol	<13.1	1.31	13.1
enzoic Acid	<21.4	2.14	21.4
s (2-Chloroethoxy) methane	<5.85	0.585	5.85
4-Dichlorophenol	<5.86	0.586	5.86
2,4-Trichlorobenzene	<5.02	0.502	5.02
aphthalene	<7.71	0.771	7.71
Chloroaniline	<6.35	0.635	6.35
exachlorobutadiene	<4.89	0.489	4.89
Chloro-3-methylphenol	<5.81	0.581	5.81
Methylnaphthalene	<8.11	0.811	8.11
exachlorocyclopentadiene	<8.93	0.893	8.93
4,6-Trichlorophenol	<12.3	1.23	12.3
4,5-Trichlorophenol	<10.1	1.01	10.1
Chloronaphthalene	<9.26	0.926	9.26
Nitroaniline	<4.84	0.484	4.84
imethylphthalate	<9.82	0.982	9.82
enaphthylene	<8.57	0.857	8.57
6-Dinitrotoluene	<6.95	0.695	6.95
enaphthene	<7.46	0.746	7.46
4-Dinitrophenol	<14.4	1.44	14.4
phenol	<5.42	0.542	5.42
furan	<18.2	1.82	18.2
itrotoluene	<5.19	0.519	5.19
iethylphthalate	<2.60	0.260	2.60
Chlorophenyl-phenylether	<11.6	1.16	11.6
uorene	<6.45	0.645	6.45

Client Name: Remediation Services, Inc.
Submission #: 9407000344
Project Name: CANNON AFB OIL/WATER SEP. REMOVAL
Report Date: 08/15/94

S 'I-VOLATILES (EPA 8270)

·oaniline	<12.1	1.21	12.1
ıitro-2-methylphenol	<8.12	0.812	8.12
N-Nitrosodiphenylamine (1)	<8.24	0.824	8.24
4-Bromophenyl-phenylether	<9.87	0.987	9.87
Hexachlorobenzene	<9.10	0.910	9.10
Pentachlorophenol	<22.8	2.28	22.8
Phenanthrene	<8.46	0.846	8.46
Anthracene	<5.22	0.522	5.22
Di-n-butylphthalate	<10.3	1.03	10.3
Fluoranthene	<16.8	1.68	16.8
Benzidine	<19.6	1.96	19.6
Pyrene	<6.57	0.657	6.57
Butylbenzylphthalate	<8.52	0.852	8.52
3,3'-Dichlorobenzidine	<9.73	0.973	9.73
Benzo (a) anthracene	<6.07	0.607	6.07
Chrysene	<4.90	0.490	4.90
bis (2-Ethylhexyl) phthalate	<6.53	0.653	6.53
Di-n-octylphthalate	<11.8	1.18	11.8
Benzo (b) fluoranthene	<17.7	1.77	17.7
Benzo (k) fluoranthene	<7.98	0.798	7.98
Benzo (a) pyrene	<11.4	1.14	11.4
ndeno (1,2,3-cd) pyrene	<6.82	0.682	6.82
Benzo (g,h,i) perylene	<6.81	0.681	6.81
N-Nitrosodimethylamine	<17.3	1.73	17.3
-Nitroaniline	<6.83	0.683	6.83
,2-Diphenylhydrazine (as Azobenzene)	<5.18	0.518	5.18
Dibenz (a,h) anthracene	<15.8	1.58	15.8
niline	<27.4	2.74	27.4
Carbazole	<8.42	0.842	8.42

'R/Ag (EPA 6010)

e	Results(mg/l)	M.D.L.	P.Q.L.
ilver	<0.120	0.0120	0.120

'ODIUM/Na (EPA 6010)

nalyte	Results(mg/l)	Det.Limit
odium	143	0.001

'HALLIUM/Tl (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
hallium	<0.56	0.056	0.56

'PH DIESEL-RANGE (MODIFIED 8015)

nalyte	Results(mg/l)	Det.Limit
iesel-Range Petroleum Hydrocarbons	590	1.0

his sample eluted in the diesel range but also
hows components that do not fit the diesel pattern.

'ANADIUM/V (EPA 6010)

nalyte	Results(mg/l)	M.D.L.	P.Q.L.
anadium	<0.037	0.0037	0.037

'OLATILES (EPA 8260)

nalyte	Results(ug/l)	M.D.L.	P.Q.L.
cetone	<5.70	0.570	5.70
enzene	9.2	0.396	3.96
romobenzene	<4.81	0.481	4.81
romochloromethane	<11.43	1.43	11.43
romoform	<6.90	0.690	6.90
none(MEK)	<11.49	1.49	11.49
Benzene (total)	230	0.477	4.77
Disulfide	<4.61	0.461	4.61
arbon Tetrachloride	<2.82	0.282	2.82
hlorobenzene	<4.02	0.402	4.02
hlorodibromomethane	<4.25	0.425	4.25

Client Name: Remediation Services, Inc.
Submission #: 9407000344
Project Name: CANNON AFB OIL/WATER SEP. REMOVAL
Report Date: 08/15/94

TILES (EPA 8260)

Chloroethane	<6.76	0.676	6.76
Chloroform	<8.19	0.819	8.19
Chlorotoluenes (Total)	<3.56	0.356	3.56
1,2-Dibromo-3-chloropropane	<3.59	0.359	3.59
1,2-Dibromoethane	<2.59	0.259	2.59
Dichlorodifluoromethane	<8.02	0.802	8.02
Dibromomethane	<3.25	0.325	3.25
Dichlorobromomethane	<2.34	0.234	2.34
1,1-Dichloroethane	<7.02	0.702	7.02
1,2-Dichloroethane	<4.81	0.481	4.81
is-1,2-Dichloroethene	<5.54	0.554	5.54
rans-1,2-Dichloroethene	<4.72	0.472	4.72
,1-Dichloroethene	<5.27	0.527	5.27
,2-Dichloropropane	<4.57	0.457	4.57
is-1,3-Dichloropropene	<4.12	0.412	4.12
rans-1,3-Dichloropropene	<3.94	0.394	3.94
,2-Dichloropropane	<4.60	0.460	4.60
,1-Dichloropropene	<4.93	0.493	4.93
Ethylbenzene	140	0.469	4.69
-Hexanone	<3.88	0.388	3.88
sopropyl Benzene	<1.96	0.196	1.96
-Isopropyl toluene	<3.75	0.375	3.75
Methyl Bromide	<6.02	0.602	6.02
Methyl Chloride	<5.04	0.504	5.04
-Methyl-2-Pentanone	<3.11	0.311	3.11
Methylene Chloride	<11.6	1.16	11.6
-Propyl benzene	25	0.241	2.41
Trichlorofluoromethane	<6.37	0.637	6.37
robenzenes (total)	<11.31	1.31	11.31
e	<3.10	0.310	3.10
,1,2-Tetrachloroethane	<3.54	0.354	3.54
Tetrachloroethene	<2.48	0.248	2.48
Toluene	72	0.253	2.53
,1,1-Trichloroethane	<4.59	0.459	4.59
,1,2-Trichloroethane	<3.73	0.373	3.73
,2,3-Trichloropropane	<4.05	0.405	4.05
Trichloroethene	<4.54	0.454	4.54
Trimethylbenzenes (total)	500	0.311	3.11
,1,2-Tetrachloroethane	<3.85	0.385	3.85
Vinyl Acetate	<4.52	0.452	4.52
Vinyl Chloride	<6.61	0.661	6.61
Xylene (Total)	330	0.421	4.21

ZINC/Zn (EPA 6010)

Analyte	Results(mg/l)	M.D.L.	P.Q.L.
Zinc	3.1	0.0031	0.031

Report To: Remediation Service, Inc.
Project: Cannon AFB Oil/Water Sep. Removal
Lab Number: 9407000344

VOLATILE ORGANICS QUALITY CONTROL DATA SHEET

SAMPLE LOG # >34483

METHOD #: 8260

ANALYST: James Lynch

DATE ANALYZED: 7/29/94

SPIKED SAMPLE #'S: >210Z1 >210Z2

DUPLICATE A: Chlorobenzene-d5
SPIKE AMT: 50 ppb

DUPLICATE B: 1,4-Difluorobenzene
SPIKE AMT: 50 ppb

VALUE #1:	96.6	96.1
VALUE #2:	93.9	90.8
% VARIANCE:	2.8	5.5

CONCENTRATION UNITS: ug/l

SEMIVOLATILE ORGANICS QUALITY CONTROL DATA SHEET

SAMPLE LOG # >'4483

METHOD #: 8270

ANALYST: James Lynch

DATE ANALYZED: 8/4/94

SPIKED SAMPLE #'S: >215LC >215LD

DUPLICATE A: Naphthalene-d8
SPIKE AMT: 100 ppb

DUPLICATE B: Terphenyl-d14
SPIKE AMT: 100 ppb

VALUE #1:	94.2	79.6
VALUE #2:	95.6	82.9
% VARIANCE:	1.5	4.0

CONCENTRATION UNITS: ug/l

QUALITY CONTROL DATA

DIESEL-RANGE TPH results are reported in parts per million (ppm) in liquid.

	Value 1	Value 2	% Var.
TPH:	92.8	90.1	2.9

CONCENTRATION UNITS: TPH - ppm (mg/l)

DETECTION LIMITS: D.R. TPH - 1.0

ANALYST	ANALYTE	DATE EXTRACTED	DATE ANALYZED
Eileen Allen	D.R. TPH	7/29/94	8/02/94

Report To: Remediation Services, Inc.
Project: Cannon AFB Oil/Water Sep. Removal
Number: 9407000344

QUALITY CONTROL DATA

ANALYTE	DATE ANALYZED	SPIKE VOL	STAND. DEV.	COEFF. OF VAR %	REC1/%	REC2/%
Aluminum	8/9/94	5	0.003	0.1	99	99
Antimony	8/9/94	1.00	0.081	9.3	80	96
Arsenic	8/10/94	0.03	0.001	3.1	111	105
Barium	7/29/94	1	0.025	3.1	84	79
Beryllium	8/9/94	1.00	0.059	7.1	78	90
Cadmium	7/29/94	1	0.015	1.6	94	91
Chromium	7/29/94	1	0.019	2.1	92	82
Cobalt	8/9/94	1.00	0.063	7.6	77	90
Copper	7/29/94	1	0.022	2.4	90	94
Lead	7/29/94	1	0.056	6.2	96	85
Manganese	8/9/94	1.00	0.005	0.5	106	105
Mercury	7/28/94	---	0.276	6.8	98	108
Nickel	7/29/94	1	0	0	110	110
Selenium	8/10/94	0.03	0.001	3.4	103	96
Silver	7/29/94	1	0.020	2.6	81	77
[illegible]lium	8/9/94	1.00	0.065	7.2	84	97
[illegible]dium	8/9/94	1.00	0.060	6.7	83	95
Zinc	7/29/94	1	0.010	0.9	114	116

Standard Deviation = (x1-x2)/1.414
Coefficient of Variability % = (S.D./Avg.) X 100
Recovery % = [(spiked-unspiked)/expected] X 100

Chain Of Custody/Order Form

Anachem,Inc. 8 Prestige Circle, Suite 104, Allen,Tx 75002 Phone: 214-727-9003 Fax: 214-727-9686

Report To: Remediation Services Inc.	Bill To:
Company:	Purchase Order #:
Address: 924 N.W 60th Street	Address:
City,State,Zip: Oklahoma City OK 73118	City,State,Zip:
Phone: 840-4434 Fax: 840-9373	Phone: Fax:
Project Name:	
Project Location: Oil Contaminated Stockpile	City,State:
Date Due: Rush: 0% 50% 100%	Sampled By: J.L.I

Anachem Lab#	Client Sample ID#	Matrix	Date/Time	Presrv/Temp.	TPH	BTEX	Lead		8015 Diesel	Reactive		8 Tors	Comments
1 34945	C.S. 1		8/3 12:45	Ice 4°C	✓	✓	✓						24 hour turn around
2 34946	C.S. 2		8/4 12:00	Ice 4°C	✓	✓	✓						
3													
4													
5													
6													
7													
8													
9													
10													

Relinquished By	Rec'd By	Transport Method	Date	Time	Analyst
	Shad J	Fed-X	8/5/94	9:00	Logan

In the event that Anachem determines that a sample is hazardous, client agrees to:

Pay For Sample Disposal _____

Accept Returned Sample _____

Remarks:

Anachem Submission #: 9408-65

008 REV 4/94

Sample information is vital for proper login and reporting.

ANACHEM INC.

8 Prestige Circle, Suite 104 • Allen, Texas 75002
214/727-9003 • FAX # 214/727-9686 • 1-800-966-1186

Customer Name: Remediation Services, Inc.
Date Received: August 5, 1994 at 09:05:37
Date Reported: August 8, 1994
Submission #: 9408000065
Project: OIL CONTAMINATED STOCKPILE

SAMPLES: The submission consisted of 2 samples with sample I.D.'s shown in the attached data tables.

TESTS: The samples were analyzed for:
* BTEX (MOD 8020)
* LEAD/Pb (EPA 6010)
* MICROWAVE DIGESTION (EPA 3015)
* TPH DIESEL-RANGE (MODIFIED 8015)

RESULTS: See attached data table for results.

Distribution Of Reports:
2-Remediation Services, Inc.
Attn:John Inglehart
Ph. 405-840-4434 Fax 405-840-9373

LAB NUMBER: 9408000065 lims

Respectfully Submitted,
Anachem,Inc.

James D. Lynch

James D. Lynch, Ph.D.
Chemist

C E Newton

C.E. Newton, Ph.D.
Chemist

NOTE: Submitted material will be retained for 60 days unless notified or consumed in analysis. Material determined to be hazardous will be returned or a $20 disposal fee will be assessed. Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply to the sample tested and/or inspected, and are not necessarily indicative of the qualitites of apparently identical or similar materials.

Client Name: Remediation Services, Inc.
Submission# : 9408000065
Project Name: OIL CONTAMINATED STOCKPILE
Report Date: 08/08/94

Client Sample #: C.S. 1

Laboratory ID #: *34845* *Matrix:* *Soil*
Sample Container: *2x4oz EPA Approved Glass Jar\Black lid*
Sampling Location: *OIL CONTAMINATED STOCKPILE*
Sampling Date : *08/03/94*
Temperature (Celcius):4

BTEX (MOD 8020)

Analyte	Results(mg/kg)	M.D.L.	P.Q.L.
Benzene	<0.396	0.0396	0.396
Toluene	<0.253	0.0253	0.253
Ethyl Benzene	<0.469	0.0469	0.469
Xylenes	<0.421	0.0421	0.421

LEAD/Pb (EPA 6010)

Analyte	Results(mg/kg)	M.D.L.	P.Q.L.
Lead	<21.2	2.12	21.2

TPH DIESEL-RANGE (MODIFIED 8015)

Analyte	Results(mg/kg)	Det.Limit
Diesel-Range Petroleum Hydrocarbons	17	5.0

Oil-range TPH 76 mg/kg

Client Sample #: C.S. 2

Laboratory ID #: *34846* *Matrix:* *Soil*
Sample Container: *2x4oz EPA Approved Glass Jar\Black & Green lid*
Sampling Location: *OIL CONTAMINATED STOCKPILE*
Sampling Date : *08/04/94*
Temperature (Celcius):4

BTEX (MOD 8020)

Analyte	Results(mg/kg)	M.D.L.	P.Q.L.
Benzene	<0.396	0.0396	0.396
Toluene	<0.253	0.0253	0.253
Ethyl Benzene	<0.469	0.0469	0.469
Xylenes	<0.421	0.0421	0.421

LEAD/Pb (EPA 6010)

Analyte	Results(mg/kg)	M.D.L.	P.Q.L.
Lead	<21.2	2.12	21.2

TPH DIESEL-RANGE (MODIFIED 8015)

Analyte	Results(mg/kg)	Det.Limit
Diesel-Range Petroleum Hydrocarbons	110	5.0

No evidence of oil was found in this sample.

Report To: Remediation Services, Inc.
Project: Oil Contaminated Stockpile
Lab Number: 9408000065

QUALITY CONTROL DATA

DIESEL-RANGE TPH and BTEX results are reported in parts per million (ppm) in solid.

	Value 1	Value 2	% Var.
DIESEL FUEL:	87.1	95.6	8.9
BTEX:	19.7	19.9	1.0
CONCENTRATION UNITS:	BTEX - ppm		TPH - ppm
DETECTION LIMITS:	BTEX - 0.5		D.R.TPH - 5.0

ANALYST	ANALYTE	DATE EXTRACTED	DATE ANALYZED
James Lynch	BTEX	8/05/94	8/05/94
Anthony Taylor	TPH	8/05/94	8/05/94

QUALITY CONTROL DATA

NALYTE	DATE ANALYZED	SPIKE VOL	STAND. DEV.	COEFF. OF VAR %	REC1/%	REC2/%
ead	8/5/94	250	7.5	3.2	99	106

tandard Deviation = (x1-x2)/1.414
oefficient of Variability % = (S.D./Avg.) X 100
ecovery % = [(spiked-unspiked)/expected] X 100

3.10

E, F

CONTROLLED RECOVERY INC.

P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

LEASE OPERATOR/COMPANY: CAFB

LEASE NAME: Clovis

TRANSPORTER COMPANY: Plute | TIME: 500 AM/PM

DATE: 8 12 94 | VEHICLE No.: 32 | DRIVER No.:

TYPE OF MATERIAL

[ ] PRODUCTION WATER [ ] DRILLING FLUIDS [ ] COMPLETION FLUIDS
[ ] TANK BOTTOMS [ ] CONTAMINATED SOIL [ ] C-117 No.: _____
[X] OTHER MATERIAL:
DESCRIPTION: UST Liquid

VOLUME OF MATERIAL [ ] BBLS: _____ : [ ] YARD _____ X 14200 gallons

THIS WILL CERTIFY that the above Transporter loaded the material represented by this Transporter Statement at the above described location, and that it was tendered by the above described shipper. This will certify that no additional materials were added to this load, and that the material was delivered without incident.

DRIVER: _____ (SIGNATURE)

FACILITY REPRESENTATIVE: _____ (SIGNATURE)

112 16970

White - CRI Canary - CRI Accounting Pink - CRI Accounting Gold - Transporter

B-25251

CONTROLLED RECOVERY INC.

P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

LEASE OPERATOR/COMPANY: CAFB
LEASE NAME: Clovis
TRANSPORTER COMPANY: TAD | TIME: 5 10 AM/PM
DATE: 8 11 94 | VEHICLE No.: 304 | DRIVER No.:

TYPE OF MATERIAL
[ ] PRODUCTION WATER [ ] DRILLING FLUIDS [ ] COMPLETION FLUIDS
[ ] TANK BOTTOMS [ ] CONTAMINATED SOIL [ ] C-117 No.: 01
[X] OTHER MATERIAL
DESCRIPTION: UST Soil Gross 90,400
32200

VOLUME OF MATERIAL [ ] BBLS.: [ ] YARD 24.1056

THIS WILL CERTIFY that the above Transporter loaded the material represented by this Transporter Statement at the above described location, and that it was tendered by the above described shipper. This will certify that no additional materials were added to this load, and that the material was delivered without incident.

DRIVER: (SIGNATURE)
FACILITY REPRESENTATIVE: (SIGNATURE)

No. 16955

White - CRI Canary - CRI Accounting Pink - CRI Accounting Gold - Transporter
B-25251

CONTROLLED RECOVERY INC.

P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

LEASE OPERATOR/COMPANY: CAFB
LEASE NAME: Clovis
TRANSPORTER COMPANY: TAD | TIME: 8 30 AM/PM
DATE: 8 11 94 | VEHICLE No.: 301 | DRIVER No.:

TYPE OF MATERIAL
[ ] PRODUCTION WATER [ ] DRILLING FLUIDS [ ] COMPLETION FLUIDS
[ ] TANK BOTTOMS [ ] CONTAMINATED SOIL [X] C-117 No.: 02
[X] OTHER MATERIAL
DESCRIPTION: UST Soil 76000
32540

VOLUME OF MATERIAL [ ] BBLS.: [X] YARD 21.73 43460 lbs

THIS WILL CERTIFY that the above Transporter loaded the material represented by this Transporter Statement at the above described location, and that it was tendered by the above described shipper. This will certify that no additional materials were added to this load, and that the material was delivered without incident.

DRIVER: (SIGNATURE)
FACILITY REPRESENTATIVE: (SIGNATURE)

No. 16956

White - CRI Canary - CRI Accounting Pink - CRI Accounting Gold - Transporter
B-25251

CONTROLLED RECOVERY INC.

P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

LEASE OPERATOR/COMPANY: CAFB
LEASE NAME: Clovis
TRANSPORTER COMPANY: TAD | TIME: 4 10 AM/PM
DATE: 8 12 94 | VEHICLE No.: 304 | DRIVER No.:

TYPE OF MATERIAL
[ ] PRODUCTION WATER [ ] DRILLING FLUIDS [ ] COMPLETION FLUIDS
[ ] TANK BOTTOMS [ ] CONTAMINATED SOIL [X] C-117 No.: 4
[X] OTHER MATERIAL
DESCRIPTION: UST Soil 91100
32200

VOLUME OF MATERIAL [ ] BBLS.: [X] YARD 29.45 58900

THIS WILL CERTIFY that the above Transporter loaded the material represented by this Transporter Statement at the above described location, and that it was tendered by the above described shipper. This will certify that no additional materials were added to this load, and that the material was delivered without incident.

DRIVER: (SIGNATURE)
FACILITY REPRESENTATIVE:

CONTROLLED RECOVERY INC.

P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

LEASE OPERATOR/COMPANY: CAFB
LEASE NAME: Clovis
TRANSPORTER COMPANY: TAD | TIME: 8 30 AM/PM
DATE: 8 11 94 | VEHICLE No.: 302 | DRIVER No.:

TYPE OF MATERIAL
[ ] PRODUCTION WATER [ ] DRILLING FLUIDS [ ] COMPLETION FLUIDS
[ ] TANK BOTTOMS [ ] CONTAMINATED SOIL [X] C-117 No.: 03
[X] OTHER MATERIAL
DESCRIPTION: UST Soil 82580
33840

VOLUME OF MATERIAL [ ] BBLS.: [X] YARD 24.37 48740 lb

THIS WILL CERTIFY that the above Transporter loaded the material represented by this Transporter Statement at the above described location, and that it was tendered by the above described shipper. This will certify that no additional materials were added to this load, and that the material was delivered without incident.

DRIVER: (SIGNATURE)
FACILITY REPRESENTATIVE:

CONTROLLED RECOVERY INC.
P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

ANY: CAFB
Clovis
TAD
TIME: 240 AM/PM
VEHICLE No.: 304
DRIVER No.:
TYPE OF MATERIAL
[ ] DRILLING FLUIDS
[ ] COMPLETION FLUIDS
[ ] CONTAMINATED SOIL
[ ] C-112 No.:
UST Soil 8820 304 30
] BBLS. ____ : [X] YARD 2 K gal X 5.7540 = 11,480 pounds
IFY that the above Transporter loaded the material represented by this Transporter
bed location, and that it was tendered by the above described shipper. This will certify
ere added to this load, and that the material was delivered without incident.
E: (SIGNATURE)
Y - CRI Accounting Pink - CRI Accounting Gold - Transporter

CONTROLLED RECOVERY INC.
O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079
NY: CAFB
Clovis
TAD
TIME: 240 AM/PM
VEHICLE No.: 301
DRIVER No.:
TYPE OF MATERIAL
[ ] DRILLING FLUIDS
[ ] COMPLETION FLUIDS
[ ] CONTAMINATED SOIL
[ ] C-117 No.:
UST Soil 91200 31729
] BBLS. ____ : [ ] YARD X 14,280 gallons
IFY that the above Transporter loaded the material represented by this Transporter
bed location, and that it was tendered by the above described shipper. This will certify
are added to this load, and that the material was delivered without incident.
E: (SIGNATURE)

CONTROLLED RECOVERY INC.
P.O. BOX 369 • HOBBS, NEW MEXICO 88241
(505) 393-1079

LEASE OPERATOR/COMPANY: CAFB
LEASE NAME: Clovis
TRANSPORTER COMPANY: Plute
TIME: 500 AM/PM
DATE: 8 12 94
VEHICLE No.: 32
DRIVER No.:

TYPE OF MATERIAL
[ ] PRODUCTION WATER
[ ] DRILLING FLUIDS
[ ] COMPLETION FLUIDS
[ ] TANK BOTTOMS
[ ] CONTAMINATED SOIL
[ ] C-117 No.:
[X] OTHER MATERIAL:
DESCRIPTION: UST Liquid

VOLUME OF MATERIAL [ ] BBLS: ____ : [ ] YARD ____ X 14200 gallons

THIS WILL CERTIFY that the above Transporter loaded the material represented by this Transporter Statement at the above described location, and that it was tendered by the above described shipper. This will certify that no additional materials were added to this load, and that the material was delivered without incident.

DRIVER: ____ (SIGNATURE)

FACILITY REPRESENTATIVE: ____ (SIGNATURE)

16970

White - CRI Canary - CRI Accounting Pink - CRI Accounting Gold - Transporter
8-25251

INVOICE

INVOICE NUMBER: 3850

INVOICE DATE: Aug 19, 1994

PATE TRUCKING CO., INC.
P. O. DRAWER 760 · DENVER CITY, TEXAS 79323
TELEPHONE (806) 592-2772

Voice: 806-592-2772
Fax: 806-592-7404

ADD TO:

REMEDIATION SERVICES, INC
924 NW 60TH STREET
OKLAHOMA CITY, OK 73118

CUSTOMER ID	PURCHASE ORDER	PAYMENT TERMS	PAGE
R6045		Net 30 Days	1

QUANTITY	ITEM NUMBER	DESCRIPTION	UNIT PRICE	EXTENSION
	01	LEASE: CANNON AFB		
	1	WK TKT: 3453		
10.00	600	VACUUM TRUCK W/DRIVER H 32	[redacted]	[redacted]
	1	WK TKT: 3470		
9.00	600	VACUUM TRUCK W/DRIVER H 32	[redacted]	[redacted]
	1	WK TKT: 1810		
8.00	140	WINCH TRUCK W/DRIVER H42	[redacted]	[redacted]
	1	WK TKT: 3919		
13.00	205	FRAC TANK ADDITIONAL DAYS	[redacted]	[redacted]

Sales Tax
Total Invoice Amount [redacted]
Amount Received With Invoice 0.00

Check No:

TOTAL [redacted]

CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: Cannon AFB

JOB NUMBER: 94-08-356

DEPOSITION DATE: 8 11 94

TRANSPORTER NAME: TAD

DRIVER NAME: Daniel Keener

TRUCK LICENSE NUMBER: B 14176 STATE NM

VOLUME: 21.73 (GALLONS/YARDS)

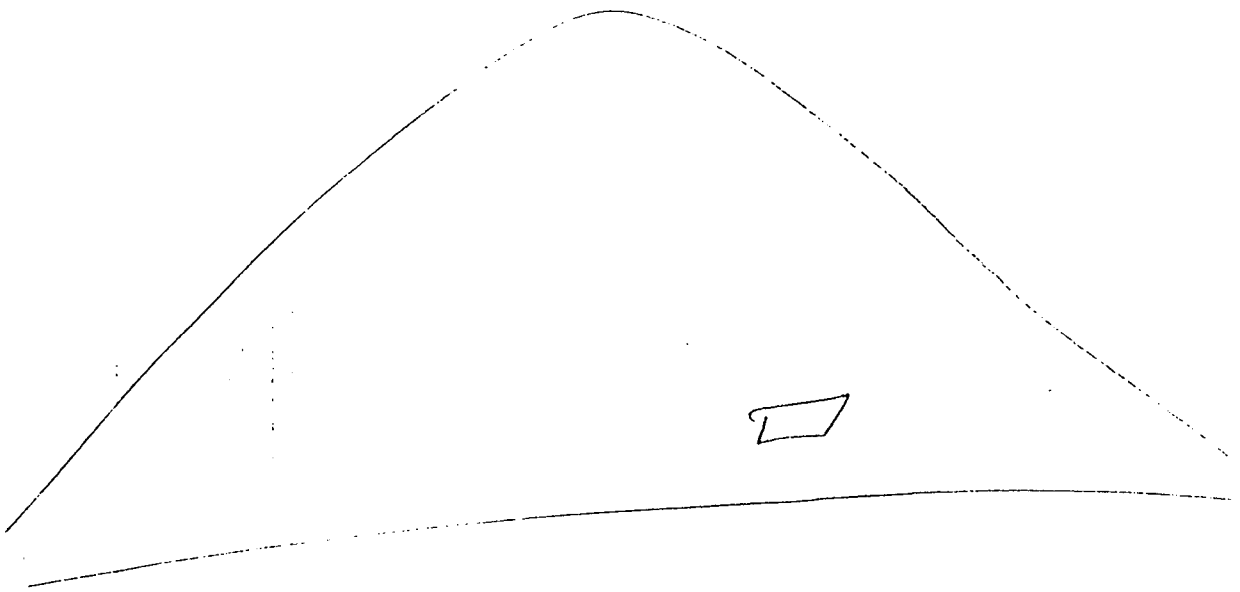
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: Cannon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT B



CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: Canon AFB

JOB NUMBER: 94-08-356

DEPOSITION DATE: 8 11 94

TRANSPORTER NAME: TAD

DRIVER NAME: Telly Hoosier

TRUCK LICENSE NUMBER: B 1478 STATE NM

VOLUME: _____ (GALLONS/YARDS)

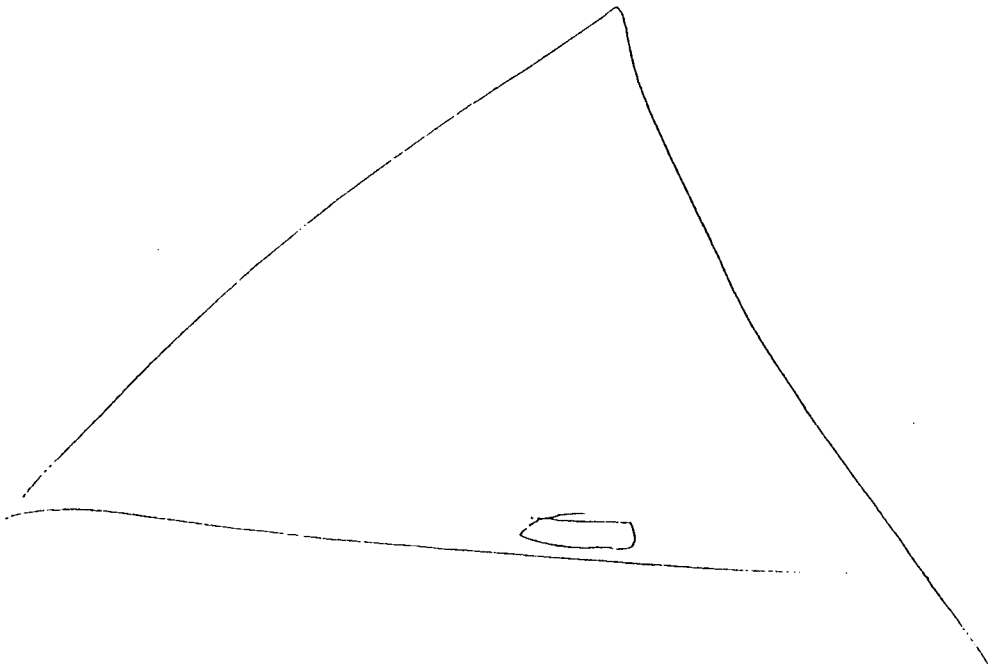
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION _____

SITE NAME: Canon AFB

SITE ADDRESS: Clovis NM

==========

PLOT B



CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: Cannon AFB

JOB NUMBER: 94-08-356

DEPOSITION DATE: 8 11 94

TRANSPORTER NAME: TAD

DRIVER NAME: Alan Souza

TRUCK LICENSE NUMBER: 1479 STATE NM

VOLUME: 24.57 (GALLONS / YARDS)

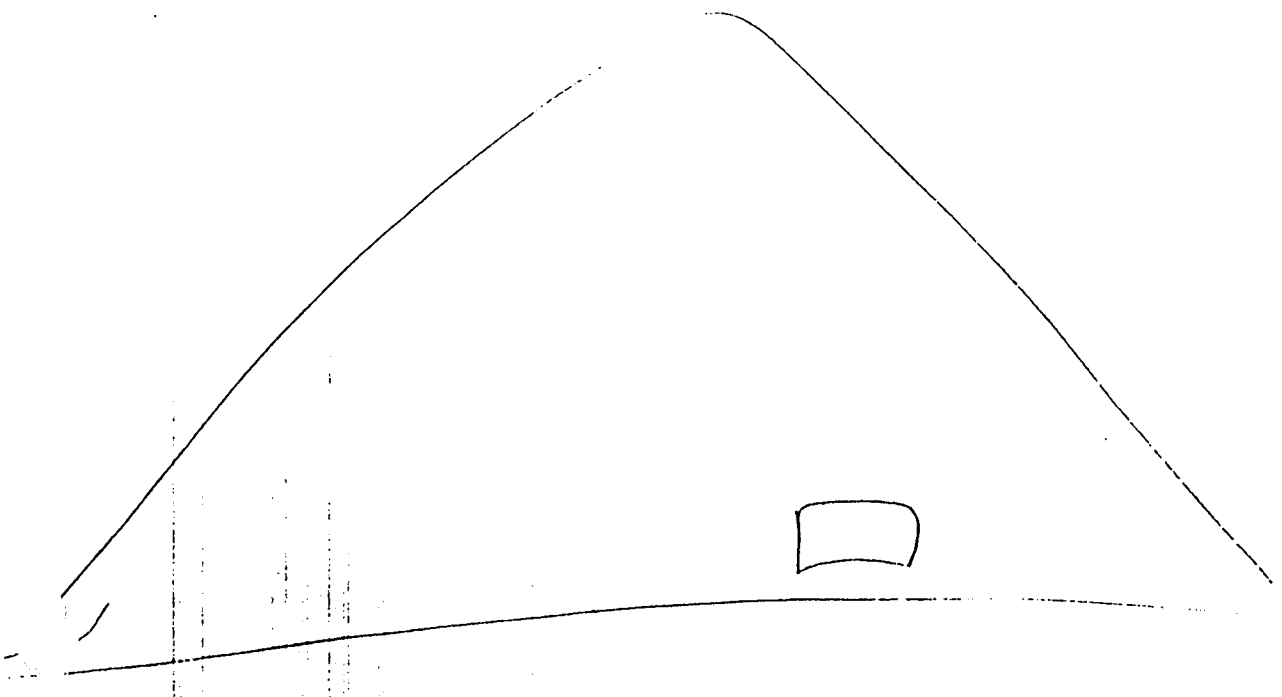
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: Cannon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT



CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: CAFB

JOB NUMBER: 94-DR-356

DEPOSITION DATE: 8 12 94

TRANSPORTER NAME: TAD

DRIVER NAME: Terry Hoosier

TRUCK LICENSE NUMBER: B 1478 STATE NM

VOLUME: 29.45 (GALLONS/YARDS)

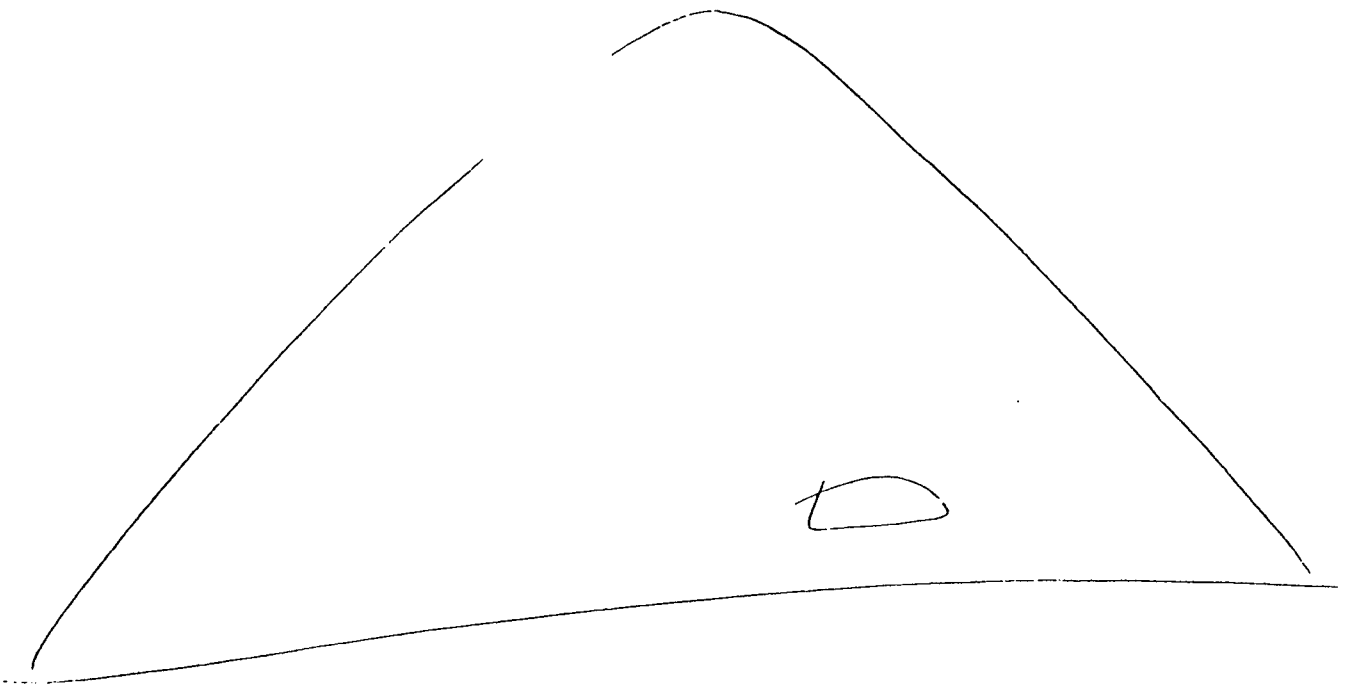
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: ~~Clovis AFB~~ Canon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT B



CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: CAFB

JOB NUMBER: 94-08-356

DEPOSITION DATE: 8 12 94

TRANSPORTER NAME: Pate

DRIVER NAME: Guy Ellis

TRUCK LICENSE NUMBER: R 6408 STATE TX

VOLUME: 4200 gallons ~~(GALLONS/YARDS)~~

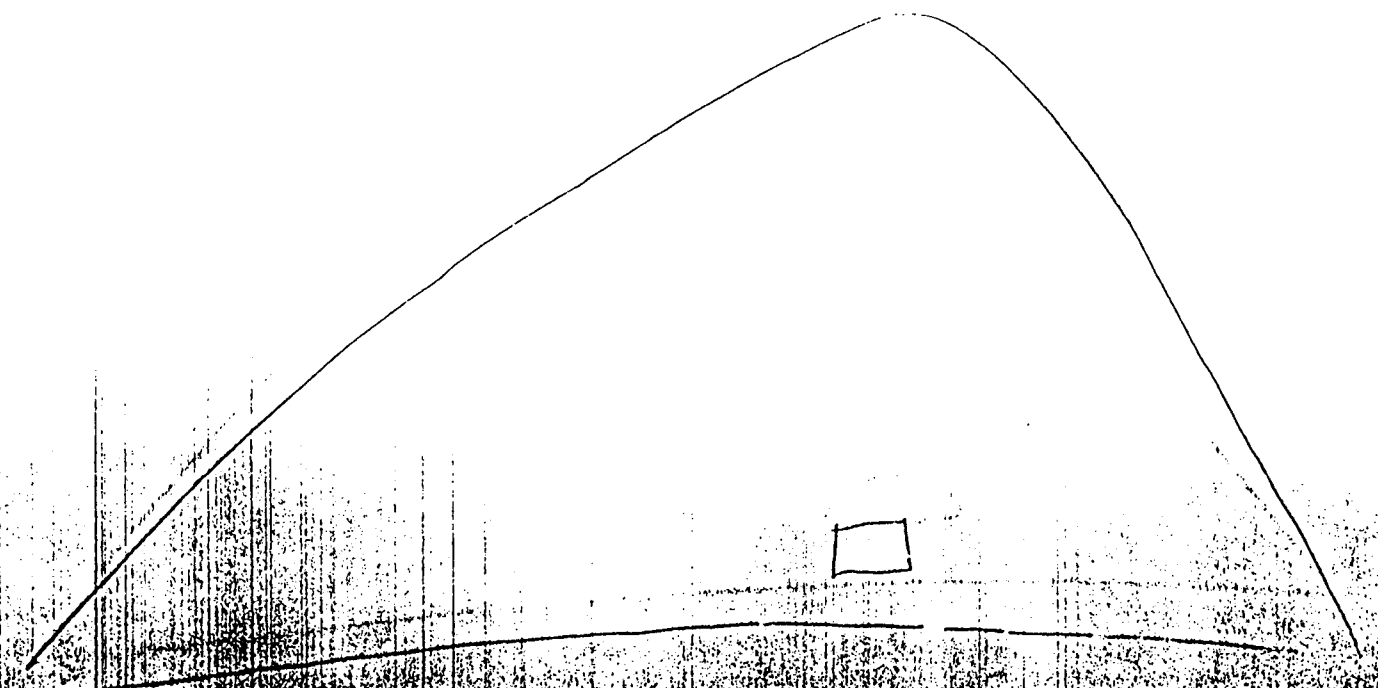
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: Canon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT B



CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: CAFB - Remediation Serv.

JOB NUMBER: 941-08-356

DEPOSITION DATE: 8 15 94

TRANSPORTER NAME: TAD

DRIVER NAME: Alan Souza

TRUCK LICENSE NUMBER: B 1479

VOLUME: ~~82840~~ ~~36600~~ 46240 pounds (~~GALLONS/YARDS~~)

STATE NM

TYPE OF MATERIAL: [ ] GASOLINE; [✓] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: Cannon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT B

D

CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: C A F B - Remediation Services

JOB NUMBER: 94-08-356

DEPOSITION DATE: 8 15 94

TRANSPORTER NAME: TAD

DRIVER NAME: Terry Hoosier

TRUCK LICENSE NUMBER: B 1478 STATE NM

VOLUME: 88520 30980 57,540 pounds (~~GALLONS/YARDS~~)

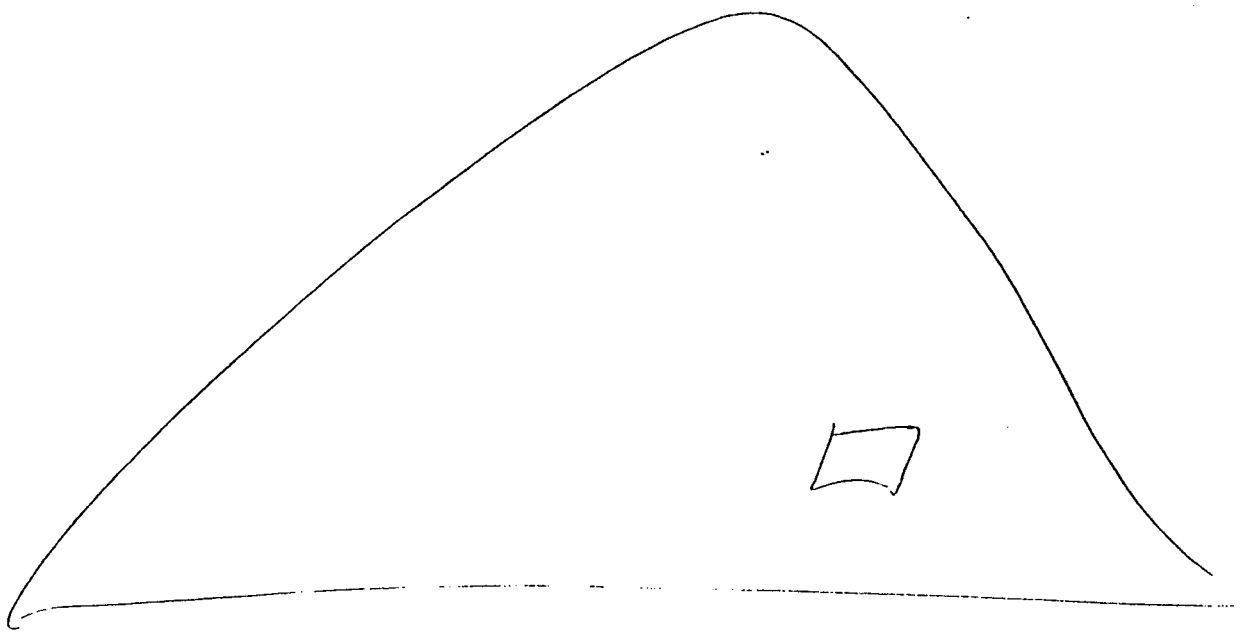
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: Cannon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT B



CONTROLLED RECOVERY INC.
HYDROCARBON REMEDIATION SITE
PERMIT DP-818

DRIVER'S MANIFEST

JOB NAME: CAFB - Remediation Services

JOB NUMBER: 94-08-356

DEPOSITION DATE: 8 05 94

TRANSPORTER NAME: TAD

DRIVER NAME: Daniel Keener

TRUCK LICENSE NUMBER: 31476 STATE NM

VOLUME: 59480 Pounds ~~(GALLONS/YARDS)~~

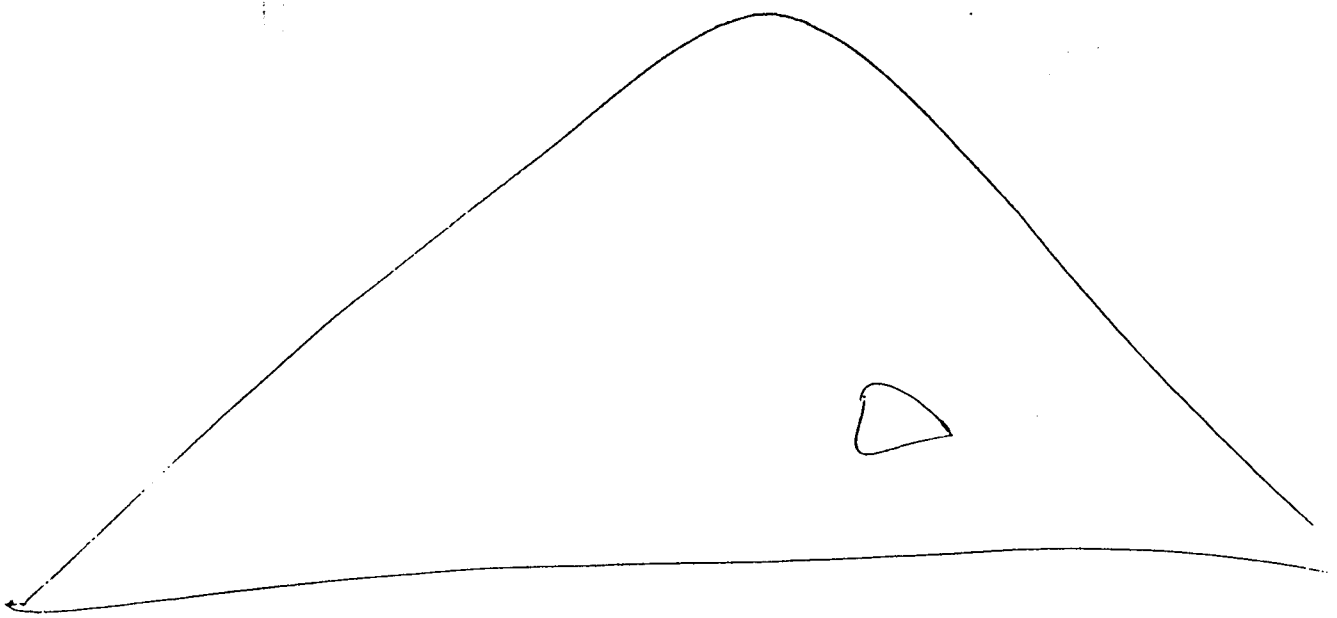
TYPE OF MATERIAL: [ ] GASOLINE; [X] DIESEL
[ ] OTHER DESCRIPTION

SITE NAME: Cannon AFB

SITE ADDRESS: Clovis, NM

==========

PLOT B



TRANSPORTS
FRAC TANKS
VAC TRUCKS

PATE TRUCKING CO.

P.O. BOX 639, HOBBS, N.M. 88241

Harvey

PHONE (505) 397-6264

CONTRACT NUMBER		FIELD ORDER NUMBER	№ 3453
A.F.E. NUMBER		DATE	7-29-94
REQ. OR PURCHASE ORDER NUMBER		ORDERED BY	

LTO
EMEDIATION SERVICES INC.
924 NW 60TH STREET
OKLAHOMA CITY, OK 73118

DELIVERED FROM

TO

LOCATION: Cannon AFB

WELL OR RIG NO.

TRUCK OR UNIT NO.	CAPACITY	AMOUNT HAULED	TIME OUT	TIME IN	HOURS CHGD.	DELIVERED BY
B32	130	35	7:30 AM PM	7:00 AM PM	10	

DESCRIPTION	O HR. O BBL.	RATE	AMOUNT
furnished Vac-Truck to empty & Clean			
Cement Cellar & put in frac-Tank			
VAC Truck	10hrs	[redacted]	[redacted]

TOP GAUGE | BOTTOM GAUGE | SET DATE | RELEASE DATE

HIGHWAY MILES	
LOADED	UNLOADED

TERMS:

AUTHORIZED BY:

TAX [redacted]

NET TOTAL [redacted]

Thank You

OPERATOR OR DRIVER

X

Sales Tax [redacted]
Total Invoice Amount
Amount Received With Invoice 0.00

Check No:

TOTAL [redacted]

TRANSPORTS
FRAC TANKS
VAC TRUCKS

PATE TRUCKING CO.

P.O. BOX 639, HOBBS, N.M. 88241

PHONE (505) 397-9716

Harvey

B ~~Cannon AFB~~
? EMEDIATION SERVICES INC.

CONTRACT NUMBER		FIELD ORDER NUMBER № 1810
A.F.E. NUMBER		DATE 8-12-94
REQ. OR PURCHASE ORDER NUMBER		ORDERED BY

DELIVERED FROM LOCATION: Location

TO: CRI & yard

WELL OR RIG NO.

TRUCK OR UNIT NO.	CAPACITY	AMOUNT HAULED	TIME OUT	TIME IN	HOURS CHGD.	DELIVERED BY
42			7:30 AM PM	4:30 AM PM	9	

DESCRIPTION	O HR. O BBL.	RATE	AMOUNT
Hauled Frac Tank From A.F.B. to CRI, Jetted out Tank, Hauled to yard.			
winch Truck: 9hrs	9hrs	[redacted]	[redacted]

GAUGE | BOTTOM GAUGE | SET DATE | RELEASE DATE

HIGHWAY MILES	
LOADED	UNLOADED

TERMS:

TAX [redacted]

NET TOTAL [redacted]

AUTHORIZED BY:

OPERATOR OR DRIVER

X

Thank You

Sales Tax
Total Invoice Amount [redacted]
Amount Received With Invoice 0.00

Check No:

TOTAL [redacted]

PATE TRUCKING CO

TRANSPORTS
FRAC TANKS
VAC TRUCKS

PATE TRUCKING CO.

P.O. BOX 639, HOBBS, N.M. 88241

HARVEY

PHONE (505) 397-6264

FIELD ORDER NUMBER № 3913

CONTRACT NUMBER	
A.F.E. NUMBER	
REQ. OR PURCHASE ORDER NUMBER	

DATE 8-11-94

ORDERED BY

Remediation Services Inc.

DELIVERED FROM Hobbs YARD

TO CANNON AFB

LOCATION

WELL OR RIG NO.

TRUCK OR UNIT NO.	CAPACITY	AMOUNT HAULED	TIME OUT AM PM	TIME IN AM PM	HOURS CHGD.	DELIVERED BY
#42						

DESCRIPTION	O HR. O BBL.	RATE	AMOUNT
1 FRAC TANK			
SET DATE 7-26-94			
RELEASE DATE 8-11-94			
ADD DAYS	13 DAYS	[redacted]	[redacted]

TOP GAUGE | BOTTOM GAUGE | SET DATE | RELEASE DATE

HIGHWAY MILES	
LOADED	UNLOADED

TERMS:

AUTHORIZED BY:

OPERATOR OR DRIVER

X

TAX [redacted]

NET TOTAL [redacted]

Thank You

Sales Tax [redacted]
Total Invoice Amount
Amount Received With Invoice

Check No:

TOTAL [redacted]

TRANSPORTER MANIFEST

MAINIFEST# 01

SHIPPING FACILITY NAME & ADDRESS:
Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:
CRI/Halfway, NM

TRANSPORTER NAME & ADDRESS:
TADD Trucking
P.O Box 584
Hobbs, NM 88240

TNRCC Waste Code:
None required

FUL DESCRIPTION OF WASTE:
Non-Hazardous Contaminated Soil

TOTAL QUANTITY
29.10 yds.

Facility Contact:
Jim Anderson Jim Anderson

NAME: Michael Patterson
SIGNATURE: mm/dd/yy 15 Aug 94

REPRESENTATIVE: Jim Sign here Jim Alyshurst 27 CES/DEVP Vera A. Wood Vera A. Wood

NAME OF TRANSPORTER: (Driver)
Terry Hazier Terry Hazier 8-11-94
SIGNATURE: mm/dd/yy

DISPOSAL SITE:
CRI/Halfway, NM 8/11/94
SIGNATURE: mm/dd/yy

TRANSPORTER MANIFEST

MAINIFEST# 02

SHIPPING FACILITY NAME & ADDRESS:
Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:
CRI / Halfway, NM

TRANSPORTER NAME & ADDRESS:
TADD Trucking
P.O. Box 584
Hobbs, NM 88240

TNRCC Waste Code:
None required

FUL DESCRIPTION OF WASTE:
Non-Hazardous Contaminated Soil

TOTAL QUANTITY
21.73 yds

Facility Contact:
Jim Anderson

NAME: Michael Pallerson
Jim Sign here
REPRESENTATIVE: 97CES/CEVP Vera A. Wood

SIGNATURE: mm/dd/yy
15 Aug 94
Vera A. Wood

NAME OF TRANSPORTER: (Driver)
Daniel Keener

Daniel Keener 8-11-94
SIGNATURE: mm/dd/yy

DISPOSAL SITE:
CRI / Halfway, NM

8/11/94
SIGNATURE: mm/dd/yy

TRANSPORTER MANIFEST

MAINIFEST# 03

SHIPPING FACILITY NAME & ADDRESS:

Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:

CRI/Halfway, NM

TRANSPORTER NAME & ADDRESS:

TADD TRUCKING
P.O. Box 584
Hobbs, NM 88240

TNRCC Waste Code:

None required

FUL DESCRIPTION OF WASTE:

Non-Hazardous Contaminated Soil

TOTAL QUANTITY

24.37 yds

Facility Contact:

Jim Anderson

Cannon AFB: Sandi K. Mukherjee CES/CEVR

15 Aug 94

SIGNATURE: mm/dd/yy

NAME: Michael Patterson

REPRESENTATIVE: Jim Sign here

NAME OF TRANSPORTER: (Driver)

8-11-94

SIGNATURE: mm/dd/yy

DISPOSAL SITE:

CRI/Halfway, NM

8/1/94

SIGNATURE: mm/dd/yy

TRANSPORTER MANIFEST

MANIFEST# 24

SHIPPING FACILITY NAME & ADDRESS:

Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:

CRI / Halfway, NM

TRANSPORTER NAME & ADDRESS:

TADD TRUCKING
P.O. BOX 584
Hobbs, NM 88240

TNRCC Waste Code:

None Required

FUL DESCRIPTION OF WASTE:

Non-Hazardous Contaminated Soil

TOTAL QUANTITY

29.45 yds

Facility Contact:

Jim Anderson

NAME: Michael Patterson

SIGNATURE: mm/dd/yy

REPRESENTATIVE: Jim Sign here Vera Wood Vera Wood, 27 CES/CEV

NAME OF TRANSPORTER: (Driver)

Terry Hoxie Terry Hoxie 8-12-94

SIGNATURE: mm/dd/yy

DISPOSAL SITE:

CRI / Halfway, NM 8/2/94

SIGNATURE: mm/dd/yy

TRANSPORTER MANIFEST

MAINIFEST# 05

SHIPPING FACILITY NAME & ADDRESS:
Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:
CRI/Halfway, NM

TRANSPORTER NAME & ADDRESS:
TADD Trucking
P.O. Box 584
Hobbs NM 88240

TNRCC Waste Code:
None required

FUL DESCRIPTION OF WASTE:
Non-Hazardous Contaminated Soil

TOTAL QUANTITY
28.77 yds.

Facility Contact:
Jim Anderson

NAME: Michael Patterson
Jim Sign here
SIGNATURE: mm/dd/yy
15 Aug 94

REPRESENTATIVE: 27 CES/CEVP Vera A Wood

NAME OF TRANSPORTER: (Driver)
Terry Hosoe
SIGNATURE: mm/dd/yy 8-15-94

DISPOSAL SITE:
C.R.I/Halfway, NM
SIGNATURE: mm/dd/yy 8/15/94

TRANSPORTER MANIFEST

MAINIFEST# 06

SHIPPING FACILITY NAME & ADDRESS:
Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:
CRI/Halfway, NM

TRANSPORTER NAME & ADDRESS:
TADD TRUCKING
P.O. Box 584
Hobbs NM 88240

TNRCC Waste Code:
None Required

FUL DESCRIPTION OF WASTE:
Non-Hazardous Contaminated Soil

TOTAL QUANTITY
29.14 yds.

Facility Contact:
Jim Anderson

NAME: Michael Patterson
Jim Sign here
REPRESENTATIVE:

SIGNATURE: mm/dd/yy
15 Aug 94
Vera A. Wood
27 CES/CEVP Vera A. Wood

NAME OF TRANSPORTER: (Driver)
Daniel Young 8-15-94
SIGNATURE: mm/dd/yy

DISPOSAL SITE:
CRI/Halfway, NM

8/15/94
SIGNATURE: mm/dd/yy

TRANSPORTER MANIFEST

MANIFEST# 07

SHIPPING FACILITY NAME & ADDRESS:

Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:

CRI/Halfway, NM

TRANSPORTER NAME & ADDRESS:

TADD TRUCKING
P.O. Box 584
Hobbs NM 88240

TNRCC Waste Code:

None Required

FUL DESCRIPTION OF WASTE:

Non-Hazardous Contaminated Soil

TOTAL QUANTITY

23.12 yds.

Facility Contact:

Jim Anderson

CANNON AFB, NM 27 CES/CEVR SANDY K. MULHEERTEE 15 Aug 94

SIGNATURE: mm/dd/yy

NAME: Michael Patterson
REPRESENTATIVE: Jim Sign here

NAME OF TRANSPORTER: (Driver)

Alan R. Souza 8-15-94

SIGNATURE: mm/dd/yy

DISPOSAL SITE:

CRI/Halfway, NM 8/15/94

SIGNATURE: mm/dd/yy

TOTAL P.02

TRANSPORTER MANIFEST

MAINIFEST# 08

SHIPPING FACILITY NAME & ADDRESS:
Cannon Air Force Base
Clovis, NM

DISPOSAL SITE:
CRI/Halfway, NM

TRANSPORTER NAME & ADDRESS:
PATE TRUCKING
BOX 760
DENVER CITY TX 79323

TNRCC Waste Code:
None required

FUL DESCRIPTION OF WASTE:
NON-HAZARDOUS WASTE WATER

TOTAL QUANTITY
4200 gal.

Facility Contact:
Jim Anderson

SIGNATURE: mm/dd/yy

NAME: Michael Patterson
Jim Sign here
REPRESENTATIVE: VERA Wood 27CES/CEVP

NAME OF TRANSPORTER: (Driver)
GUY ELLIS

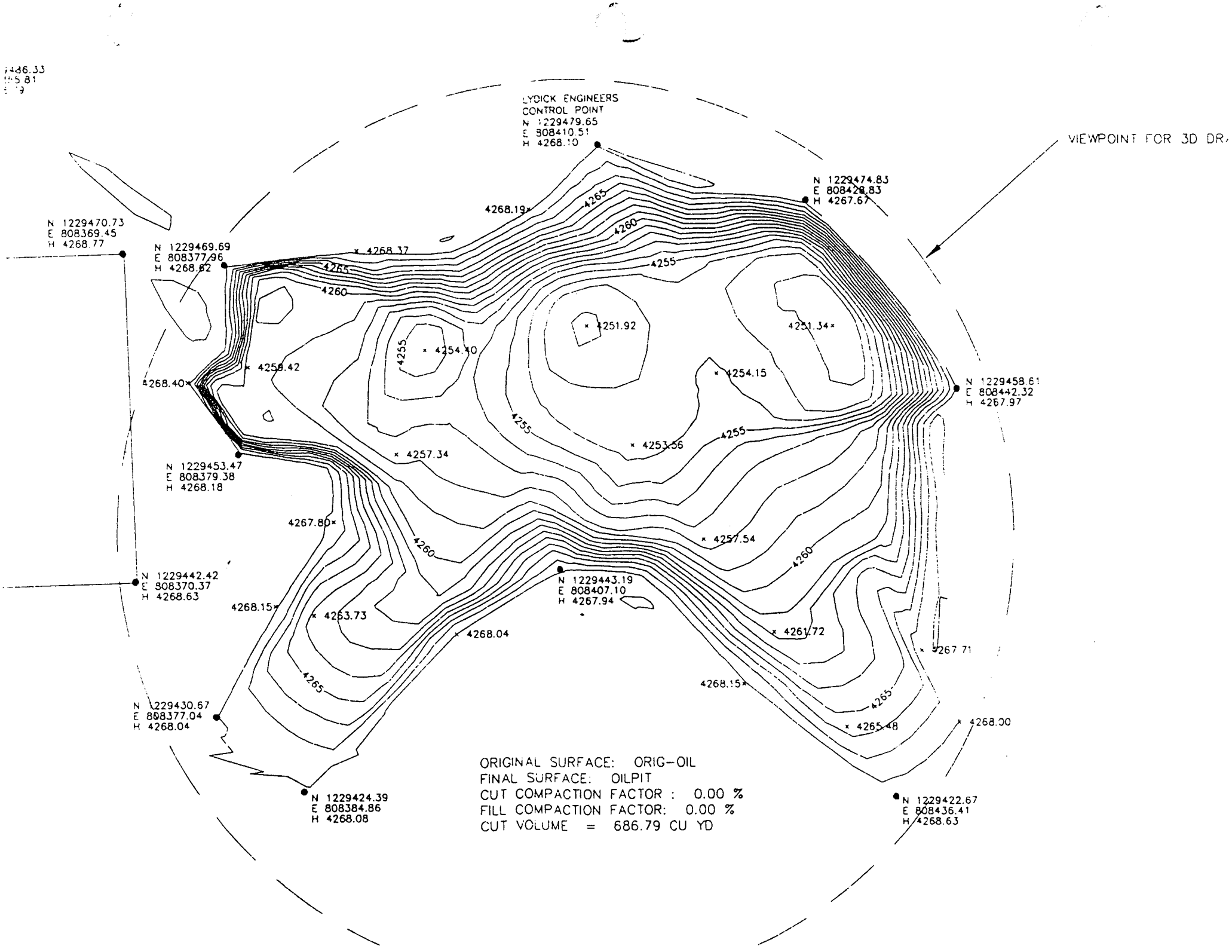
SIGNATURE: mm/dd/yy

DISPOSAL SITE:
CRI/HALFWAY, NM

SIGNATURE: mm/dd/yy 8 12 94

3.10

H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VIEWPOINT FOR 3D DR
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N 1229470.73
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4251.92
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4254.15
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4257.34
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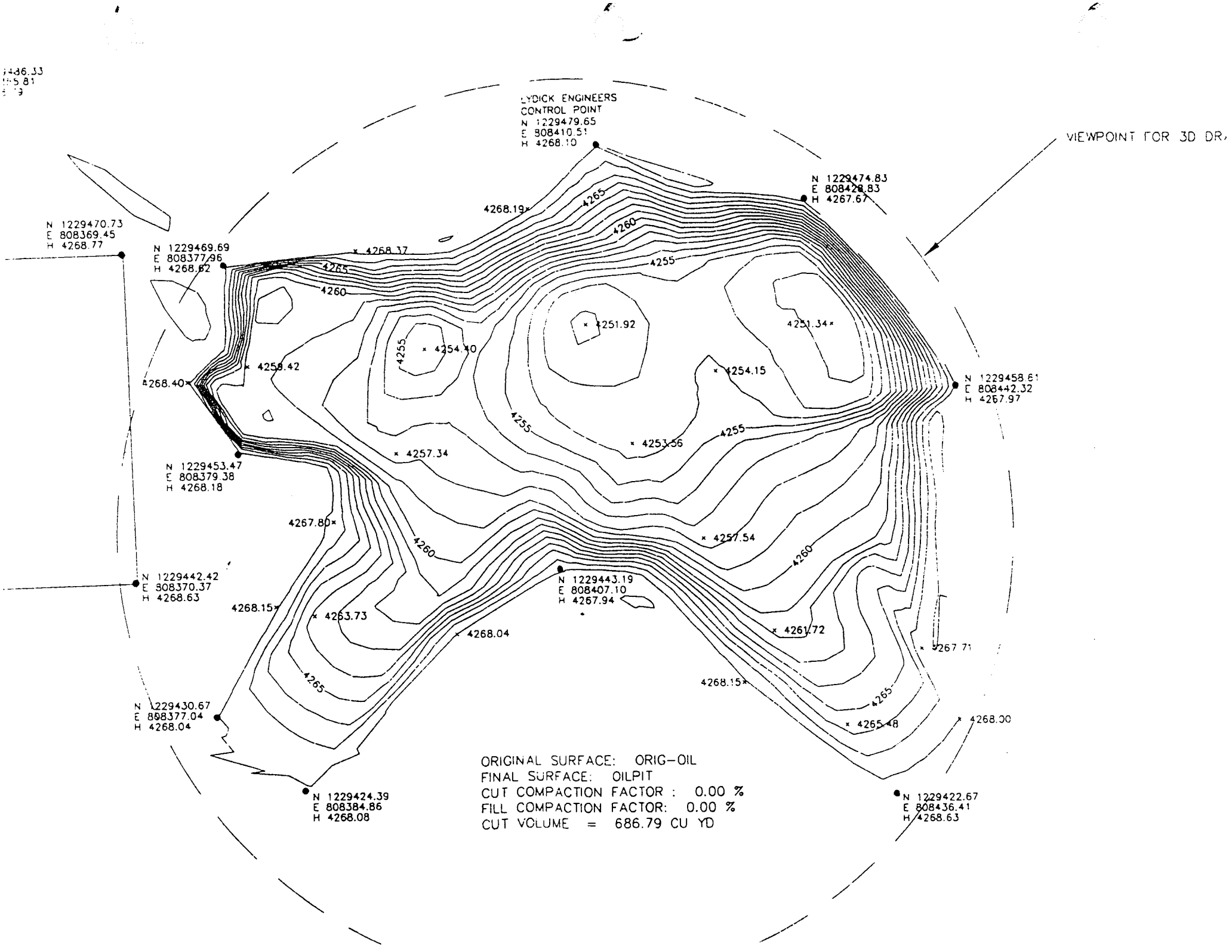
4268.15
4253.73
4268.04
4261.72
4267.71
4268.15
4265.48
4268.00
4265
4260
4255
ORIGINAL SURFACE: ORIG-OIL
FINAL SURFACE: OILPIT
CUT COMPACTION FACTOR : 0.00 %
FILL COMPACTION FACTOR: 0.00 %
CUT VOLUME = 686.79 CU YD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4268.00
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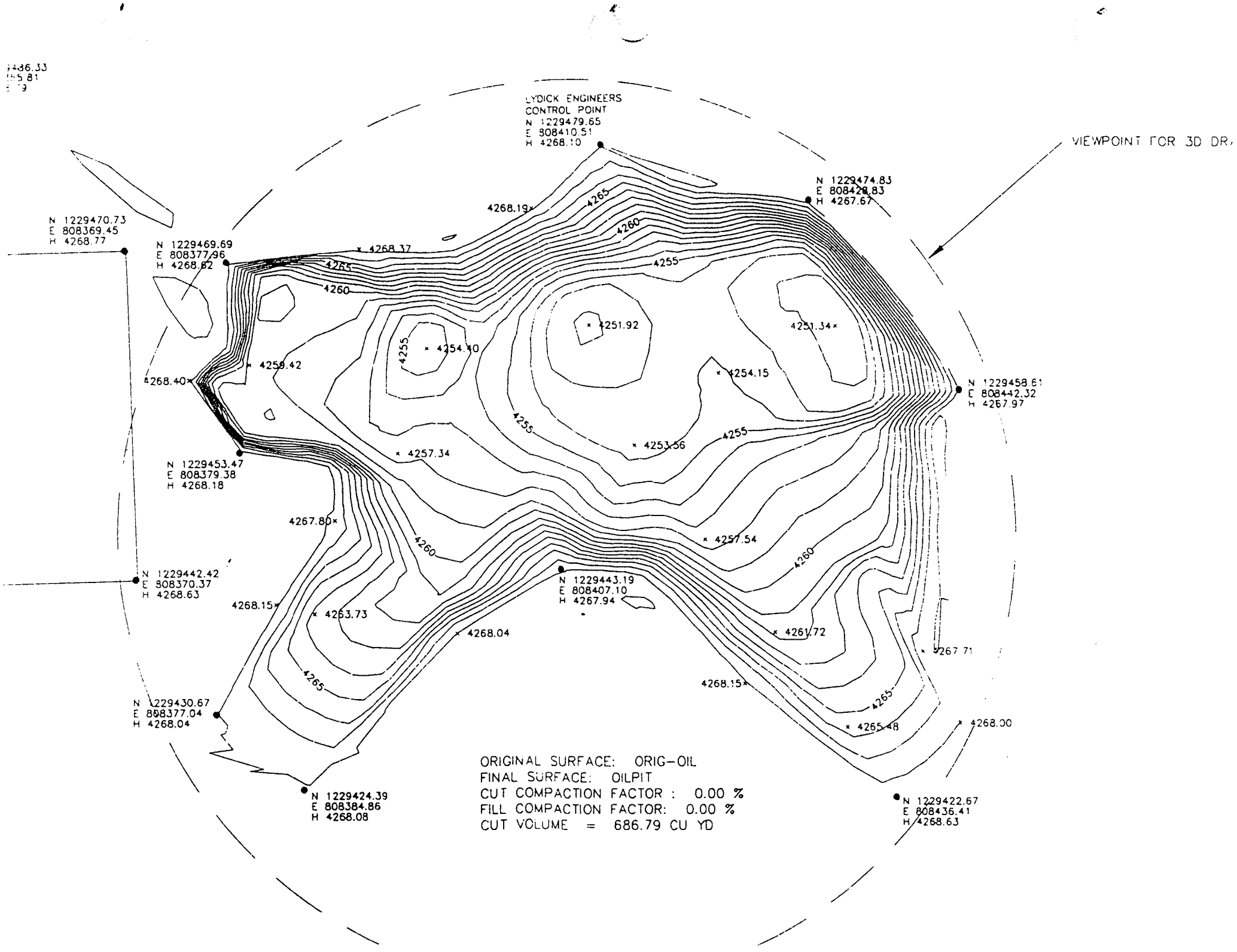
4260
4255
ORIGINAL SURFACE: ORIG-OIL
FINAL SURFACE: OILPIT
CUT COMPACTION FACTOR : 0.00 %
FILL COMPACTION FACTOR: 0.00 %
CUT VOLUME = 686.79 CU YD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VIEWPOINT FOR 3D DR
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4268.04
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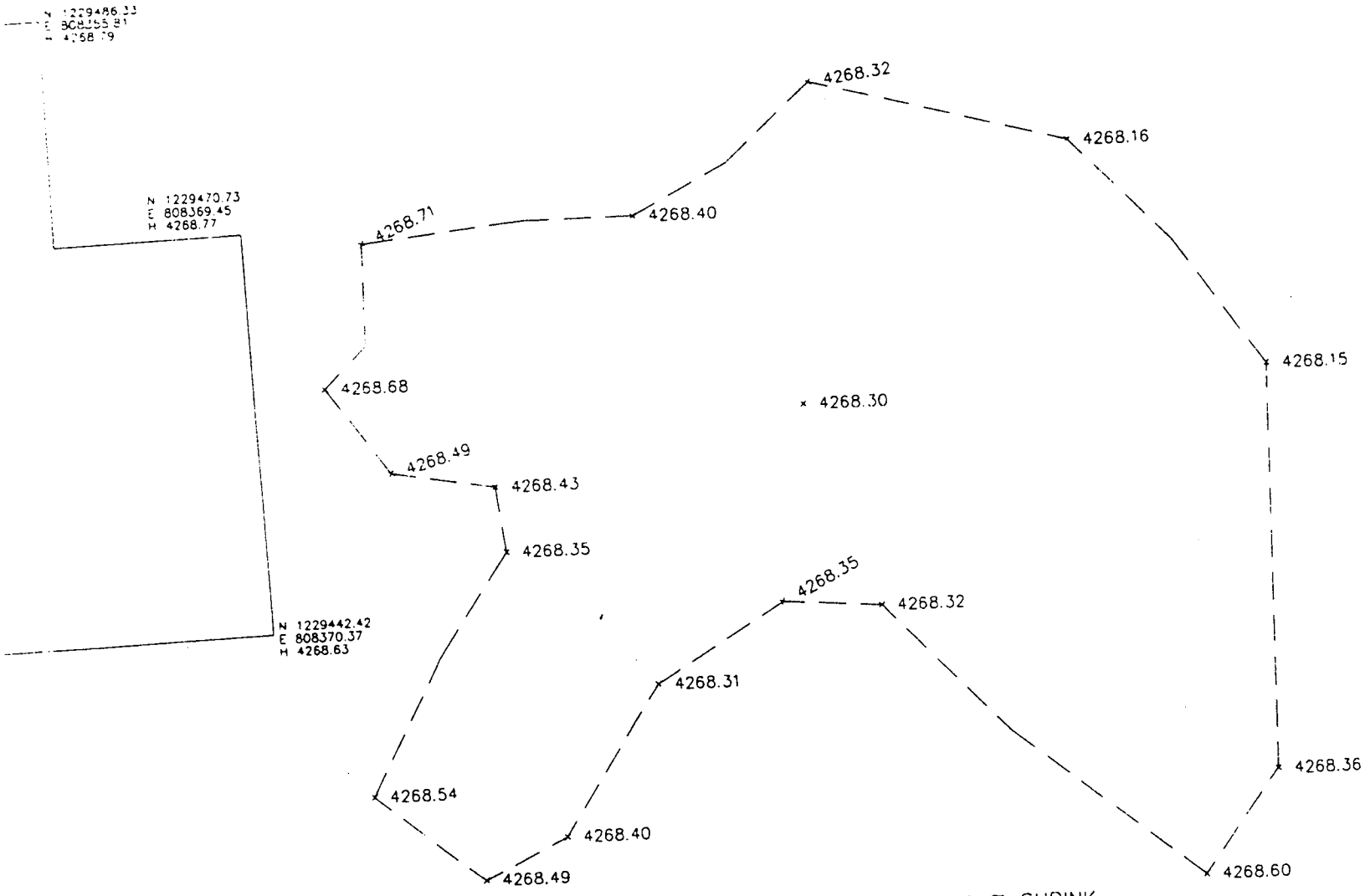
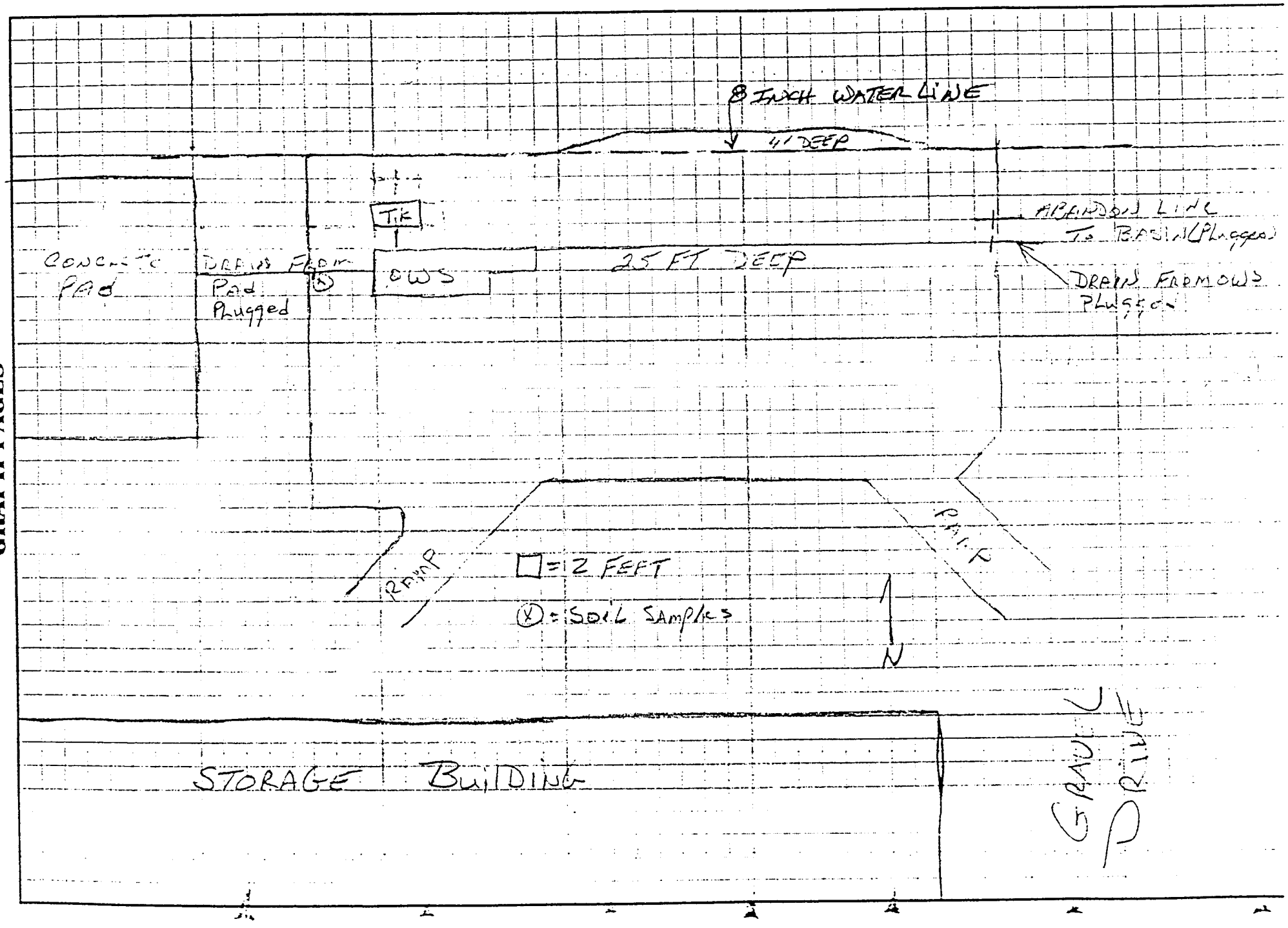
4267.71
4268.15
4265.48
4268.00
4265
4260
4255
ORIGINAL SURFACE: ORIG-OIL
FINAL SURFACE: OILPIT
CUT COMPACTION FACTOR : 0.00 %
FILL COMPACTION FACTOR: 0.00 %
CUT VOLUME = 686.79 CU YD



FILL COMPACTION FACTOR: 18.00 % SHRINK
CUT VOLUME = 686.79 CU YD (ORIGINAL PIT)
FILL VOLUME = 700.85 CU YD (AS-BUILT)
COMPACTED FILL VOLUME = 827.00 CU YD

SAMPLE FORM

GRAPH PAGES

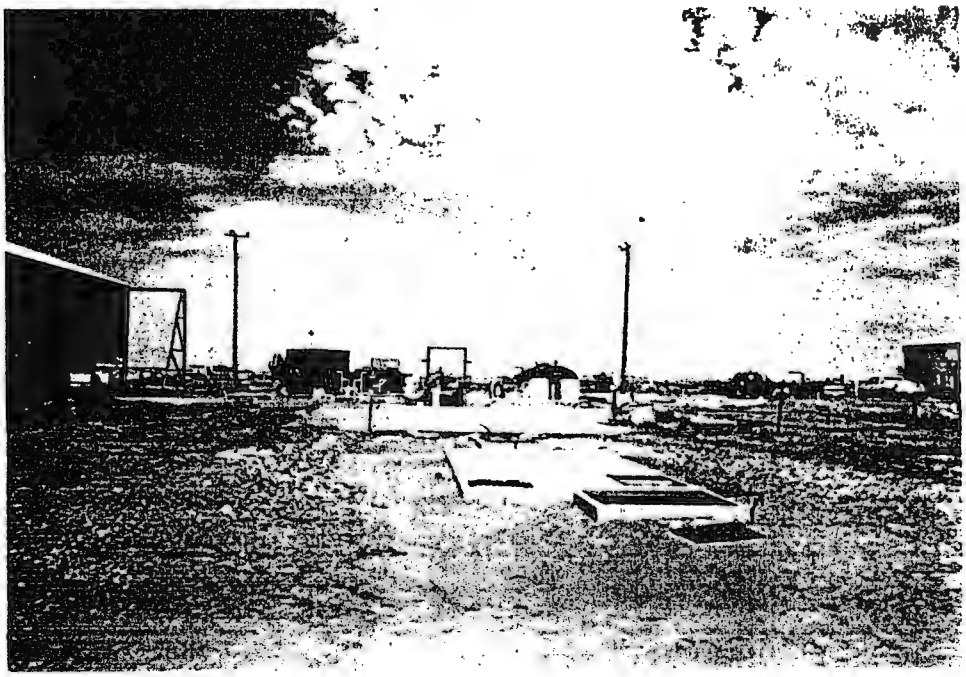


3.10

I

WEST

DACA 45-94-C-0100



JULY 26, 1994

OIL/WATER SEPARATOR SITE PRIOR TO START

EAST

DACA 45-94-C-0100

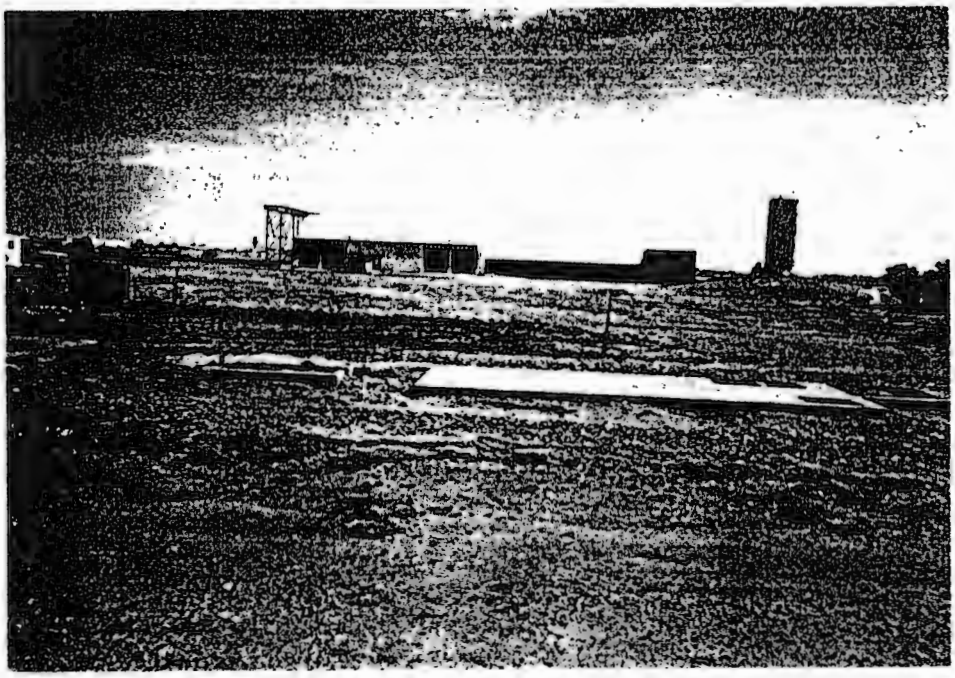
OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: P.S.I.

OIL/WATER SEPARATOR SITE PRIOR TO START

NORTH

DACA45-94-C-0100

3



JULY 26, 1994

OIL/WATER SEPARATOR SITE PRIOR TO START

SOUTH

DACA45-94-C-0100

4

OWS REMOVAL - DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

OIL/WATER SEPARATOR SITE PRIOR TO START

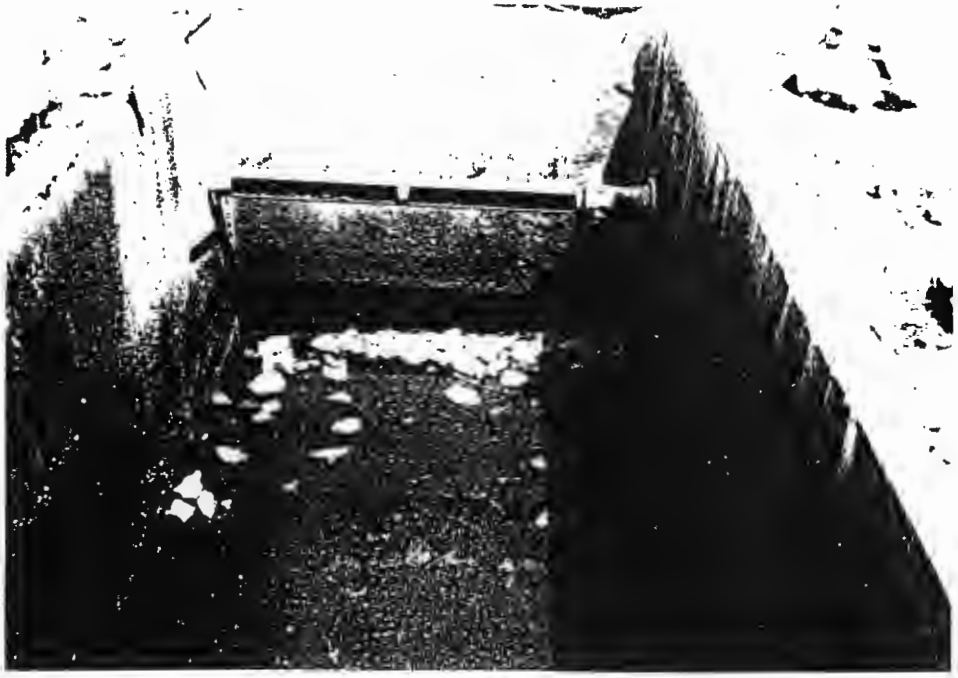
DACA45-94-C-0100

5

JULY 27, 1994
TOP REMOVED FROM OIL/WATER SEPARATOR

DACA45-94-C-0100

6



OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

JULY 29, 1994
PUMPED AND CLEANED

SOUTH WEST

DACA45-94-C-0100

7

JULY 29, 1994

EXCAVATING AROUND OIL/WATER SEPARATOR

SOUTH EAST

DACA45-94-C-0100

6

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

JULY 29, 1994

EXCAVATING AROUND OIL/WATER SEPARATOR

SOUTH EAST

DACA45-94-C-0100

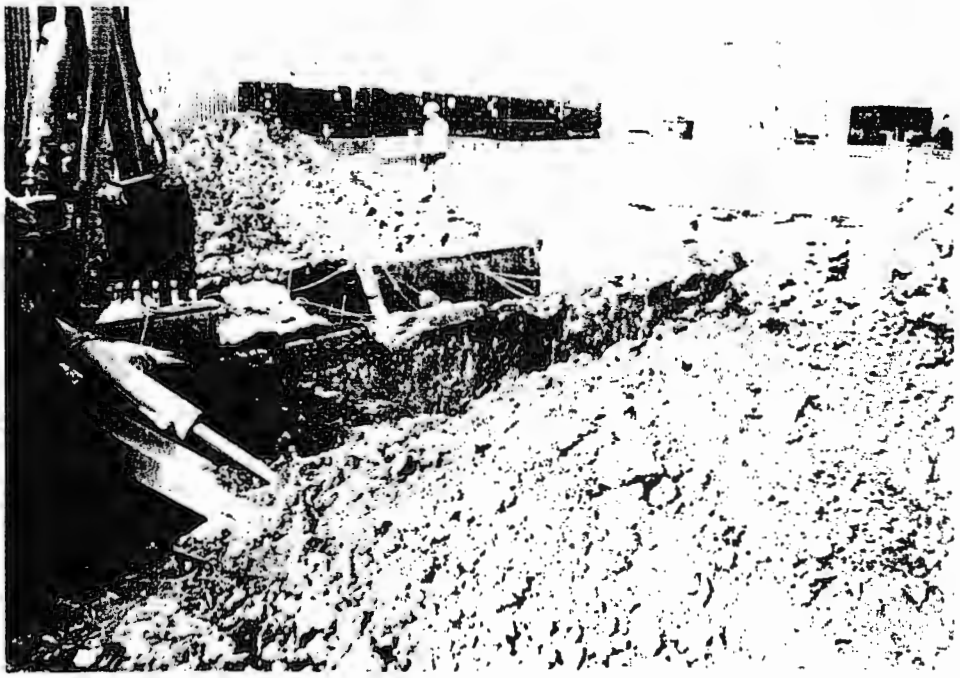
9

JULY 29, 1994
DIGGING AROUND OIL/WATER SEPARATOR

SOUTH WEST

DACA45-94-C-0100

10



OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

JULY 29, 1994
DIGGING AROUND OIL/WATER SEPARATOR

DACA45-94-C-0100

11

JULY 29, 1994
EXPOSED NORTH WALL OF
OIL/WATER SEPARATOR

DACA45-94-C-0100

12

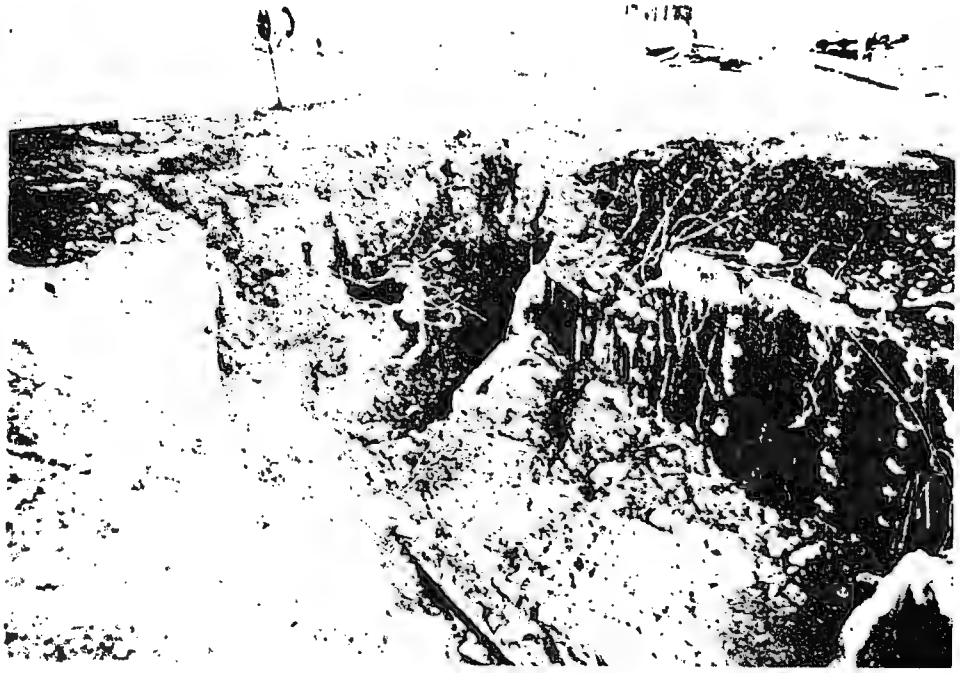
OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

JULY 29, 1994
EXPOSED SOUTH WALL
PAGE 6

SOUTHWEST

DACA 45-94-C-0100

13

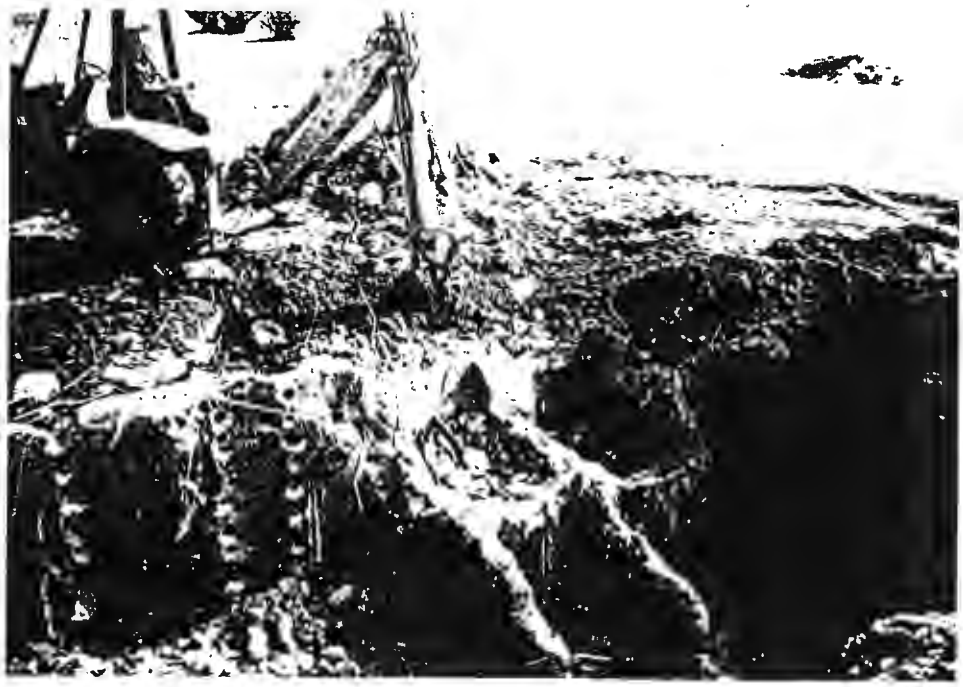


JULY 30, 1994
REMOVING CONCRETE

NORTH EAST

DACA 45-94-C-0100

14

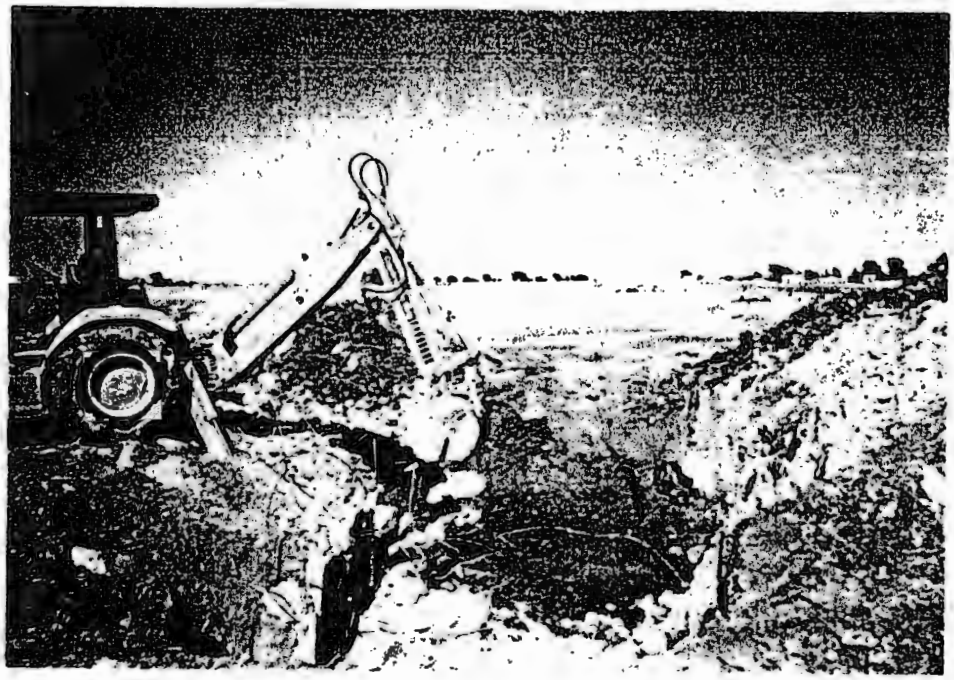


OWS REMOVAL -DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

JULY 31, 1994
REMOVING CONCRETE

DACA 45-94-C-0100

15



JULY 31, 1994
REMOVING CONCRETE

DACA 45-94-C-0100

16

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

JULY 31, 1994
REMOVING OIL/WATER SEPARATOR AND TANKS

DACA45-94-C-0100

17

JULY 31, 1994
REMOVED
OIL/WATER SEPARATOR

DACA45-94-C-0100

18

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 1, 1994
HAD TO PUMP WATER FROM HOLE
PAGE 9

EAST
DACA 45-94-C-0100

19

AUGUST 2, 1994
EXCAVATING

WEST
DACA45-94-C-0100

20

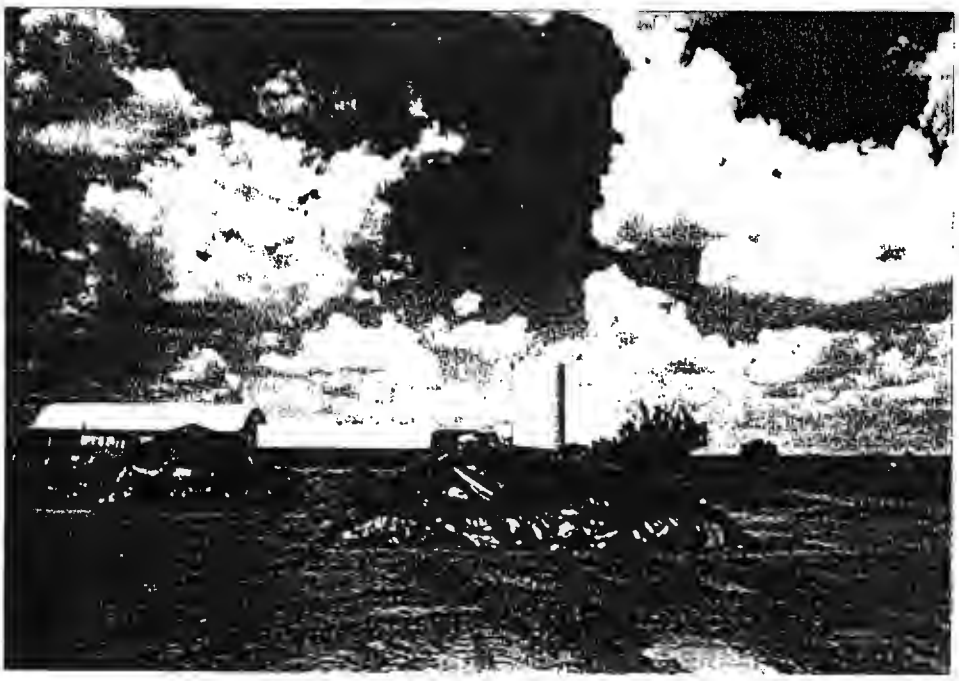
OWS REMOVAL - DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 2, 1994
EXCAVATING

NORTH

DACA45-94-C-0100

21



AUGUST 3, 1994
DIRT MOVED ONTO 80 MIL MEMBRANE AND COVERED

WEST

DACA45-94-C-0100

22

OWS REMOVAL - - DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 4, 1994
EXCAVATING SITE

NORTH EAST

DACA45-94-C-0100

23

AUGUST 8, 1994
EXCAVATING SITE

WEST

DACA45-94-C-0100

24

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 9, 1994
EXCAVATING SITE

NORTH WEST

DACA45-94-C-0100

25

AUGUST 10, 1994
EXCAVATING SITE

SOUTH EAST

DACA45-94-C-0100

26

OWS REMOVAL - DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 11, 1994
RAMP TO PIT RE-WORKED

NORTH WEST

DACA45-94-C-0100

27

AUGUST 11, 1994
SLOPED WALLS FOR SAFETY

DACA45-94-C-0100

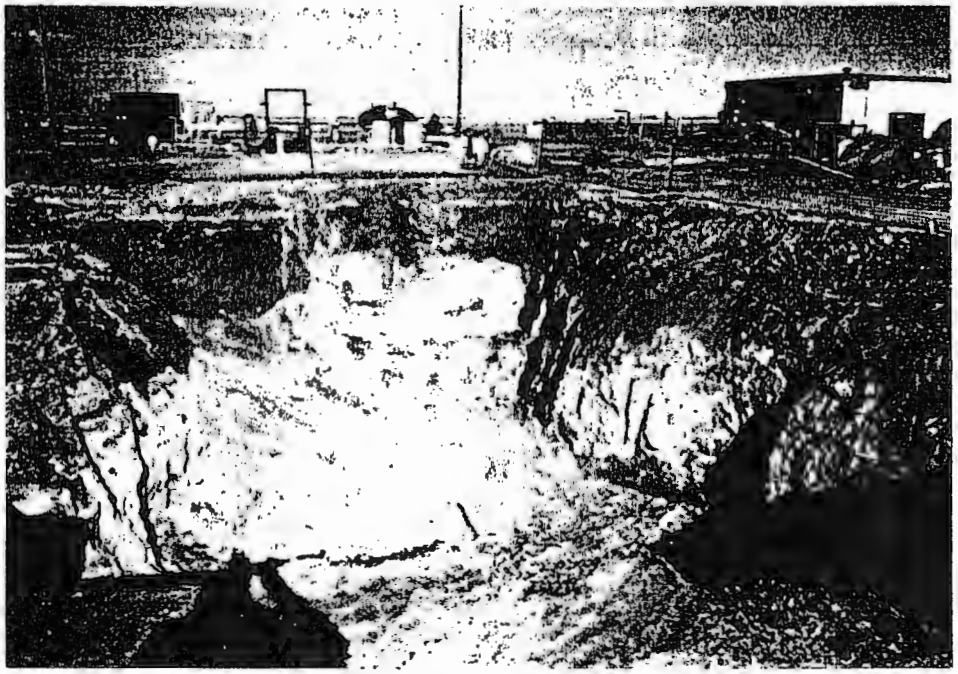
28

OWS REMOVAL -DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 12, 1994
HAULING OF SOIL TO LANDFILL

NORTH

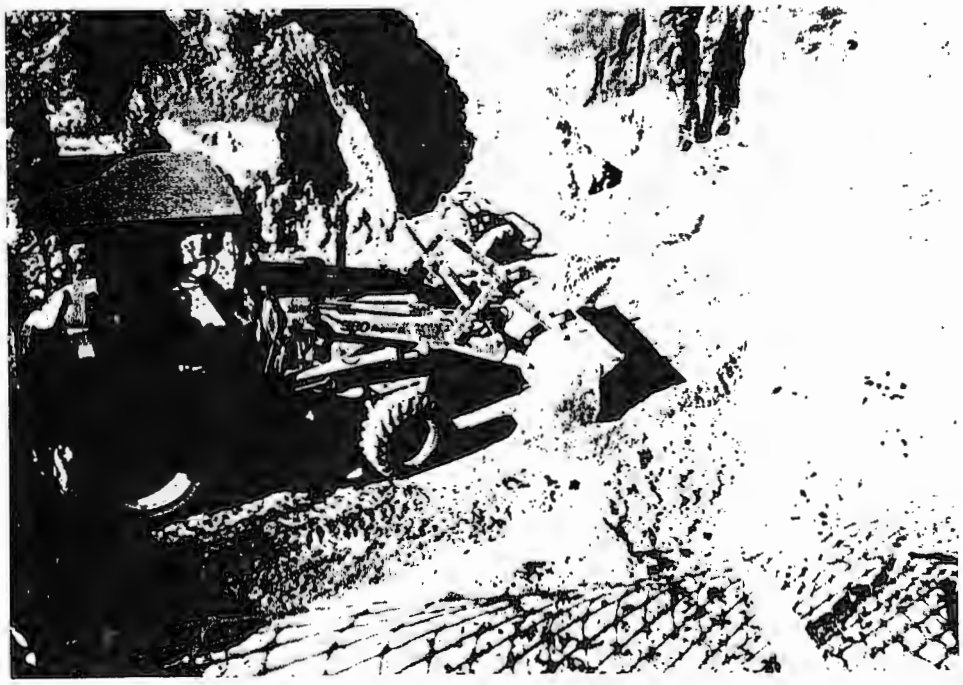
29



AUGUST 17, 1994
START BACKFILLING SITE/HAD TO STOP - NO COMPACTION

DACA45-94-C-0100

30



OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 20, 1994
START TO BACKFILLING AND COMPACTION

NORTH

DACA45-94-C-0100

AUGUST 25, 1994
BACKFILLING

NORTH

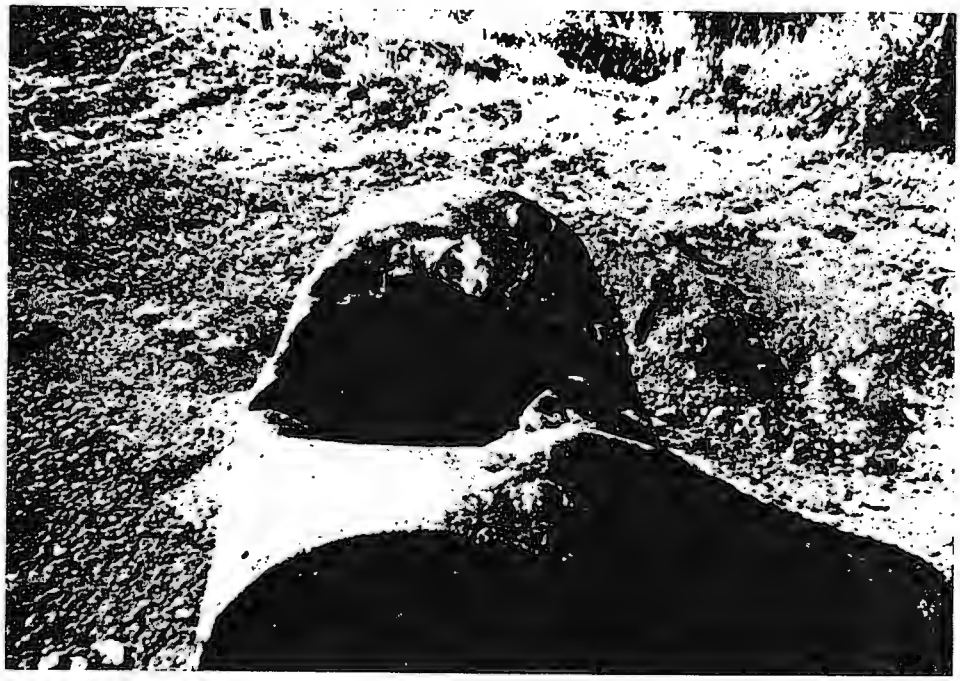
DACA45-94-C-0100

OWS REMOVAL DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 25, 1994
LYDICK ENGINEERING DENSITY CHECK

DACA45-94-C-0100

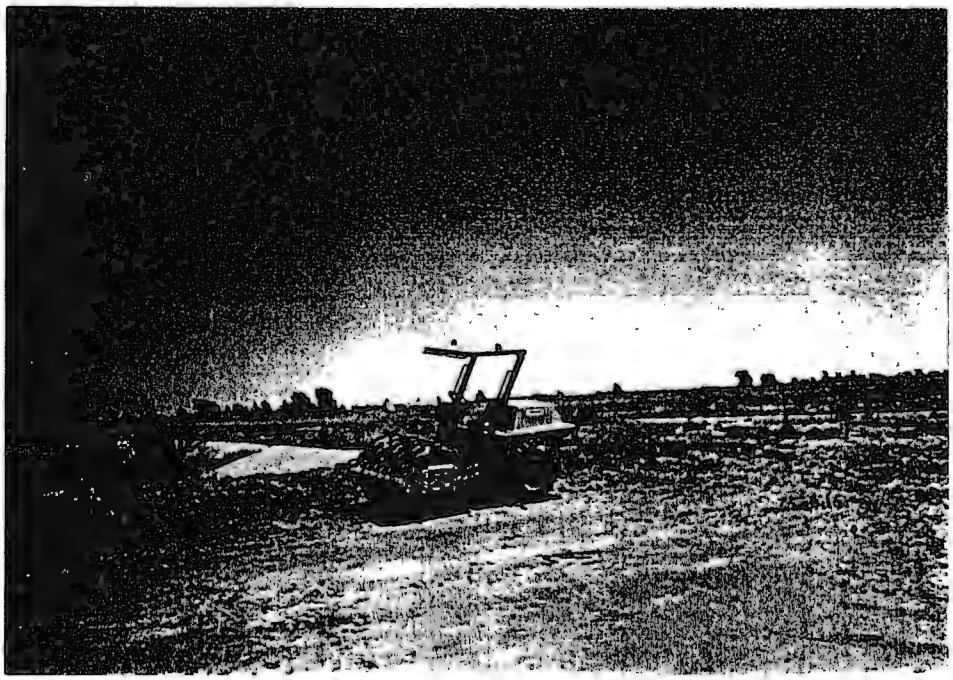
35



AUGUST 25, 1994
OIL/WATER SEPARATOR DEMO

DACA45-94-C-0100

34



OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

AUGUST 25, 1994
ROLLER VIBRATOR PACKER USED FOR COMPACTION

DACA 05-94-C-0 00

35

AUGUST 31, 1994
FILL CONTINUES

DACA45-94-C-0100

36

OWS REMOVAL--DACA45-94-C 0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

SEPTEMBER 1, 1994
FILL CONTINUES

DACA45-94-C-0100

37

SEPTEMBER 7, 1994
WATER IN PIT FROM HOLE THROUGH WATER LINE

DACA45-94-C-0100

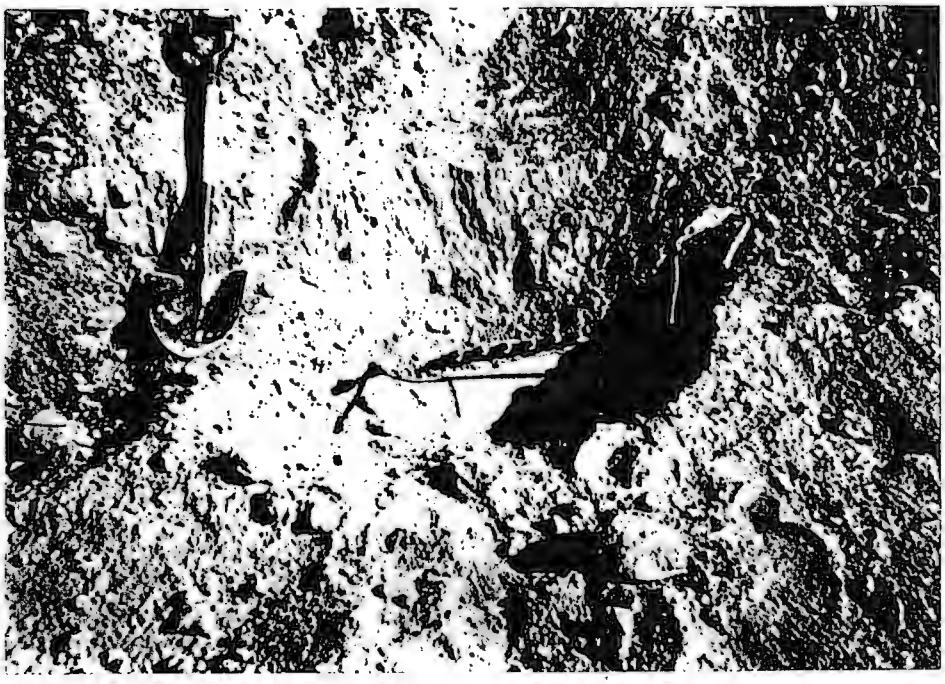
38

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

SEPTEMBER 7, 1994
WATER IN PIT FROM HOLE THROUGH WATER LINE
PAGE 19

DACA45-94-C-0100

39



SEPTEMBER 8, 1994
LINE PATCHED - FULL CIRCLE CLAMP

DACA45-94-C-0100

40

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

SEPTEMBER 8, 1994
FILL DIRT/COMPACTION CONTINUES

EAST

DACA 45-94-C-0100

43

SEPTEMBER 9, 1994
COMPLETED PROJECT

WEST

DACA 45-94-C-0100

44

OWS REMOVAL DACA45-94-C-0100
CANNON AFB., NEW MEXICO
CONTRACTOR: R.S.I.

SEPTEMBER 9, 1994
COMPLETED PROJECT

NORTH

DACA45-94-C-0100

41

SEPTEMBER 9, 1994
COMPLETED PROJECT

SOUTH

DACA45-94-C-0100

42

OWS REMOVAL--DACA45-94-C-0100
CANNON AFB.,NEW MEXICO
CONTRACTOR: R.S.I.

SEPTEMBER 9, 1994
COMPLETED PROJECT