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CAFB97

DEPARTMENT OF THE AIR FORCE

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

Colonel Michael J. Koerner
Commander
100 S DL Ingram Blvd Suite 100
Cannon AFB NM 88103-5214

14 FEB 1997

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

Dear Mr. Garcia

Enclosed for your review and approval are Decision Documents for 17 Installation Restoration Program (IRP) sites located on Cannon AFB. The 17 sites are part of the original 23 sites of the Cannon AFB IRP and are also listed as Solid Waste Management Units (SWMUs) in the Hazardous and Solid Waste Amendments (HSWA) section of the Cannon AFB RCRA Part B Permit.

Questions regarding these documents and the Cannon AFB restoration program may be directed towards Mr. John S. Pike or Mr. Sanford Hutsell, of my Civil Engineer Environmental Flight, at (505) 784-4348. I look forward to the continued cooperation between our organizations in addressing the environmental restoration concerns at Cannon AFB.

Sincerely

Michael Koerner

MICHAEL J. KOERNER, Colonel, USAF
Commander

Attachments:
17 Decision Documents

cc:
NMED (S. Pullen)
NMED (J. Jacobs)
EPA (B. Sturdivant)
HQ ACC CES/ESVW (M. Calvert) w/o Attachment

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
JP-4 Fuel Spill
AOC B / IRP No. SS-18

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

JP-4 Fuel Spill
AOC B/IRP No. SS-18
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

JP-4 Fuel Spill
AOC B/IRP No. SS-18

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the JP-4 Fuel Spill (AOC B/IRP No. SS-18) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Based on the results of the IRP Phase I study in 1983 performed by CH_2M Hill and February 1992 investigation performed near the site by Radian Corporation (Radian), no present significant risk or threat to public health or the environment exists at JP-4 Fuel Spill (AOC B/IRP SS-18). Therefore, No Further Response Action Planned is warranted at this site.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the JP-4 Fuel Spill (AOC B/IRP No. SS-18) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from past releases of contaminants. The activities performed for this IRP Phase I followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP. The statutory preference for further treatment is not satisfied because further treatment was not found to be necessary.

U.S. AIR FORCE

_____ By: _____
Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____
Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____
Date

Title: _____

DECISION SUMMARY

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LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
gpm	Gallons per Minute
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Forest and Wildlife Service

LIST OF ACRONYMS

USGS	United States Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.1 SITE LOCATION AND DESCRIPTION

The JP-4 Fuel Spill, designated as Area of Concern (AOC) B and Installation Restoration Program (IRP) No. SS-18, is located in the western central area of the base on the south apron southwest of former Building 120. The site resulted from an accidental spill of approximately 400 gallons of JP-4 fuel onto a concrete apron from a broken fuel coupling on an aircraft fuel tank in 1980.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. The JP-4 Fuel Spill site is located on the south apron southwest of former Building 120 and approximately 2000 feet east of the western Cannon AFB boundary. The site location is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The JP-4 Fuel Spill site (AOC B/SS-18) is in an area of the base used for Aircraft Operations and Maintenance Facilities, as characterized by the Cannon AFB Base Comprehensive Plan (W-C 1995). The site is characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The JP-4 Fuel Spill Site (AOC B/SS-18)is located in the western central part of the base. The immediate area is used by aircraft operations and maintenance personnel. The site is approximately 500 and 1,000 feet from two commercial areas of the base and 1500 feet from the administrative support area. The site is approximately 2,000 feet from the nearest housing area.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The JP-4 Fuel Spill site is covered by a flat concrete apron.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The JP Fuel Spill site was on the south apron, southwest of the former location of Bldg. 120. Approximately 400 gallons of JP-4 fuel spilled onto the concrete apron from a broken fuel coupling on an aircraft fuel tank in 1980.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at the JP-4 Fuel Spill (AOC B/SS-18) was evaluated by reviewing existing information and conducting an

analysis of installation records. The study concluded that conditions at the site present no significant threat to public health and the environment.

- The site was scheduled to be investigated during the Appendix III Phase I, Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Investigation. However, 13 new borings were drilled in the area in February 1992 in anticipation of construction of a new hangar, although none of the borings were drilled precisely at the site, as shown in **Figure 1-3**. The samples were analyzed for total petroleum hydrocarbons (TPH), TPH extractables and purgeables, total recoverable petroleum hydrocarbons (TRPH), and total volatile organic compounds (VOCs).

1.2.2 Period of Operation

The JP-4 Fuel Spill (AOC B/SS-18) was the site of an accidental spill of 400 gallons of JP-4 fuel onto a concrete apron in 1980.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U.S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Site SS-18 is the location of the south apron where an accidental spill of 400 gallons of JP-4 fuel occurred in 1980.

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RFI on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs; and
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

Approximately 400 gallons of JP-4 fuel spilled onto the concrete apron from a broken fuel coupling on an aircraft fuel tank in 1980. Some portion of the JP-4 fuel may have entered the apron subgrade through construction joints and cracks in the apron, although it is unlikely that this would have been a significant amount. Most of the fuel would have evaporated from the top of the concrete apron.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/Visual Site Inspection (VSI), RCRA Facility Assessment (RFA) conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes

Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.

4. 1994 Appendix II and III Phase I Reports approved by EPA Region VI.
5. 1994 RFI Appendix II and III Phase II Work Plans approved by EPA Region VI.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for NFA, 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation (RFI), and 4 sites are under Long Term Monitoring.

The JP-4 Fuel Spill Site (AOC B/SS-18) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Ninety percent of Cannon AFB is covered by surface soil of the Amarillo series. The soils were formed in the Blackwater Draw Formation of unconsolidated alluvium deposits of Pleistone age. Permeability of these loams is moderate and ranges from 1E-3 to 4E-4 cm/sec. The Amarillo soils overlie a 25-50 foot thick white chalky caliche zone that occurs at about 4 feet below the surface and is part of the Ogallala Formation. The caliche is underlain by sand, silts, and clay which may extend up to 400 feet below land surface. Where the sediments are saturated they form part of the High Plains Aquifer (Ogallala Aquifer). The base of the aquifer is predominantly sandstone beds of Triassic age Dockum Group.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Soil samples were collected in the area of the JP-4 Fuel Spill site February 1992 during drilling in anticipation of the construction of a new hangar. Thirteen soil borings were drilled to a depth of 20 feet in the vicinity of the site, but not at the site. One soil sample was collected from each boring at depths varying from 1 to 20 feet. The boring closest to the site (BH-7) was drilled approximately 90 feet from the outer edge of the site, as shown in **Figure 1-3**. The samples were analyzed for TPH extractables and purgeables, TRPH, and total VOCs. All chemicals in the sample obtained from Boring BH-7 registered below the detection limit, as shown in **Table 2-1**.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft bgl. Therefore, no hydrogeologic investigation was planned or conducted at this site and no groundwater monitoring wells were installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to the JP-4 Fuel Spill site (AOC B/SS-18).

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to be a risk to the environment or public health due to air emissions from the JP-4 Fuel Spill site (AOC B/SS-18).

2.6 POTENTIAL RECEPTORS/PATHWAYS

The accidental spill of JP-4 Fuel occurred on a paved surface. The only spillage which may have entered the soil would have done so through cracks in the pavement. The amount of penetration is presumed to be very small, if any. As a result of the Records Search and a site visit, there is no indication that hazardous substances or petroleum products were stored, disposed of, or remain at the JP-4 Fuel Spill site. Available information indicates that the

suspected site poses no risk to human health or the environment. Therefore, discussion of potential receptors and pathways is not applicable to this site.

3.0
DATA ANALYSIS/RISK ASSESSMENT

The accidental spill of JP-4 Fuel occurred on a paved surface. The only spillage which may have entered the soil would have done so through cracks in the pavement. The amount of penetration is presumed to be very small, if any. As a result of the Records Search and a site visit, there is no indication that any hazardous substance or petroleum product was stored, disposed of, or remains at the JP-4 Fuel Spill site. The aircraft apron at the site and the classification of the site as Industrial under the Rational National Standards Initiative preclude most land uses (i.e. recreation, housing, agriculture). In addition, available information indicates that the suspected site poses no risk to human health or the environment. Therefore, a discussion of data analysis/risk assessment is not applicable to this site.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the investigation for the JP-4 Fuel Spill site (AOC B/SS-18) the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the investigation, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

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TABLES

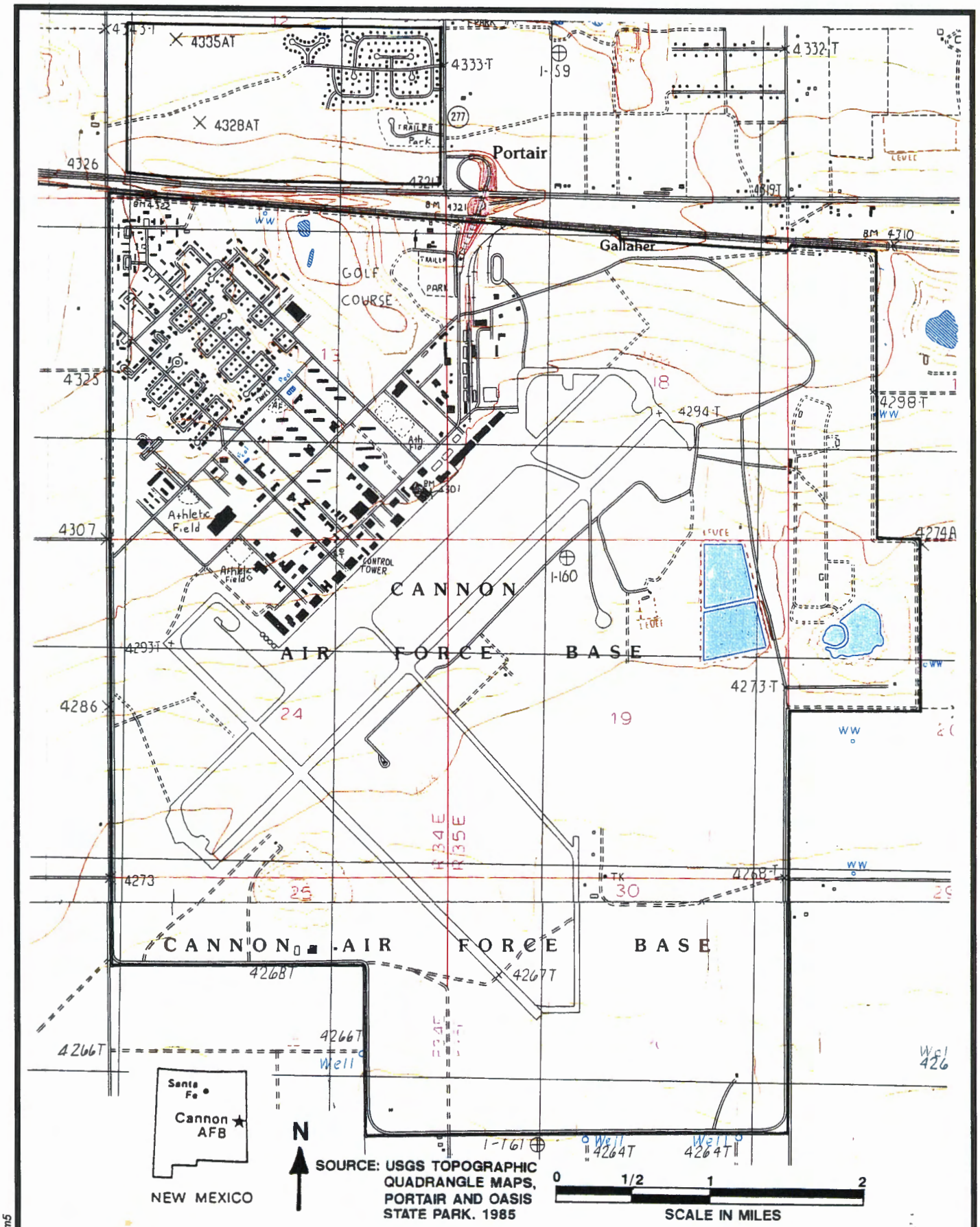
TABLE 2-1
TRPH, TPH PURGEABLES AND EXTRACTABLES, AND VOLATILE ORGANICS IN SOIL SAMPLES
JP-4 FUEL SPILL
AOC B/IRP NO. SS-18
Cannon Air Force Base, New Mexico

Sample	Depth (ft)	TRPH (ppm)		TPH purgeables (limit = 1000 ppm)[a] (ppm)		TPH extractables (limit = 1000 ppm)[a] (ppm)		Volatile Organics (BTEX limit = 500 ppm)[a] (Benzene limit = 100 ppm)[a]
		Detec. Conc.	Detec. Conc.	Detec. Conc.	Detec. Conc.	Detec. Conc.	Detec. Conc.	
BH-1-A	3.5-4	<31	31	ND	--	ND	--	ND
BH-2	9-10	<23	23	ND	--	ND	--	ND
BH-3	5-5.5	<22	22	ND	--	ND	--	ND
BH-4	14-14.5	<22	22	ND	--	ND	--	ND
BH-5	13-14	<22	22	ND	--	ND	--	ND
BH-6	5-6	<21	21	0.120[d]	0.032[f]	ND	--	ND
BH-7	**6-7**	**<21**	**21**	**ND**	**--**	**ND**	**--**	**ND**
BH-8	6.5-7	<21	21	ND	--	ND	--	ND
BH-9	6-6.5	<21	21	0.054[e]	0.032[e]	ND	--	ND
BH-10	3-3.5	<21	44	0.035[d]	0.033[d]	65[f]	5.6[f]	ND[c]
BH-11	13.5-14	7,500	22	ND	--	ND	--	ND
BH-12	8-8.5	<21	21	ND	--	ND	--	ND
BH-13	2-3	700	22	ND	--	8.4[f]	5.6[f]	ND
BH-14[c]	13-14	110	22	ND	--	ND	--	ND

[a]Limits based on New Mexico Solid Waste Regulations (Draft dated 16 July 1991), Section 708, paragraph E.
[b]BH-14 is BH-5 duplicate, QC sample.
[c]Unknown alkane and other unknown compounds found, <0.16 ppm.
[d]Toluene
[e]Benzene
[f]Mid-boiling constituents (e.g. motor oil)
ND = Not Detected

Source: Extent of Contamination South End Flight Line, Draft Site Assessment Report (Radian 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

JP-4 FUEL SPILL
AOC B / IRP No. SS-18
Cannon Air Force Base, New Mexico

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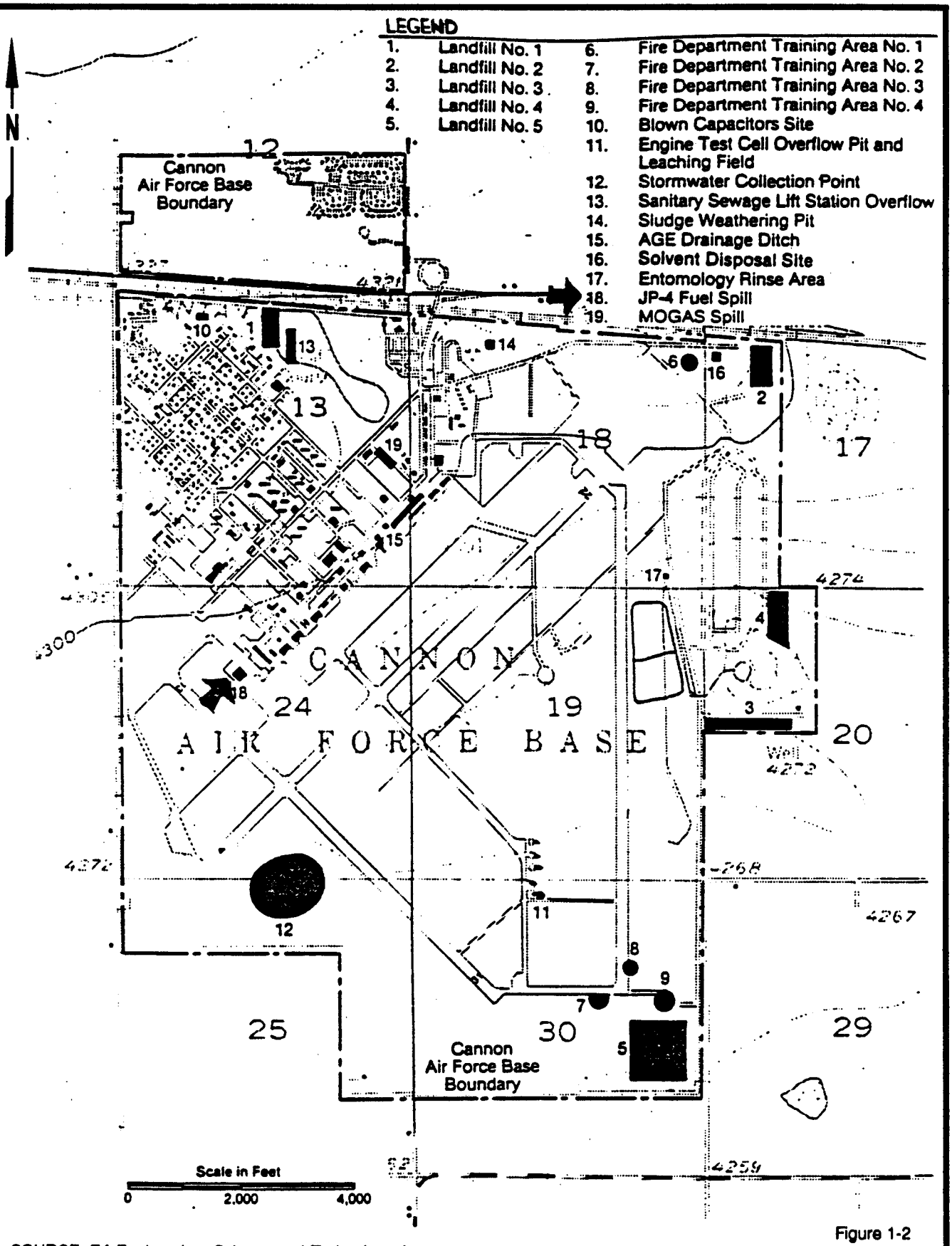

SOURCE: EA Engineering, Science and Technology, Inc., November 1990

HARZA *Consulting Engineers and Scientists*

Figure 1-2

IRP/SWMU SITE LOCATION MAP

JP-4 FUEL SPILL
AOC B / IRP No. SS-18
Cannon Air Force Base, New Mexico

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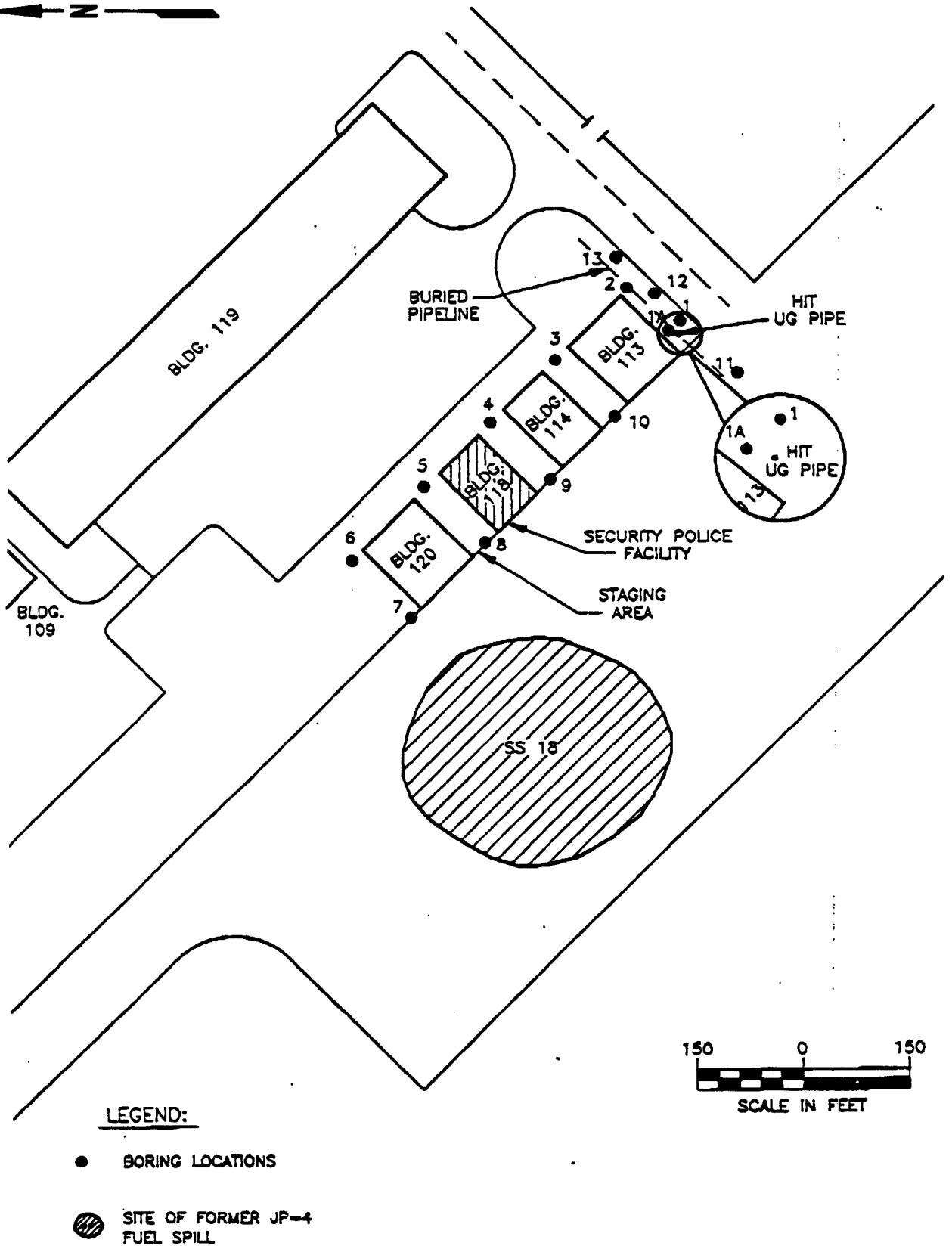

LEGEND:

● BORING LOCATIONS

SITE OF FORMER JP-4 FUEL SPILL

SOURCE: U.S. Army Corps of Engineers, May 1992

HARZA Consulting Engineers and Scientists

Figure 1-3

STUDY SITE PLAN

JP-4 FUEL SPILL
AOC B / IRP No. SS-18
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico performed by CH_2M Hill in 1983 and a analysis of soil borings obtained in February 1992 when drilling in anticipation of the construction of a new hangar. The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Volume 1, Final Report for Cannon Air Force Base, New Mexico. Radian Corporation. September 1986. Volumes 2 and 3, Appendix A-M, Draft Report for Cannon AFB, New Mexico. Radian Corporation. June 1985.

  These reports are the second phase of a four part IRP and are designed to determine if environmental contamination has resulted from base activities.

- Landfill 5, Cell 3, Geotechnical Summary Report, U.S. Army Corps of Engineers, Tulsa District, September 1988.

- Installation Restoration Program, Phase IV-A, Site 17 - Entomolgy Rinse Area, Final Remedial Action Plan and Conceptual Documents, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. December 1988a. Installation Restoration Program, Phase IV-A, Site 17 - Entomolgy Rinse Area, Final Environmental Assessment, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. December, 1988b.

This report is the final phase of a four part IRP investigation of SD-17.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Fire Department Training Area No. 2
SWMU No. 106 / IRP No. FT-07

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Fire Department Training Area No. 2
SWMU No. 106/IRP No. FT-7
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Fire Department Training Area No. 2
SWMU No. 106/IRP No. FT-7

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Fire Department Training Area No. 2 (SWMU No. 106/IRP No. FT-7) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the Fire Department Training Area No. 2 (SWMU No. 106/IRP No. FT-7) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Fire Department Training Area No. 2 (SWMU No. 106/IRP No. FT-7) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this SWMU/IRP site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendices

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Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
TAL	Target Analytical List

LIST OF ACRONYMS

TCE	Trichloroethylene
TCL	Target Compound List
TPH	Total Petroleum Hydrocarbons
UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

Fire Department Training Area No. 2, designated as Solid Waste Management Unit (SWMU) No. 106 and Installation Restoration Program (IRP) No. FT-7, is a former base fire department training area operated from 1968 to 1974. The site consists of two small unlined depressions in the land surface, which each measure approximately 250 feet across. During the period of operation, approximately 300 gallons of unused fuel was poured onto water-saturated soil at each exercise to create fires for personnel training purposes.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. Fire Department Training Area No. 2 (SWMU No. 106) is located in the southeast corner of the base, bounded on the north by an east-west paved road and on the west by an old abandoned north-south runway (**Figure 1-2**).

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Fire Department Training Area No. 2 occupies an area of approximately 0.5 acre and is essentially flat. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. Fire Training Area No. 2 is located within an area characterized by the Cannon AFB Base comprehensive Plan as an Open Area. Open Areas are defined as conservation areas and required buffer space. The site is also characterized as Open

Space according to the U.S. Air Force's Rational National Standards Initiative. To the east of Fire Training Area No. 2 is an Industrial Area (Landfill No. 5). Immediately to the south and to the west of the site is an Aircraft Operations and Maintenance Facilities Area.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Fire Department Training Area No. 2 is located approximately 2 1/4 miles from on-base family housing areas. These housing areas include on-base facilities at the northwest corner of the base and the Chaves Manor Housing Area, north of U.S. Highway 60/84. Due to the remoteness and inactivity of this SWMU/IRP site, no personnel use this area.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Fire Training Area No. 2 is approximately 250 feet across. The facility consists of two round depressions in the land surface that are sparsely vegetated. The vegetation in the area appears mildly stressed.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

Fire Department Training Area No. 2 is made up of two shallow unlined depressions which are each less than 100-ft in diameter. The site is in the southeast area of the base. The facility was active from 1968 to 1974. Approximately 300 gallons of fuel were poured on the ground monthly to create fires at the site.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at Fire Department Training Area No. 2 was evaluated by reviewing existing information and conducting an analysis of installation records.

- During 1984 and 1985, a Phase II (Stage 1) investigation was conducted by Radian Corporation (Radian) to determine if environmental contamination had resulted from fire training exercises at Fire Department Training Area No. 2 (Radian 1986). During this investigation, one deep soil boring (Boring No. 7) was drilled and samples for chemical analyses collected to evaluate the impact of past and ongoing activities and to define site-specific hydrogeologic conditions. Boring locations are shown on **Figure 1-3.** Soil samples collected during this investigation were analyzed for oil and grease, lead, and purgeable organic compounds.

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the USEPA at Cannon AFB by A.T. Kearney, Inc. (A.T. Kearney 1987). The purpose was to identify and evaluate SWMUs to assess the potential for releases of hazardous wastes or constituents to the environment. Results identified Fire Department Training Area No. 2 as a potential SWMU.

- In September 1991, Woodward-Clyde (W-C) investigated Fire Department Training Area No. 2 as part of a Remedial Investigation (RI) conducted for 18 IRP/SWMU sites at Cannon AFB. Four soil borings (Borings 1061 through 1064) were drilled and subsurface samples collected for chemical and geotechnical analyses. Two borings were located in each of two lobe-like depressions (**Figure 1-3**). Surface samples also were collected from near both soil borings. Results of the W-C investigation are summarized in Section 2.2.

1.2.2 Period of Operation

The Fire Department Training Area No. 2 (SWMU No. 106) was used to conduct fire department training exercises from 1968 to 1974.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that Fire Department Training Area No. 2 was used exclusively for fire training exercises throughout its period of operation (1968 to 1974).

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

During its period of operation (1968 to 1974), Fire Department Training Area No. 2 was used for training exercises eight to twelve times per year. For each usage, approximately 300 gallons of unused JP-4 fuels were poured on the ground within the site and ignited to create training fires (USAF 1990). In some instances, the ground may have been presaturated with water prior to pouring the waste products onto the ground.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI at Fire Department Training Area No. 2 was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of Fire Department Training Area No. 2 site indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Fire Department Training Area No. 2 (SWMU No. 106/IRP No. FT-07) has been categorized as requiring No Further Action.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Geologic units immediately underlying Fire Department Training Area No. 2 are Tertiary (Miocene to Pliocene) fluvial deposits of the Ogallala Formation (W-C 1992). These consist predominantly of well-sorted sands with scattered thin (1 to 11 feet thick) caliche layers and, based on regional information, may be up to 390 feet thick in the general area.

Borings completed at Fire Department Training Area No. 2 have penetrated the Ogallala deposits to a maximum depth of 58 feet and suggest one, and possibly two, distinct sand and sand/caliche fluvial units. The lower fluvial deposits consist of medium-grained, moderately sorted, light to medium orange sands. These sands are comprised predominantly of quartz grains with varying amounts of silt and clay. Occasionally, there are hard caliche pockets throughout. This unit was only encountered in the Radian Boring 7 at approximately 40 feet BGL. The thickness of this unit is not fully known at present due to the fact that the unit was not fully penetrated, but is at least 19 feet thick at this IRP/SWMU site.

The upper fluvial deposits consist of fine- to very fine-grained, well sorted, silty, calcerous, medium to light red-brown to pale brown sands. These sands are comprised predominantly of subangular to angular quartz grains with varying amounts of silt and calcium carbonate. Occasionally, these sands are moderately to well cemented with calcium carbonate. Prominene layers and small pockets or nodules or light red-brown to pale brown, silty, sandy, clayey caliche are scattered throughout this unit. The caliche samples were comprised of approximately 48 to 57 percent calcium carbonate and/or clay-sized material, 23 to 33 percent sand, and 19 to 10 percent silt, while the sand samples were comprised of approximately 43 to 67 percent sand, 13 to 21 percent silt, and 20 to 36 percent calcium carbonate and/or clay sized material. This thickness of this unit was probably ranges from 38 to 40 feet thick based on Boring 7.

Near the base of this unit, a very fine- to fine-grained, well sorted, calcerous red-brown sand layer was encountered in Borings 1063 and 1064 at approximately 30 feet BGL. This sand

is comprised predominantly of subangular quartz grains with very minor amounts of silt. This sand was comprised of approximately 73 percent sand, 14 percent silt, and 13 percent calcium carbonate and/or clay sized material. Approximately 1 to 4 feet of native topsoil exists above this unit (see Section 2.2.1). No groundwater was encountered during the drilling of these borings.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 land forms are relict sand dunes located along the northern side of the Portales Valley south of the base. Relict dunes are not found at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985 (Hale 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

Soils at Fire Department Training Area No. 2 area consist of sandy loam and loamy sand of the Amarillo Soil Group with a total thickness of approximately 4 feet (W-C 1992). The soils consist primarily of very-fine to fine-grained, well sorted, silty, clayey, unconsolidated red-brown sands. The sands are generally dry to slightly moist at depth. One gradation analysis was performed on a sample collected within this unit at 0.5 feet BGL in Boring 1061. The results indicate that this soil sample was comprised of approximately 44 percent sand, 28 percent silt, and 28 percent clay.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations conducted at Cannon AFB encompassed soils at Fire Department Training Area No. 2. The Phase II (Stage 1) investigation was conducted by Radian Corporation in 1984 and 1985, during which soil Boring No. 7 (**Figure 1-3**) was drilled and samples for chemical analyses collected (Radian 1986). Results indicated the presence of oil and grease, and lead at the site (**Table 2-1**), but no further actions were recommended.

The PA/VSI, RFA performed in 1987 by A.T. Kearney, Inc. identified Fire Department Training Area No. 2 as a potential SWMU. The RFA also indicated that the potential for releases to the soil was high due to past disposal of hazardous wastes and because the SWMU was unlined. 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 additional soil sampling to determine if soil contamination still exists.

W-C conducted further sampling at Fire Department Training Area No. 2 in 1991 to further evaluate the nature and extent of potential hazardous contaminants. Four soil borings (Borings 1061 through 1064) were drilled and samples collected for chemical and geotechnical analyses (**Figure 1-3**). Two borings were located in each of the two lobe-like depressions (**Figure 1-3**) Surface samples were collected from the upper 0.5 feet of soil at locations near each soil boring. Subsurface soil samples were collected at depths ranging from 4 to 30 feet BGL. All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), and the metals lead and chromium. Due to laboratory missed holding times for TCL VOCs on several of the original samples, resampling was performed 5 feet northwest of Boring 0782 as required to complete the investigation sampling program.

Results of the W-C analyses are summarized in **Tables 2-2** and **2-3** and indicated that TPH contamination is present in the shallow soils at depths less than 4 feet BGL and probably does not extend beyond the boundary of the IRP/SWMU site. The metals lead and chromium were detected at concentrations above background levels in surface soil samples. Concentrations of lead and chromium in the subsurface soil samples were generally below site background

concentrations with the exception of chromium at 11.4 mg/kg at 10 feet BGL in Boring 1061 and 10.9 mg/kg at 10 feet BGL in Boring 1063. The analytical results for chromium and lead are summarized in **Table 2-2**, and total petroleum hydrocarbons analytical results are found in **Table 2-3**.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and

to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during W-C's remedial investigation and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to Fire Department Training Area No. 2; therefore, no surface water information was collected as part of the RI performed by W-C.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with Fire Department Training Area No. 2. No air sampling was performed as part of this RI, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination. However, air modeling was performed in support of the baseline risk assessment.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at

Cannon AFB. Fire Department Training Area No. 2 is within RAA1, which also includes Landfill No. 5, and Fire Department Training Areas No. 3 and No. 4.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

Current Exposure Scenario:

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore,

conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of RAA1 is greater than ½ acre and, therefore, future construction or intrusive action was assumed.

2.6.2 Pathways

The primary chemical sources in RAA 1 include fuel spills to the soil during fire training (from fire training areas) and chemicals potentially released to the soil (from the landfill). As mentioned above, the fire training areas are larger than ½ acres and therefore the potential for soil excavation and residential home construction in the future is plausible.

Secondary release mechanisms from soil include leaching of chemicals to groundwater, storm water runoff to surface water, direct contact with subsurface soils, fugitive VOC and dust emissions, and intrusive actions such as site excavation and construction. As a result of intrusive actions, ingestion or dermal absorption via direct contact with chemicals in surface and subsurface soils may occur. Disturbance of soil may result in the generation of fugitive dust, and release of VOC emissions into the air, providing a complete pathway by inhalation. Potential pathways are discussed below.

Soils. Direct contact with soils containing chemicals may result in potentially significant exposure via ingestion or dermal absorption. Such pathways may be particularly important in children. A high frequency of contact with soils by children is not expected under current conditions due to the location of these SWMUs and access limitations. Workers in the vicinity of these SWMUs are the most likely to come into contact with soils from these areas.

Air. Chemicals can be released into the air via volatilization or via fugitive dust emissions, resulting in potential exposures via inhalation.

Stormwater runoff. Storm water runoff may result in migration of chemicals from soil to surface water and from surface water to groundwater. Potential exposure routes for surface water include ingestion, direct contact (dermal contact), and ingestion of fugitive VOC emissions from surface water. These pathways are not expected to be complete due to the intermittent nature of on-site surface water runoff.

Groundwater. Potential exposure to groundwater may occur via ingestion, inhalation, or dermal absorption from showering, bathing, o other domestic uses of groundwater. The groundwater gradient in this area is to the southeast. The groundwater pathway is expected to be incomplete due to the great depth to the groundwater (over 270 feet) and the site geology (presence of clay and caliche).

Crop Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils.

Atmospheric Deposition of Airborne Particulates on Edible Crops. Atmospheric deposition of airborne particulates on edible crops located off-site (or within the RAA under the future exposure scenario) is possible due to land use in the area. This exposure pathway is not expected to be significant based on the concentrations of chemicals detected in soils from this RAA. Fugitive dust inhalation by workers is expected to result in greater levels of chemical intake. If the results of risk characterization from the inhalation routes for workers and future residents in this RAA are acceptable, it is likely that indirect exposure via ingestion of edible crops is also insignificant.

Based on the above, potential receptors for this site are current and future Maintenance Workers, future construction workers, and future residents. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA1 is provided in **Figure 2-1**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed in 1991 by W-C under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989a), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA1 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA1 were benzene, toluene, xylenes, trichloroethylene (TCE), ethylbenzene, chromium, and lead. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors (potential receptors are discussed in Section 2.6). Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA1, future construction workers, and future residents. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA1: benzene, toluene, xylenes, trichloroethylene (TCE), ethylbenzene, chromium, and lead. RAA1 includes Fire Department Training Area No. 2 as well as Landfill No. 5 and Fire Department Training Areas No. 3 and No. 4. Of the COCs listed above, only lead, and chromium were found to be present at Fire Department Training Area No. 2.

Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA1 were well below the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure and potential risks and hazards associated with groundwater use were not evaluated in the BRA.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 to 1.00E-04 for all exposure scenarios except future child residents (1.10E-4). However, given the fact that risk is only slightly above the allowed risk of 1.00E-04, and given high detection limits in chemical analyses and conservative assumptions used in the risk calculations (chemicals contributing to the estimated risks were detected at extremely low frequencies, and the VOC model used to estimate airborne VOC concentrations did not take into account biodegradation of benzene or TCE). The results may, therefore, represent an overestimation of the calculated risks.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA1 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for

each receptor. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

The exposure pathway contributing the most to the total HI for both the average and RME exposure scenarios is inhalation of VOCs, making up nearly all of the non-carcinogenic hazard for each receptor evaluated. Total xylenes presented the majority of these non-carcinogenic hazards for this exposure pathway (W-C 1992).

Carcinogenic Risks. Carcinogenic risks are also presented in **Table 3-3**. The total carcinogenic risk (i.e., risks for all pathways combined), for the average and the RME exposures for each of the receptors evaluated was below the EPA's target risk range (1.0E-04 and 1.0E-06) for Superfund sites (EPA 1989b), with the exception of total RME cancer risk for the future hypothetical child resident (1.1E-04). The primary exposure pathway contributing the majority of the cancer risk was inhalation of VOCs. In this case, benzene contributed at least 80% of this risk, regardless of the exposure scenario (i.e. average or RME). However, the chemicals contributing to the estimated risks were detected at extremely low frequencies (1/29 for TCE and 1/37 for benzene). The highest values for these chemicals were based on non-detects and the detection limits ranged from 30 to 60 mg/kg. Thus, the corresponding risk estimates are probably artifacts based on matrix effects associated with the soil analyses. In addition, the VOC model used to estimate airborne VOC concentrations did not take into account biodegradation of benzene or TCE, which would tend to decrease VOC concentrations over time. Thus, the estimated ambient VOC concentration would probably not be sustained over the entire exposure duration.

Lead as a Potential Risk/Hazard. Lead in RAA1 was measured in soil and in groundwater and modeling was performed to estimate ambient air concentration of lead in fugitive dust. The surface soil and groundwater lead 95% UCL concentrations for RAA1 were 100.4 mg/kg and 0.011 mg/L, respectively. The groundwater lead is below the current action level (0.015 mg/L) and MCL (0.050 mg/L) for lead in drinking water. Surface soil lead concentrations were well below current EPA guidance, which has established soil lead cleanup levels of 400 mg/kg at Superfund sites (EPA 1994).

Air modeling was performed to determine the lead concentrations in ambient air under the baseline, intrusive action, and future residential exposure conditions. The baseline

average and RME air concentrations of lead were 0.008 $\mu g/m^3$ and 0.017 $\mu g/m^3$, respectively. The predicted average and RME air concentrations of lead were for the intrusive action and future use (residential) scenarios were 0.006, 0.011, 0.0056, and 0.0099 $\mu g/m^3$, respectively. The estimated concentrations for the above three exposure conditions were below the EPA Uptake Biokinetic (UBK) model's default value of 0.200 $\mu g/m^3$, which is considered by the EPA to be the average (1988) background urban air concentration for lead in the U.S. (EPA 1991).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) and one semi-volatile organic compound (benzo-a-pyrene) were detected in soils at levels which were considered to be above background. Benzo-a-pyrene, because of its relatively low concentration at near background levels, is not considered to be a chemical of concern. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA1. The total noncarcinogenic HIs for all receptors were below the EPA's level of concern (1.0) at RAA1 for both the average exposure and RME scenarios. The total carcinogenic risks for the average and RME exposures for workers were below the EPA's target risk range of 1.0E-04 to 1.0E-06 for a Superfund site, except for the RME cancer risk for the hypothetical future child resident, which was 1.1E-04. Although this level exceeds the EPA target risk range, the COCs were detected infrequently and had high detection limit values. The results may, therefore, represent an overestimation of the calculated risks.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA1, which includes Fire Department Training Area No. 2.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for Fire Department Training Area No. 2, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the NFRAP alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for Fire Department Training Area No. 2, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
OIL AND GREASE, TOTAL LEAD, AND PURGEABLE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

Sample Number	Sample Depth (Ft-BGL)	Oil and Grease (mg/kg)	Total Lead (mg/kg)	Purgeable Organic Compounds (EPA 8010/8020) (μg/kg)
7-1	1.0-2.5'	1000	3.1	ND
7-2	5.0-6.0'	3400	3.9	ND
7-3	57.4-58.0'	8600 [80]	3.9	NA

Ft-BGL	=	Feet below ground level
mg/kg	=	Milligrams per kilogram
μg/kg	=	Micrograms per kilogram
[ ]	=	re-analysis using infrared methods
ND	=	Not detected
NA	=	Not analyzed, sample discarded

Source: Final Report, IRP Phase II (Radian 1986)

TABLE 2-2
CHROMIUM AND LEAD CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

Sample	Sample Depth (Ft-BGL)	Chromium[1] (mg/kg)	Lead[2] (mg/kg)
1061	0 - 0.5	19.2	31.4
	4	5.6	4.5
	10	11.4	7.4
	20	4.3	2.6
	30	6.2	3.2
1062	0 - 0.5	11.4	11.1J
	6	3.4	3.0
	10	6.3	5.8
	20	2.9	1.0
	30	3.6	2.4
1063	0 - 0.5	8.9	41.0
	4	4.0	3.8
	10	10.9	8.8
	20	6.4	3.2
	30	4.7	1.8
1064	0 - 0.5	9.8	10.3
	4	6.7	3.5
	10	8.1	5.8
	20	4.6	2.4
	30	7.6	3.9

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
J = Estimated concentration

[1]Background range for chromium is 2.67 to 9.31 mg/kg (see Table 2-7) of RI Report (W-C 1992).
[2]Background range for lead is 1.76 to 8.64 mg/kg (see Table 2-7) of RI Report (W-C 1992).

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (W-C 1992)

TABLE 2-3
TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

Boring Number (Redrill Boring Number)	Sample Depth (Ft-BGL)	TPH (mg/kg)
1061	0-0.5	102
(1065)	4-6	45.1U
	10-12	47U
	20-22	44.5U
	30-32	45.4U
1062	0-0.5	177
	6-8	45.6U
	10-12	45.6U
	20-22	44.9U
	30-32	44.4U
1063	0-0.5	232
(1066)	4-6	44.1U
	10-12	45.4U
	20-22	42.9U
	30-32	44.2U
1064	0-0.5	49.6
	4-6	45.6U
	10-12	44.1U
	20-22	44U
	30-32	44.2U

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
U = Not detected at the concentration given

Source: Final Remedial Investigation Report for 18 solid waste management units (Woodward-Clyde 1992)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1(continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level
(1) = MCL for total trihalomethanes (2) = effective July 30, 1992
Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL
(1) = MCL for total trihalomethanes (2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA1
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Current Worker - Maintenance						
-- Soil Ingestion	5.04E-13	1.07E-09	1.06E-08	1.35E-10	5.52E-08	5.50E-07
-- Dermal Contact - Soil	1.95E-13	2.30E-11	2.12E-10	4.72E-11	1.46E-09	1.38E-08
-- Inhalation - VOCs	1.75E-07	3.63E-04	3.63E-04	2.83E-06	2.38E-03	2.38E-03
-- Inhalation - Particulates[1]	0.00E+00	1.08E-04	1.08E-03	0.00E+00	4.43E-04	4.43E-03
Total	1.75E-07	4.71E-04	1.44E-03	2.83E-06	2.83E-03	6.81E-03
Future Worker - Maintenance						
-- Soil Ingestion	5.04E-13	1.07E-09	1.06E-08	1.35E-10	5.52E-08	5.50E-07
-- Dermal Contact - Soil	1.95E-13	2.30E-11	2.12E-10	4.72E-11	1.46E-09	1.38E-08
-- Inhalation - VOCs	1.75E-07	3.63E-04	3.63E-04	2.83E-06	2.38E-03	2.38E-03
-- Inhalation - Particulates[1]	0.00E+00	1.08E-04	1.08E-03	0.00E+00	4.43E-04	4.43E-03
Total	1.75E-07	4.71E-04	1.44E-03	2.83E-06	2.83E-03	6.81E-03

TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA1
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Future Worker - Intrusive						
-- Soil Ingestion	5.01E-11	2.59E-07	1.57E-06	3.63E-10	1.92E-06	1.08E-05
-- Dermal Contact - Soil	3.89E-12	1.79E-08	9.98E-08	6.33E-11	3.14E-07	1.67E-06
-- Inhalation - VOCs	3.97E-08	7.59E-04	7.59E-04	2.15E-07	4.55E-03	4.55E-03
-- Inhalation - Particulates	0.00E+00	5.02E-04	5.02E-03	0.00E+00	1.72E-03	1.72E-02
Total	3.97E-08	1.26E-03	5.78E-03	2.16E-07	6.27E-03	2.17E-02
Future Resident - Adult						
-- Soil Ingestion	3.09E-10	1.77E-07	1.08E-06	9.52E-08	1.68E-05	9.46E-05
-- Dermal Contact - Soil	1.20E-10	6.13E-08	3.42E-07	1.66E-08	2.74E-06	1.46E-05
-- Inhalation - VOCs	9.69E-06	2.02E-02	2.02E-02	7.52E-05	5.27E-02	5.27E-02
-- Inhalation - Particulates[1]	0.00E+00	8.41E-03	8.41E-02	0.00E+00	1.20E-02	1.20E-01
Total	9.69E-06	2.86E-02	1.04E-01	7.53E-05	6.48E-02	1.73E-01

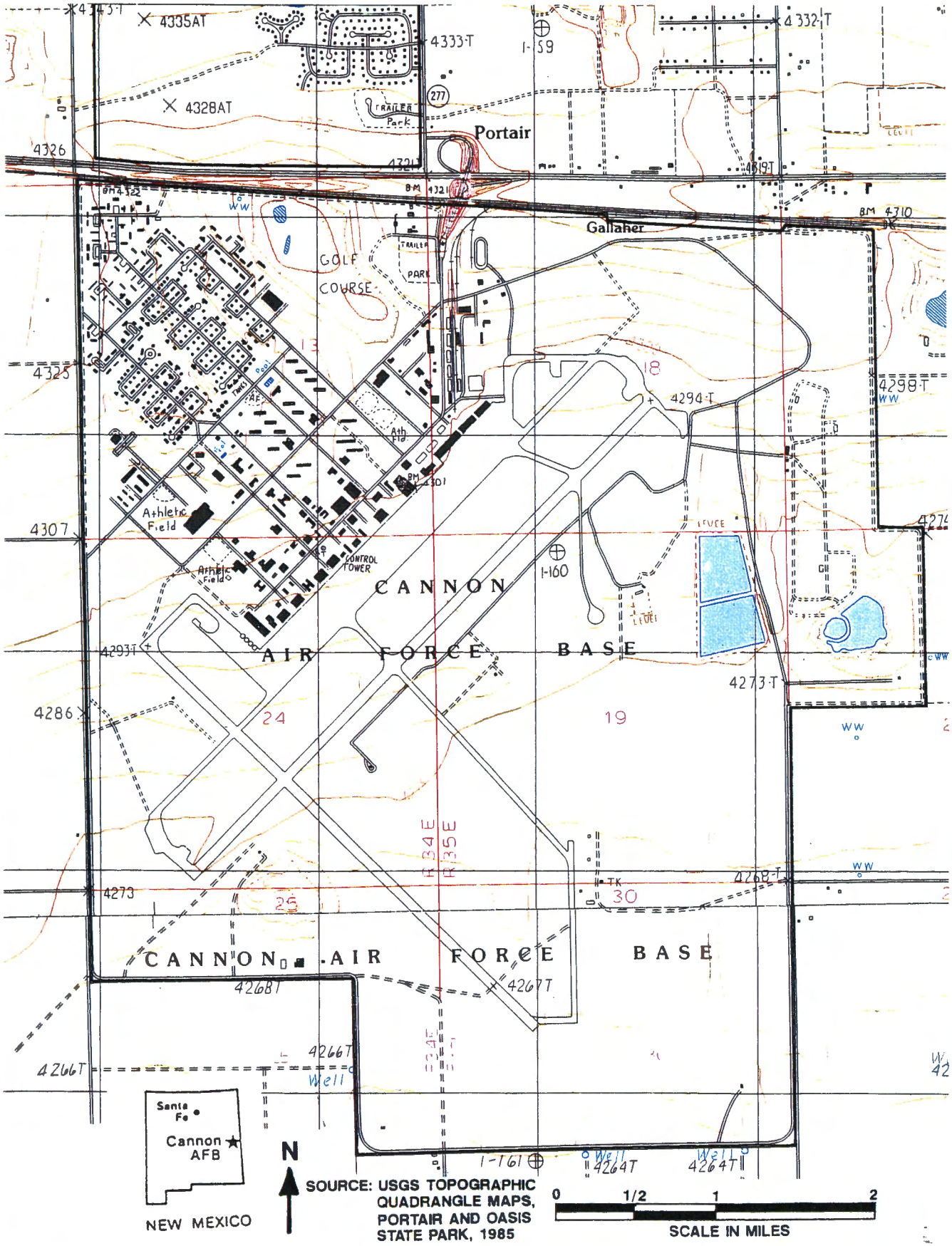
TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA1
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index
Future Resident - Child						
-- Soil Ingestion	6.01E-09	3.45E-06	2.09E-05	2.78E-07	4.91E-05	2.76E-04
-- Dermal Contact - Soil	1.32E-10	6.76E-08	3.77E-07	1.81E-08	2.99E-06	1.59E-05
-- Inhalation - VOCs	3.77E-05	7.84E-02	7.84E-02	1.10E-04	7.69E-02	7.69E-02
-- Inhalation - Particulates[1]	0.00E+00	3.27E-02	3.27E-01	0.00E+00	1.76E-02	1.76E-01
Total	3.77E-05	1.11E-01	4.05E-01	1.10E-04	9.45E-02	2.53E-01

[1]No carcinogenic chemicals with EPA-verified toxicity factors were identified for inhalation of chemicals of concern in particulates.

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

FIRE DEPARTMENT TRAINING AREA No. 2
SWMU No. 106 / IRP No. FT-07
Cannon Air Force Base, New Mexico

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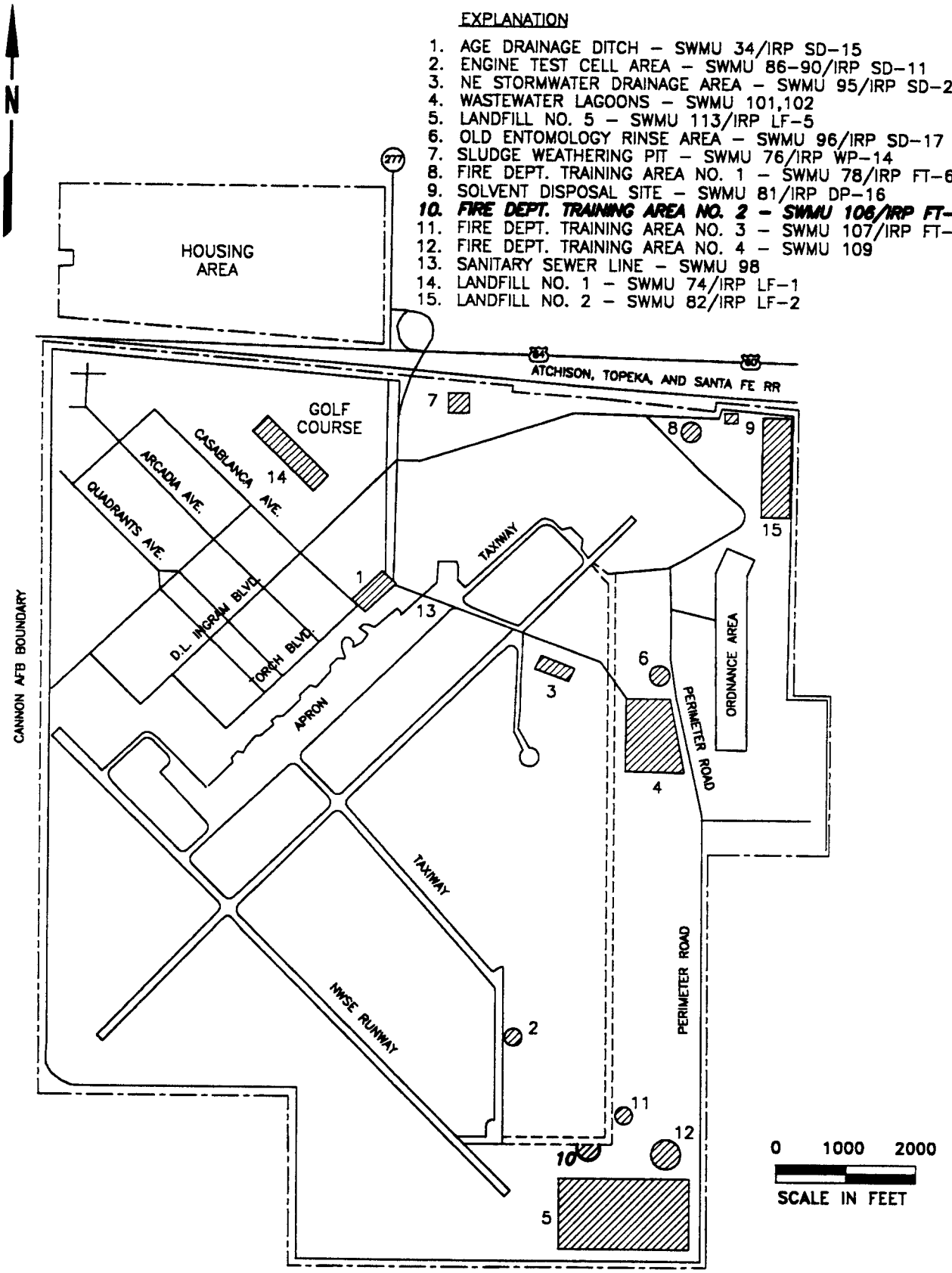

SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-2

IRP/SWMU SITE LOCATION MAP

FIRE DEPARTMENT TRAINING AREA No. 2
SWMU No. 106 / IRP No. FT-07
Cannon Air Force Base, New Mexico

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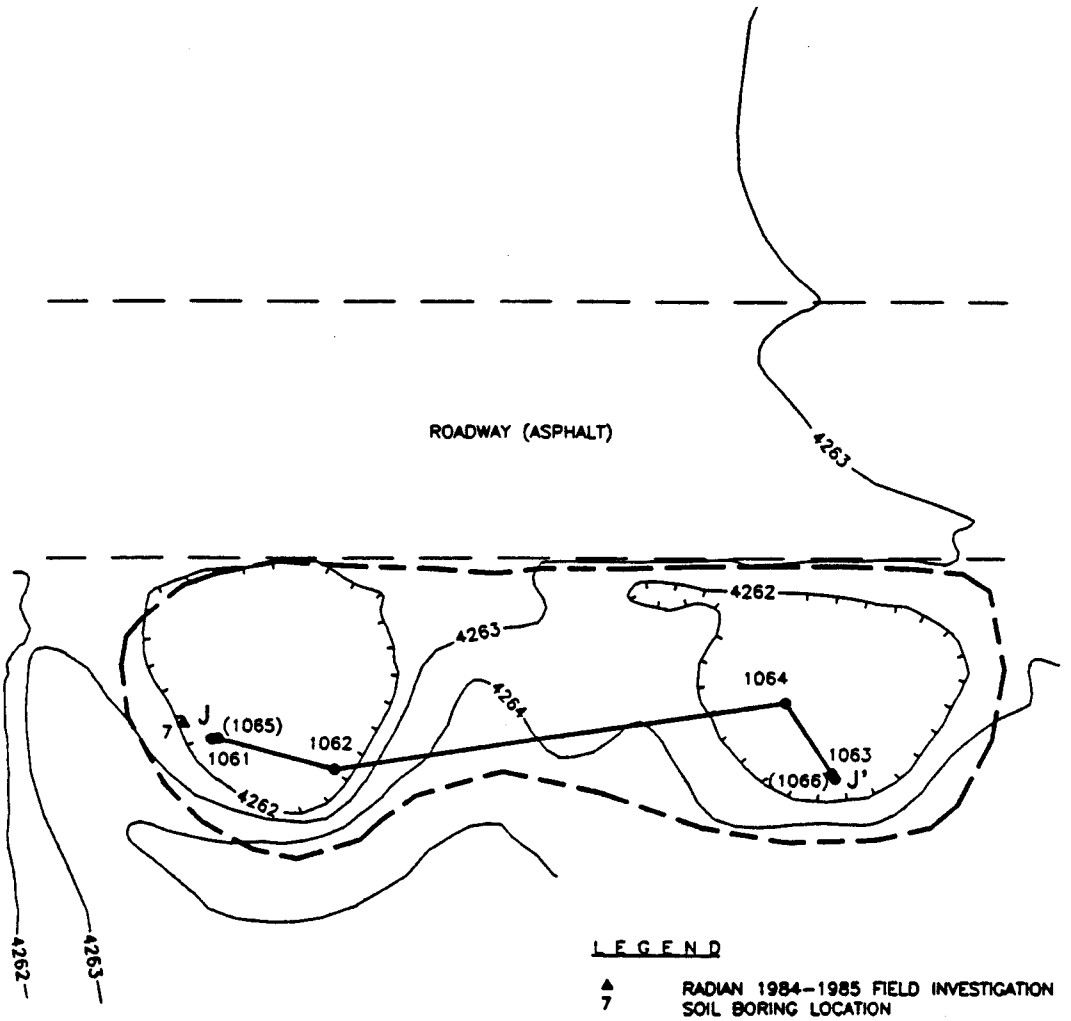

LEGEND

▲ 7	RADIAN 1984-1985 FIELD INVESTIGATION SOIL BORING LOCATION
● 1063	W-C 1991 FIELD INVESTIGATION SOIL BORING LOCATION
— —	SWMU BOUNDARY
4263	GROUND SURFACE CONTOUR LINE IN FEET MSL CONTOUR INTERVAL = 1 FOOT
J — J'	GEOLOGIC CROSS-SECTION LOCATION

0 25 50
SCALE IN FEET

NOTE: THE NUMBERS IN PARENTHESIS CORRESPOND TO REDRILLS/RESAMPLES OF THE ORIGINAL BORING/SAMPLE

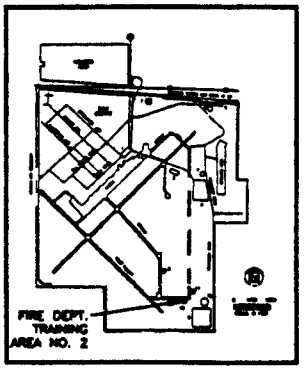

Figure 1-3

LOCATION OF SOIL BORINGS AND SURFACE SOIL SAMPES

FIRE DEPARTMENT TRAINING AREA No. 2
SWMU No. 106 / IRP No. FT-07
Cannon Air Force Base, New Mexico

SOURCE: Woodward-Clyde, February1996

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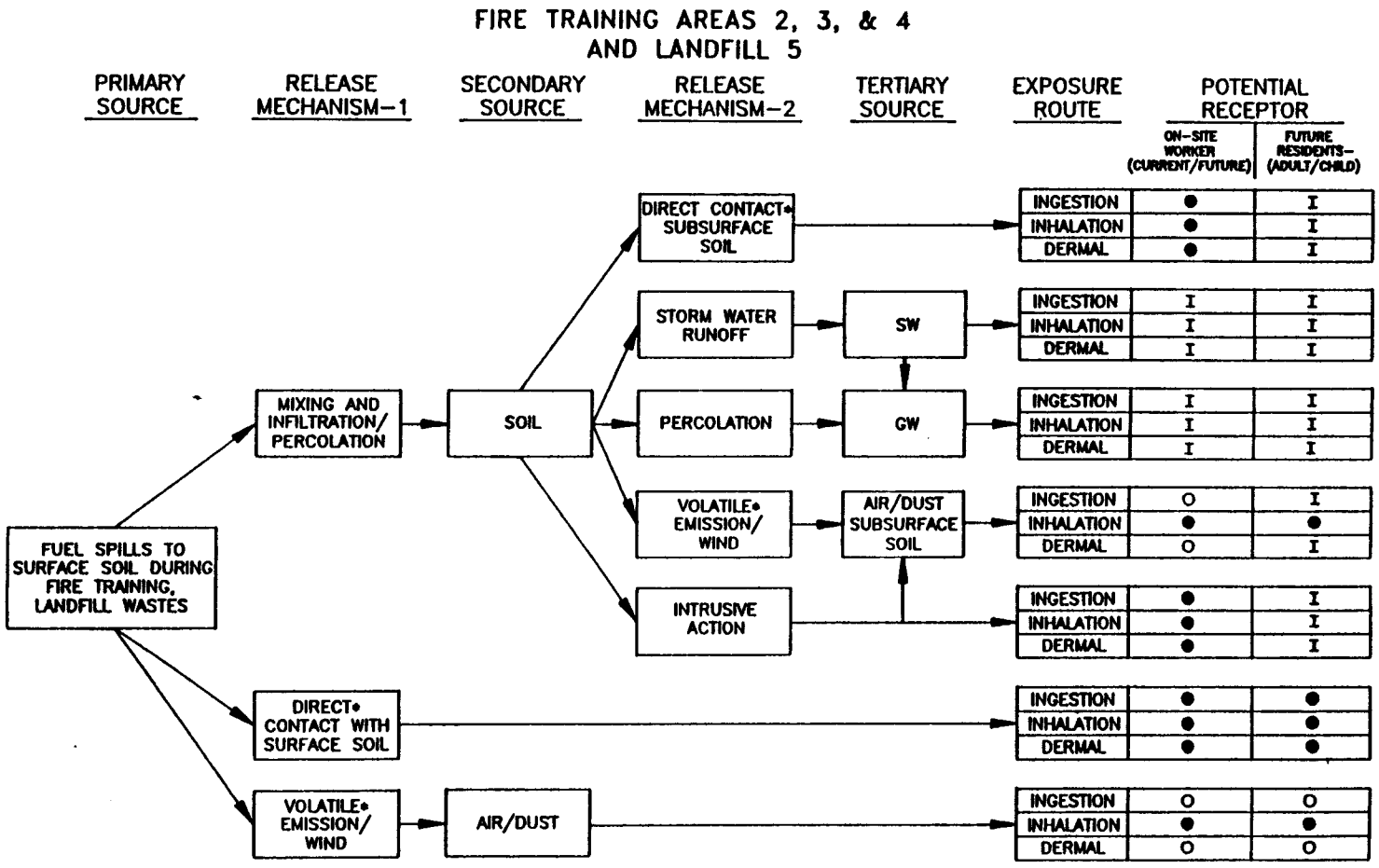

SOURCE: Woodward-Clyde, 1995

HARZA Consulting Engineers and Scientists

Figure 2-1

CONCEPTUAL SITE MODEL

FIRE DEPARTMENT TRAINING AREA No. 2
SWMU No. 106 / IRP No. FT-07
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Fire Department Training Area No. 2 (SWMU No. 106) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

  This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Underground Storage Tank
SWMU No. 48A / IRP No. ST-26

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Underground Storage Tank
SWMU No. 48A/IRP No. ST-26
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Underground Storage Tank
SWMU No. 48A/IRP No. ST-26

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the Underground Storage Tank site (SWMU No. 48A/IRP No. ST-26) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the RCRA Facility Investigation (RFI) Phase I performed by LRL in 1993, the RFI for the Underground Storage Tank (SWMU No. 48A/IRP No. ST-26) performed by Woodward-Clyde (W-C) in 1995, and results of other past investigations indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the Underground Storage Tank (SWMU No. 48A/IRP No. ST-26) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RFI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RFI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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4.0 DESCRIPTION OF NFRAP ALTERNATIVE 4-1
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- 4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS 4-1

5.0 REFERENCES 5-1

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
MMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
RBC	Risk Based Concentrations
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command

LIST OF ACRONYMS

TAL	Target Analytical List
TCL	Target Compound List
TRPH	Total Recoverable Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USCS	Unified Soil Classification System
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UTL	Upper Tolerance Limit
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

The Underground Storage Tank, designated as Solid Waste Management Unit (SWMU) No. 48A and Installation Restoration Program (IRP) No. ST-26, was a 20,000-gallon storage tank. The tank and associated piping, removed in 1988, were used first as a gas station and then to store waste products including waste oils, spent solvents, paint thinners, and recovered fuels. The products were removed periodically from the tank. The area is presently paved and used as a parking lot. The depth of the former tank is unknown.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for the Underground Storage Tank is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. The removed Underground Storage Tank site (SWMU No. 48A) is located in the central part of the base approximately 125 feet east of the intersection of Argentia Avenue and Torch Boulevard. The site location is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The Underground Storage Tank has been removed. The area has been paved with asphalt and is being used as a parking lot in an area designated as industrial. Land use for industrial areas include maintenance, storage, and supply

functions directly related to aircraft. The site is also characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The Underground Storage Tank site (SWMU No. 48A) is located approximately 100 feet northeast of Building 192 and 50 feet southwest of "W" St. A parking lot for Building 195 is about 50 feet southeast of the site. The site is located in an industrial area, about 1,000 feet from an outdoor recreation area. The site is approximately 1500 feet from the nearest housing units on the base.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The removed Underground Storage Tank site (SWMU No. 48A) is flat with a thin asphalt pavement covering the area.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The Underground Storage Tank site was originally constructed as the base military gas station during WWII. When a new military gas station was constructed around 1965 the facility was partially demolished and at least one 20,000 gallon underground storage tank was left in place and used for waste solvent disposal. Prior to 1965 the tank would have contained fuel products. After 1965 the tank stored waste oils, spent solvents, paint thinners, and recovered fuels.

The following is the investigative history of the site. Results of the investigations are summarized in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983).

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the USEPA at Cannon AFB by A.T. Kearney. Soil staining was observed around the fill pipe during the investigation.

- In 1992, during a site visit, the Underground Storage Tank site was defined by broken areas of asphalt on the ground surface and the site was identified for further investigation.

- The site was studied during the Phase I RCRA Facility Investigation (RFI) investigation (LRL 1993). Three soil borings (Borings 48A-1, 48A-2, and 48A-3) were drilled to a depth of 30 feet BGL and samples were analyzed to determine if a release of SWMU-related chemicals had occurred from the tank. Soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), Cyanide, Target Analytic List (TAL) metals and benzene, toluene, ethylbenzene and xylenes (BTEX).

- The Phase II RFI investigation by W-C (1995a) at this site included three new borings (Borings 4804, 4805, and 4806) to a depth of 40 feet BGL. Nine soil samples were collected and analyzed for VOCs, SVOCs, TAL metals, and TRPH.

1.2.2 Period of Operation

The Underground Storage Tank (SWMU No. 48A) was active from 1941 to 1985. The tank was removed in 1988.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U.S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971,

the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

SWMU No. 48A was used as a gas station from 1941 to 1965. From 1965 to 1985, the tank was used to store waste products including waste oils, spent solvents, paint thinners, and recovered fuels.

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RFI on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

There is no known record of releases from the Underground Storage Tank (SWMU No. 48A). However, data from the soil borings indicate that a release occurred at a depth of approximately 10 feet. Potential contaminants include waste oils, spent solvents, paint thinners, and recovered fuels. Analysis indicates the presence of TRPH and fuel constituents and a lack of chemicals (e.g. solvents) not related to fuel, signifying that the release consisted of fuel.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995b):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney
2. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
3. 1994 Appendix II and III Phase I Reports approved by EPA Region VI.
4. 1994 RFI Appendix II and III Phase II Work Plans approved by EPA Region VI.

The 1995 RFI at the Underground Storage Tank (SWMU No. 48A) was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995b):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for NFA (No Further Action), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

The Underground Storage Tank (SWMU No. 48A/IRP No. ST-26) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Geologic units immediately underlying the Underground Storage Tank (SWMU No. 48A) are Tertiary (Miocene to Pliocene) fluvial deposits of the Ogallala Formation (W-C 1992). These consist predominantly of well-sorted sands with scattered thin caliche layers and, based on regional information, may be up to 390 feet thick in the general area.

Logs from the three Phase II borings (W-C 1995a) show a subsurface lithology consisting of Ogallala Formation sediments in a fining upward sequence. A 3-inch thick asphalt pavement at the surface was encountered at Borings 4804, 4805 and 4806, underlain by a 5 to 7-inch layer of sandy gravel fill placed as a foundation for the pavement. Below this level, silty clay fill material (soil type CL per the Unified Soil Classification System-USCS), typically reddish-brown, red, or gray, low to medium plastic, stiff to very stiff, and moist, was encountered to depths ranging from 8 to 13 feet. Some calcium carbonate and caliche cementation was present in isolated zones. At Boring 4804, a 0.5-foot layer of silty clay with some pebble and gravel is present from 4.5 to 5.0 feet. Below the silty clay layer in Borings 4804 and 4806, silt (soil type ML) was encountered to depths of 27.5 and 27 feet, respectively. The silt was light brown in Boring 4804, gray in Boring 4806, and was typically dry and hard with numerous calcium carbonate nodules and caliche cemented zones. The bottom 3.5 feet of the silt in Boring 4804 contains some fine-to medium-grained quartz sand and was heavily cemented (caliche). Below the upper silty clay layer in Boring 4805 was a red, moist, stiff, clayey silt (soil type ML) layer to a depth of 17 feet. Below this layer and below the silt in Boring 4804, was a sandy silt (soil type ML) to depths of 32 and 33 feet, respectively. Below the silt layer in Boring 4806 and below the sandy silt layer in Boring 4805 was a red or reddish brown, moist, very dense, very fine to fine-grained sand (soil type SP) to the boring completion depths at 40 feet and 39.5 feet, respectively. Boring 4804 contained silty sand (soil type SP) below the sandy silt layer to the boring completion depth of 39.5 feet. A simplified view showing the borings in stick log format is provided in **Figure 2-1**.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985e 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum.

Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Phase I RFI investigations (LRL 1993) at the site included three soil borings (Borings 48A-1, 48A-2, and 48A-3) to a depth of 30 feet BGL (**Figure 1-3**). Target analytes included TCL VOCs, cyanide, TAL metals, and BTEX. Ethylbenzene, toluene, and xylene were detected in Boring 48A-2 at 10 and 20 feet. The concentration of xylene was 100 mg/kg at 20 feet. Metals were detected above background in surface samples and subsurface samples to 20 feet in all borings.

Phase II RFI investigations (W-C 1995a) included three new soil borings (Borings 4804, 4805, and 4806) to a depth of 40 feet BGL. Chemical analysis included VOCs, SVOCs, TAL metals, and TRPH. Two of the borings were placed on either end of the presumed location of the Underground Storage Tank. The third boring was placed about 20 feet to the northeast of the presumed north end of the former Underground Storage Tank location (**Figure 1-3**). The borings assessed the presence of contamination to a depth of 40 feet, 10 feet deeper than

the previous investigation. A simplified stick-log view of the borings along with a summary of the analytical results is shown in **Figure 2-1**. Chemical concentrations detected in all samples are shown in **Table 2-1**.

Boring 4804 was non-detect for all chemicals tested beginning at 20 feet of depth through the deepest sample site of 39 ½ ft BGL. Boring 4805 was non-detect from 5 ft to 20 ft BGL and then again from 30 ft to the bottom of the boring at 40 ft BGL. Boring 4806 became non-detect at 35 ft BGL.

Organic Results: Acetone and methylene chloride were qualified as nondetect after they were determined to be laboratory contaminants. Therefore, the only VOC reported in any of the near-surface samples was toluene at estimated concentrations of 5.7 μg/kg and 1.3 μg/kg in samples CAN048-4804-0000 and CAN048-4804-0005, respectively, and 1.3 μg/kg in sample CAN048-4806-0000. Toluene was found at depth only in Boring 4804 at 5 feet at a concentration of 1.3 μg/kg (**Figure 2-1** and **Table 2-1**). The only other VOCs reported at depth were ethylbenzene, total xylenes, and 2-butanone, all in Boring 4806 subsurface samples. Ethylbenzene was reported at the 20-foot depth interval at a concentration of 420 μg/kg (Sample CAN048-4806-0020) . Total xylenes and 2-butanone were reported at the 20- and 25-foot depth intervals. The concentrations of xylenes were 3,300 μg/kg and 69 μg/kg and the concentrations of 2-butanone were 1,200 μg/kg and 140 μg/kg in samples CAN048-4806-0020 and CAN048-4806-0025, respectively.

Only one SVOC, bis(2-ethylhexyl)phthalate, was detected in the surface samples at a concentration of 57 μg/kg in sample CAN048-4804-0000. Several SVOC's were detected in the subsurface boring samples. Bis(2-ethylhexyl)phthalate was reported at the 25-foot depth in sample CAN048-4805-0025 at a concentration of 120 μg/kg, and at the 10- and 15-foot depth intervals in samples CAN048-4806-0010 and CAN048-4806-0015 at concentrations of 9,100 μg/kg and 3,300 μg/kg, respectively. However, bis(2-ethylhexyl)phthalate is a very common laboratory and field contaminant and these concentrations are probably not indicative of true site contamination. Several other SVOCs were detected in the subsurface samples from Boring 4806. Total Polynuclear Aromatic Hydrocarbons (PAHs) were detected at relatively high concentrations, decreasing with depth, at the 10-foot (18,900 μg/kg), 15-foot (9,050 μg/kg), 20-foot (5,030 μg/kg) and 25-foot (3,338 μg/kg) depth intervals. The site is capped with asphalt, but the majority of PAHs were detected at depth. Therefore, the source of the PAHs is considered to be site related. Several non-PAH SVOCs were also detected in the subsurface samples from Boring 4806 (**Figure 2-1** and **Table 2-1**). These compounds included

acenaphthene, 4-chloroaniline, di-n-butylphthalate, dibenzofuran, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and phenol. Where these compounds were detected in multiple samples, the concentrations decreased with depth (**Figure 2-1**).

TRPH was reported in all of the near-surface samples at concentrations of 185 mg/kg (CAN048-4804-0000), 61.6 mg/kg (CAN048-4805-0000), and 56.2 mg/kg (CAN048-4806-0000). TRPH was also reported in the 5-foot (1,050 mg/kg) and 10-foot (81 mg/kg, estimated) samples from Boring 4804. TRPH was detected in relatively high concentrations, decreasing with depth, from a depth of 10 feet BGL to a depth of 30 feet BGL in Boring 4806 (**Figure 2-1**). The highest concentration, 17,300 mg/kg, occurred at the 10-foot interval, and concentrations decreased to 199 mg/kg at the 30-foot depth interval.

The chemical results illustrated on **Figure 2-1** show that although significant contamination was detected in some of the boring samples, the concentrations of contaminants decreased with depth. All samples below 15 feet in Boring 4804, 25 feet in Boring 4805, and 30 feet in Boring 4806 showed no detectable concentrations of contaminants.

Inorganic Results: The maximum detected concentrations of aluminum, arsenic, beryllium, chromium, copper, lead, and vanadium did not exceed background levels. These metals were not retained for further evaluation as chemicals of concern. Antimony, barium, cobalt, manganese, nickel, and zinc exceeded background levels and were retained for further evaluation as chemicals of concern in soil. Background levels for metals were defined by the Upper Tolerance Limit (UTL) concentrations from 37 background soil samples collected at Cannon AFB (Walk, Haydel & Associates, 1990 and W-C, 1992 & 1993) and by literature values for regional soils (USGS 1984). The background UTL was defined as the mean plus two times the standard deviation. **Table 2-2** shows a comparison between the maximum detected SWMU concentrations of metals and background levels.

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

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

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

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

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1,600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc.

1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed

in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL, and a caliche layer underlays the site. Therefore, no hydrogeologic investigation was planned or conducted at this site during the W-C RFI and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The

drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to the Underground Storage Tank (SWMU No. 48A); therefore, no surface water information was collected as part of the RFI performed by W-C (1995).

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to be a risk to the environment or public health due to air emissions from activities associated with the Underground Storage Tank site (SWMU No. 48A). No air sampling was performed as part of the RFI performed by W-C.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Conceptual site model for human exposure at the Underground Storage Tank site (SWMU No. 48A) is shown in **Figure 2-2**. The primary sources of contaminant release are waste oils, spent solvents, paint thinners, and fuel and recovered fuels which may have leaked from the tank. Once mixed with surface or subsurface soil, the chemicals may then be released to other media (e.g., air or groundwater). There are three potentially complete and significant exposure pathways at these sites: direct contact (i.e., ingestion and dermal contact) with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the base and the base boundary.

Potential receptors include base workers (e.g. military and base personnel, and base contractors), hypothetical future construction workers, occasional base visitors (e.g., families of military personnel, visitors at these sites without restricted access), and residential receptors on the base and at the base boundary that may use groundwater on the base and at the base boundary.

The soil exposure pathways (including soil ingestion, dermal contact, and inhalation of airborne contaminants) are potentially complete and significant pathways for SWMU workers and hypothetical future construction workers. Potenial exposure to residents and occasional base visitors to contaminants in soils at this SWMU is considered to be insignificant because the site is covered by asphalt.

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

Surface water runoff is considered to be an insignificant pathway at this SWMU because it only covers a small area, it is no longer active, and it has been covered by pavement.

Therefore, transport of significant quantities of contaminants in surface soil by surface water from this SWMU is unlikely.

3.1 RISK ASSESSMENT APPROACH

The RFI at Cannon AFB was performed under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Under RCRA guidance, the concentrations of site chemicals were compared to non-site-specific screening levels.

There are three potentially complete exposure pathways at the Underground Storage Tank site (SWMU No. 48A): direct contact with soil; inhalation of soil; and domestic use of groundwater at the base or at the base boundary. Potential receptors include base workers (e.g. military and base personnel, and base contractors), hypothetical future construction workers, occasional base visitors (e.g., families of military personnel, visitors at these sites without restricted access), and residential receptors on the base and at the base boundary that may use groundwater on the base and at the base boundary. A complete discussion of potentially complete exposure pathways is provided in Section 2.6.

3.2 SOILS

Maximum detected soil concentrations of organic compounds and metals which exceeded background concentrations (see Section 2.2.2) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether a significant release (i.e., that could pose a significant risk to human health) had occurred at the Underground Storage Tank site. 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 methodologies. A comparison of maximum soil concentrations to RBCs for residential soil is provided in **Table 3-1**. Potential receptors include base workers, hypothetical future construction workers, occasional base visitors, and residential receptors at the base and base boundary that may use groundwater.

Organic Contaminants: None of the detected concentrations exceeded residential soil RBCs. The reporting limits for VOCs and SVOCs were elevated as much as 500 times normal reporting limits due to high levels of target compounds (e.g., ethylbenzene, xylenes) for Boring 4806 in the 5-foot to 20-foot samples. The elevation may have caused other target compounds (e.g., PAHs) which may be present at low concentrations to be reported as nondetect. These compounds were not considered in the RBC comparison. Therefore, uncertainty exists regarding potential risks to hypothetical construction workers due to exposures to contaminants that may be present in the subsurface soils but that were reported as nondetect at the elevated reporting limits. However, detected concentrations do not pose a risk even under a residential exposure scenario, and actual exposure to any chemicals of concern reported as nondetect due to elevated reporting limits would be minimal because of the small area involved (soil surrounding Boring 4806) and dilution with surrounding soil. Therefore, the average exposure is not likely to show a risk. Additionally, construction workers have a short-term exposure potential and controls could be used to limit the exposure to the workers in the contaminated area. Because potential risks at this SWMU are minimal, no further investigation is recommended. However, it may be prudent to remove the contaminated soils.

TRPH is a complex mixture of hundreds of branched, straight chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, toluene, naphthalene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU. TRPH was detected at a maximum concentration of 17,300 mg/kg which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Potentially toxic constituents of the TRPH (e.g., ethylbenzene, toluene, and xylenes) were detected at low concentrations (see **Table 3-1**), well below the RBCs for residential soil.

Several potentially toxic constituents of TRPH (e.g. PAHs) were reported as nondetect at elevated reporting limits at this SWMU. The elevated reporting limits may have caused these compounds to be reported as nondetect when they may be present at concentrations exceeding RBCs. Therefore, uncertainty exists regarding potential risks from contaminants detected at this SWMU, and further investigation may be warranted.

Inorganic Contaminants: The maximum concentrations of metals were all within the RBCs for residential soil. The maximum detected metal concentrations exceeded base background levels for antimony, barium, cobalt, manganese, nickel, and zinc.

3.3 GROUNDWATER

Groundwater beneath Cannon AFB is potable and used for domestic purposes both on and off the base. Therefore, exposures to groundwater by current and future residents is possible. However, the Ogallala Aquifer is approximately 270 feet deep and groundwater monitoring well data elsewhere at Cannon AFB has revealed no aquifer contamination. Although the groundwater exposure pathway is not likely to be a significant path of human exposure, non-site-specific potential risks for exposure to groundwater are included in the RBCs used in Section 2.1.

The fate and transport properties of the chemicals detected in the soil samples does not indicate high mobility, the local geology/hydrogeology (which includes clay and caliche layers) appear to be protective of the groundwater, and a groundwater monitoring program is in place elsewhere at Cannon AFB and is expected to continue. However, the data from the soil borings indicate that a release has occurred at a depth of approximately 10 feet BGL. The vertical distribution of the soil contamination was used to evaluate whether the release poses a threat to groundwater.

The soil data (Boring 4806) show that the release occurred around a depth of 10 feet and that the majority of the contamination is between 10 and 20 feet BGL. Only TRPH was detected at 30 feet BGL, and all of the fuel contamination is nondetect at 35 feet BGL and below. The Underground Storage Tank at this site was removed in 1988, so there is no longer a continuing source of contamination, and the soil data show that significant vertical transport has not occurred. In addition, the area where the Underground Storage Tank was located is paved which limits infiltration and vertical transport. Therefore, it can be concluded that the potential for transport of contaminants in soil at this site to groundwater, approximately 270 feet in depth, is insignificant.

Finally, data from the investigation of the Above Ground Storage Tank (SWMU 48B) located next to this site demonstrate that the lateral extent of the soil contamination is limited. That is, results from Boring 4904 (approximately 15 feet east of Boring 4806) show that

contamination is greatly reduced, and Boring 4903 (approximately 15 feet south of Boring 4806) was nondetect.

3.4 SURFACE WATER

Surface water runoff is considered to be an insignificant pathway at this SWMU because the site covers a relatively small area, it is no longer active, and the area is flat and paved.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. The non-site-specific risk of exposure to airborne contaminants is included in the RBCs discussed for soil in Section 3.2.

3.6 SUMMARY

Twenty-seven soil samples were collected from the three 40-foot soil borings drilled at this SWMU during the 1995 RFI Phase II investigation. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Twenty-two organic compounds (five of them PAHs) and six metal were reported in the SWMU samples.

Several organic compounds were detected in site soil samples. Most of these compounds were detected in near-surface samples and subsurface samples to a depth of 30 feet in one boring (Boring 4906). Where compounds were detected in multiple samples, concentrations decreased with depth. TRPH was also detected in several samples with the highest concentrations occurring in the subsurface samples from Boring 4806 to a depth of 30 feet. No contaminants were detected in any of the borings below a depth of 30 feet. Relatively high concentrations of TRPH in this boring resulted in greatly elevated reporting limits in some soil samples. Although a significant release appears to have occurred at this SWMU, and some uncertainty exists with regard to potential construction worker exposure to subsurface soil, the contaminated area is small and confined to the subsurface. Adequate controls could be implemented to limit exposures to this soil during an excavation activity. Because no detected concentrations of chemicals at this SWMU pose an unacceptable human health risk, it is recommended that no further investigation of this SWMU is necessary.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the investigation for the Underground Storage Tank site (SWMU No. 48A), the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the investigation, the NFRAP alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RFI for Underground Storage Tank, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

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TABLES

TABLE 2-1
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CAN048-4804-0000			CAN048-4804-0005			CAN048-4804-0010			CAN048-4804-0020			CAN48-4804-0025			CAN083-8305-0015		
LAB SAMPLE NUMBER	0397740007SA			0397740008SA			0397740009SA			0397740010SA			0397740011SA			0397740012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (μg/kg)																		
Acetone	3.4	11	J	<	11	U	3	12	J	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	12	U	<	11	U	<	11	U	<	11	U
Chlorobenzene	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Ethylbenzene	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Methylene chloride	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Toluene	5.7	5.6		1.3	5.7	J	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Xylenes (total)	<	5.6	U	<	5.7	U	<	5.8	U	<	5.6	U	<	5.6	U	<	5.5	U
Semivolatile Organics (μg/kg)																		
Acenaphthene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Bis(2-Ethylhexyl)phthalate	57	370	J	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
4-Chloroaniline	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Dibenzofuran	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
1,2-Dichlorobenzene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
1,3-Dichlorobenzene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
1,4-Dichlorobenzene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Fluoranthene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Fluorene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
2-Methylnaphthalene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Naphthalene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
N-Nitrosodiphenylamine	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Phenanthrene	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U
Phenol	<	370	U	<	370	U	<	380	U	<	370	U	<	370	U	<	360	U

TABLE 2-1 (continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CAN048-4804-0000			CAN048-4804-0005			CAN048-4804-0010			CAN048-4804-0020			CAN48-4804-0025			CAN083-8305-0015		
LAB SAMPLE NUMBER	0397740007SA			0397740008SA			0397740009SA			0397740010SA			0397740011SA			0397740012SA		
COLLECT DATE	12/11/94			12/11/94			12/11/94			12/11/94			12/11/94			12/11/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	12900	11.3		11900	11.3		8580	11.5		4400	55.6		8150	11.1		6370	22.1	
Antimony	5.5	6.8	J	<	6.8	UJ	<	6.9	U	<	33.3	UJ	<	6.7	UJ	<	13.2	UJ
Arsenic	3	0.56		2.6	0.57		2.9	0.58		2	0.56		1.2	0.56		1.8	0.55	
Barium	149	1.1		456	1.1		304	1.2		436	5.6		69.3	1.1		109	2.2	
Beryllium	0.53	0.23		0.5	0.23		0.46	0.23		<	1.1	U	0.26	0.22		<	0.44	U
Calcium	63800	22.5		102000	22.7		112000	23		250000	111		78900	22.3		173000	44.1	
Chromium	11.3	1.1		8.9	1.1		6.8	1.2		<	5.6	U	5.9	1.1		2.6	2.2	
Cobalt	4.1	1.1		3.5	1.1		3.3	1.2		<	5.6	U	1.6	1.1		1.2	2.2	
Copper	7.3	2.3		7	2.3		5.9	2.3		<	11.1	U	1.8	2.2	J	1.9	4.4	
Iron	9480	11.3		8550	11.3		6840	11.5		2410	55.6		4810	11.1		3680	22.1	
Lead	18.8	5.6	J	15.5	5.7	J	11.3	2.9	J	2.3	0.56	J	2.7	0.56	J	1.9	0.55	J
Magnesium	2830	22.5	J	3760	22.7	J	4160	23		13400	111		8310	22.3	J	10500	44.1	J
Manganese	133	1.1		168	1.1		118	1.2		21.4	5.6	J	40.5	1.1		34	2.2	
Nickel	8.2	4.5		7.8	4.5		8.3	4.6		9	22.2	J	5.7	4.5		4.2	8.8	J
Potassium	2140	563		1980	567		1540	576		448	2780	J	1400	556		1070	1100	J
Vanadium	18.6	1.1		18.3	1.1		17.2	1.2		17.7	5.6		18	1.1		15	2.2	
Zinc	29.2	2.3		28.2	2.3		18.2	2.3		6.1	11.1	J	10.3	2.2		7.5	4.4	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	185	45.1	J	1050	90.8	J	81	46.1	J	<	44.5	UJ	<	44.5	UJ	<	44.1	UJ

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

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

U = Nondetected value. RL = Reporting Limit (1) Duplicate for preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CAN048-4804-0030			CAN048-4804-0035			CAN048-4804-0040			CAN048-4805-0000			CAN048-4805-0005			CAN048-4805-0010			CAN048-4805-4861[1]		
LAB SAMPLE NUMBER	039794007SA			039794008SA			0397940009SA			0397940010SA			0397940011SA			0397940012SA			0398000001SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)																					
Acetone	4.8	11	J	4.9	11	J	6.7	11	J	<	11	U	9.5	12	J	<	11	U	17	11	
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	12	U	<	11	U	<	11	U
Chlorobenzene	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Ethylbenzene	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Methylene chloride	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	5.6	5.5	
Toluene	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Xylenes (total)	<	5.5	U	<	5.3	U	<	5.3	U	<	5.7	U	<	5.8	U	<	5.5	U	<	5.5	U
Semivolatile Organics (µg/kg)																					
Acenaphthene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Bis(2-Ethylhexyl)phthalate	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
4-Chloroaniline	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Di-n-butyl phthalate	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Dibenzofuran	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
1,2-Dichlorobenzene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
1,3-Dichlorobenzene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
1,4-Dichlorobenzene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Fluoranthene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Fluorene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
2-Methylnaphthalene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Naphthalene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
N-Nitrosodiphenylamine	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Phenanthrene	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U
Phenol	<	360	U	<	350	U	<	350	U	<	370	U	<	380	U	<	360	U	<	360	U

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CAN048-4804-0030			CAN048-4804-0035			CAN048-4804-0040			CAN048-4805-0000			CAN048-4805-0005			CAN048-4805-0010			CAN048-4805-4861[1]		
LAB SAMPLE NUMBER	039794007SA			039794008SA			0397940009SA			0397940010SA			0397940011SA			0397940012SA			03980000015A		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																					
Aluminum	4010	21.9		3210	10.7		3940	10.7		15300	11.3		6410	23.3		9080	10.9		4190	11	J
Antimony	<	13.1	UJ	<	6.4	UJ	<	6.4	UJ	<	6.8	UJ	<	14	UJ	<	6.6	UJ	<	6.6	UJ
Arsenic	1.6	0.55		0.85	0.53		0.67	0.53		2.5	0.57		2.1	0.58		2.1	0.55		2	0.55	
Barium	87.5	2.2		37.5	1.1		39.6	1.1		132	1.1		170	2.3		49.5	1.1		43.9	1.1	J
Beryllium	<	0.44	U	<	0.21	U	<	0.21	U	0.71	0.23	J	0.29	0.47	J	0.43	0.22	J	0.38	0.22	
Calcium	193000	43.8		67900	21.3		64000	21.3		21000	22.6		207000	46.6		49600	21.9		52600	22.1	J
Chromium	4.1	2.2		3	1.1		3.5	1.1		13.8	1.1		4.1	2.3		7.8	1.1		4.5	1.1	J
Cobalt	<	2.2	U	0.88	1.1	J	1.6	1.1		5.9	1.1		3	2.3		3.5	1.1		3.1	1.1	
Copper	2.2	4.4	J	1.8	2.1	J	2	2.1	J	10	2.3		3.2	4.7	J	5.4	2.2		4.5	2.2	
Iron	2830	21.9		3120	10.7		3800	10.7		13300	11.3		5230	23.3		8180	10.9		4480	11	J
Lead	1.4	0.55		1.8	0.53		1.7	1.1		11.8	1.1		3.7	0.58		5.9	0.55		5.2	1.1	J
Magnesium	7060	43.8		3260	21.3		5470	21.3		2840	22.6		2990	46.6		3410	21.9		2580	22.1	
Manganese	27.6	2.2		32.3	1.1		58.9	1.1		245	1.1		49.9	2.3		126	1.1		99.8	1.1	
Nickel	8.2	8.8	J	4.1	4.3	J	5	4.3		13.5	4.5		5.6	9.3	J	8.9	4.4		5.2	4.4	
Potassium	836	1100	J	725	533		838	533		2330	565		1040	1160	J	1810	547		1050	552	
Vanadium	9.5	2.2		7.4	1.1		11.6	1.1		22.2	1.1		13.9	2.3		23.4	1.1		20.7	1.1	J
Zinc	7	4.4		6.5	2.1		7.6	2.1		33.1	2.3		12.7	4.7		19.3	2.2		11.3	2.2	J
TRPH (mg/kg)																					
Total Recoverable Petroleum Hydro-carbons	<	43.8	U	<	42.7	U	<	42.6	U	61.6	45.2		<	46.6	U	<	43.8	U	<	44.2	U

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

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CAN048-4805-0015			CAN048-4805-0020			CAN048-4805-0025			CAN048-4805-0030			CAN048-4805-0035			CAN044-4805-0040		
LAB SAMPLE NUMBER	0397940013SA			0397940001SA			0397940002SA			0397940003SA			0397940004SA			0397940005SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg).																		
Acetone	5	11	J	<	11	U	8.9	11	J	4.8	11	J	<	11	U	3.8	11	J
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Chlorobenzene	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Ethylbenzene	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Methylene chloride	<	5.6	U	<	5.7	U	<	5.4	U	3.9	5.4	J	4.3	5.3	J	<	5.4	U
Toluene	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Xylenes (total)	<	5.6	U	<	5.7	U	<	5.4	U	<	5.4	U	<	5.3	U	<	5.4	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Bis(2-Ethylhexyl)phthalate	<	370	U	<	370	U	120	360	J	<	360	U	<	350	U	<	350	U
4-Chloroaniline	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
Di-n-butyl phthalate	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Dibenzofuran	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
1,2-Dichlorobenzene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
1,3-Dichlorobenzene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
1,4-Dichlorobenzene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
Fluoranthene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Fluorene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
2-Methylnaphthalene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
Naphthalene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U
N-Nitrosodiphenylamine	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Phenanthrene	<	370	U	<	370	U	<	360	U	<	360	U	<	350	U	<	350	U
Phenol	<	370	U	<	370	U	<	360	U	<	360	U	<	350	UJ	<	350	U

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

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

U = Nondetected value. RL = Reporting Limit

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CANO48-4805-0015			CAN048-4805-0020			CAN048-4805-0025			CAN048-4805-0030			CAN048-4805-0035			CAN044-4805-0040		
LAB SAMPLE NUMBER	0397940013SA			0397940001SA			0397940002SA			0397940003SA			0397940004SA			0397940005SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	8100	11.1		12100	11.4		7480	21.8		6460	10.8		3790	10.6		3120	10.7	
Antimony	<	6.7	UJ	<	6.8	UJ	<	13.1	UJ	<	6.5	UJ	<	6.4	UJ	<	6.4	UJ
Arsenic	1.7	0.56		1.7	1.1		0.79	0.54		0.65	0.54		0.58	0.53		0.64	0.54	
Barium	96.1	1.1		331	1.1		2390	2.2		40.1	1.1		35.3	1.1		41.7	1.1	
Beryllium	0.46	0.22	J	0.53	0.23	J	<	0.44	U	0.18	0.22	J	0.13	0.21	J	<	0.21	U
Calcium	37400	22.3		75100	22.7		128000	43.5		53900	21.6		41900	21.2		49200	21.5	
Chromium	7	1.1		9	1.1		4.6	2.2		5.6	1.1		2.8	1.1		3	1.1	
Cobalt	3	1.1		2.7	1.1		2.2	2.2		1.5	1.1		1.8	1.1		1.4	1.1	
Copper	5	2.2		4.1	2.3		14.5	4.4		1.8	2.2	J	1.6	2.1	J	2.4	2.1	
Iron	7620	11.1		8180	11.4		6130	21.8		4670	10.8		3630	10.6		3160	10.7	
Lead	6.5	1.1		5.8	0.57		2.5	0.54		1.9	0.54		2	0.53		2.1	0.54	
Magnesium	3340	22.3		7730	22.7		13700	43.5		5080	21.6		2820	21.2		3600	21.5	
Manganese	124	1.1		81.1	1.1		79.8	2.2		36.7	1.1		58.5	1.1		44.3	1.1	
Nickel	7.7	4.5		9.6	4.5		7.9	8.7	J	5.1	4.3		4.3	4.2		3.5	4.3	J
Potassium	1880	556		3110	568		1350	1090		1380	539		817	530		593	537	
Vanadium	17.9	1.1		21.2	1.1		15.3	2.2		11.3	1.1		8.2	1.1		8.6	1.1	
Zinc	18.3	2.2		19.5	2.3		21.1	4.4		9.2	2.2		7	2.1		7.2	2.1	
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	<	44.4	U	<	45.4	U	<	43.5	U	<	43.1	U	<	42.4	U	<	42.9	U

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

J = Estimated value.

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

U = Nondetected value. RL = Reporting Limit

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December 26, 1996, 4:26 pm

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CANO48-4806-0000			CAN048-4806-4862[1]			CAN048-4806-0005			CAN048-4806-0010			CAN048-4806-0010			CAN044-4806-0015		
LAB SAMPLE NUMBER	0398000002SA			0398000007SA			0398000003SA			0398000004RA			0398000004SA			0398000005RA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg).																		
Acetone	<	11	U	<	11	U	29	11					<	5500	U			
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U				<	5500	U			
Chlorobenzene	<	5.3	U	<	5.6	U	3	5.6	J				<	2800	U			
Ethylbenzene	<	5.3	U	<	5.6	U	1.8	5.6	J				890	2800	J			
Methylene chloride	5.2	5.3	J	5.5	5.6	J	6.5	5.6					<	2800	U			
Toluene	1.3	5.3	J	<	5.6	U	2.3	5.6	J				<	2800	U			
Xylenes (total)	<	5.3	U	<	5.6	U	26	5.6					12000	2800				
Semivolatile Organics (µg/kg)																		
Acenaphthene	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	<	750	UJ
bis(2-Ethylhexyl)phthalate	<	350	U	<	370	U	<	3700	U	9100	1500		<	7400	UJ	3300	750	
4-Chloroaniline	<	350	U	<	370	U	<	3700	U	<	1500	UJ	7900	3600	J	<	750	UJ
Di-n-butyl phthalate	<	350	U	<	370	U	<	3700	U	<	1500	UJ	410	3600	J	<	750	UJ
Dibenzofuran	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	<	750	UJ
1,2-Dichlorobenzene	<	350	U	<	370	U	<	3700	U	7500	1500		4100	3600	J	1100	750	
1,3-Dichlorobenzene	<	350	U	<	370	U	<	3700	U	700	1500	J	450	3600	J	<	750	UJ
1,4-Dichlorobenzene	<	350	U	<	370	U	<	3700	U	1800	1500		950	3600	J	<	750	UJ
Fluoranthene	<	350	U	<	370	U	<	3700	U	1200	1500	J	700	3600	J	500	750	J
Fluorene	<	350	U	<	370	U	<	3700	U	190	1500	J	<	3600	UJ	110	750	J
2-Methylnaphthalene	<	350	U	<	370	U	<	3700	U	12000	1500		<	3600	UJ	5000	750	
Naphthalene	<	350	U	<	370	U	<	3700	U	5200	1500		2900	3600	J	2200	750	
N-Nitrosodiphenylamine	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	400	750	J
Phenanthrene	<	350	U	<	370	U	<	3700	U	400	1500	J	<	3600	UJ	110	750	J
Phenol	<	350	U	<	370	U	<	3700	U	<	1500	UJ	<	3600	UJ	<	750	UJ

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

J = Estimated value. D = Sample was diluted for analysis. R = Rejected value. U = Nondetected value. RL = Reporting Limit

[1] Duplicate sample for the preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CANO48-4806-0000			CAN048-4806-4862[1]			CAN048-4806-0005			CAN048-4806-0010			CAN048-4806-0010			CAN048-4806-0015		
LAB SAMPLE NUMBER	0398000002SA			0398000007SA			0398000003SA			0398000004RA			0398000004SA			0398000005RA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg)																		
Aluminum	5240	10.7	J	5640	11.1	J	9790	11.3	J				4050	55.1	J			
Antimony	<	6.4	UJ	<	6.7	UJ	<	6.8	UJ				<	33	U			
Arsenic	2.8	0.53		2.6	0.56		2.7	0.56					3.4	0.55				
Barium	242	1.1	J	169	1.1	J	206	1.1	J				1640	5.5	J			
Beryllium	0.37	0.21		0.41	0.22		0.44	0.23					<	1.1	U			
Calcium	54100	21.3	J	32000	22.3	J	47600	22.5	J				246000	110	J			
Chromium	5.2	1.1	J	6.2	1.1	J	8.2	1.1	J				<	5.5	UJ			
Cobalt	3	1.1		3.6	1.1		3.4	1.1					4.4	5.5	J			
Copper	6.5	2.1		7.1	2.2		6.9	2.3					<	11	U			
Iron	4900	10.7	J	5810	11.1	J	7930	11.3	J				2800	55.1	J			
Lead	11.2	1.1	J	16.1	1.1		25.7	2.8	J				8.9	1.1	J			
Magnesium	3100	21.3		2320	22.3		2140	22.5					7050	110				
Manganese	132	1.1		152	1.1		138	1.1					40.2	5.5				
Nickel	7	4.3		7.1	4.5		7.1	4.5					6	22	J			
Potassium	1150	533		1270	557		1830	563					926	2750	J			
Vanadium	13.4	1.1	J	14.7	1.1	J	15.9	1.1	J				12.3	5.5	J			
Zinc	17.5	2.1	J	17.7	2.2	J	23.1	2.3	J				9.4	11	J			
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	56.2	42.7		81.8	44.5		729	45					17300	1320				

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

J = Estimated value.

R = Rejected value.

U = Nondetected value.

RL = Reporting Limit

D = Sample was diluted for analysis.

[1]Duplicate sample for the preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CANO48-4806-0015 0398000005A 12/12/94			CAN048-4806-0020 0398000006SA 12/12/94			CAN048-4806-0025 0398000008SA 12/12/94			CAN048-4806-0030 0398000009SA 12/12/94			CAN048-4806-4863[1] 0397940004SA 12/12/94			CAN048-4806-0035 0398000010SA 12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg).																		
Acetone	<	5700	U	<	2900	U	410	110		13	12		<	11	U	9.2	10	J
2-Butanone (MEK)	<	5700	U	1200	2900	J	140	110		<	12	U	<	11	U	<	10	U
Chlorobenzene	<	2800	U	<	1400	U	<	56	U	<	5.8	U	<	5.3	U	<	5.2	U
Ethylbenzene	570	2800	J	420	1400	J	<	56	U	<	5.8	U	<	5.3	U	<	5.2	U
Methylene chloride	<	2800	U	<	1400	U	41	56	J	4.8	5.8	J	1.9	5.3	J	3.3	5.2	J
Toluene	<	2800	U	<	1400	U	<	56	U	<	5.8	U	<	5.3	U	<	5.2	U
Xylenes (total)	5500	2800		3300	1400		69	56		<	5.8	U	<	5.3	U	<	5.2	U
Semivolatile Organics (µg/kg)																		
Acenaphthene	88	750	J	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
bis(2-Ethylhexyl)phthalate	<	750	UJ	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
4-Chloroaniline	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Di-n-butyl phthalate	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Dibenzofuran	220	750	J	<	1900	U	88	370	J	<	380	U	<	350	U	<	340	U
1,2-Dichlorobenzene	1100	750	J	220	1900	J	<	370	U	<	380	U	<	350	U	<	340	U
1,3-Dichlorobenzene	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
1,4-Dichlorobenzene	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Fluoranthene	510	750	J	230	1900	J	150	370	J	<	380	U	<	350	U	<	340	U
Fluorene	130	750	J	<	1900	U	47	370	J	<	380	U	<	350	U	<	340	U
2-Methylnaphthalene	5700	750	J	3600	1900		2300	370		<	380	U	87	350	J	<	340	U
Naphthalene	2100	750	J	1200	1900	J	800	370		<	380	U	<	350	U	<	340	U
N-Nitrosodiphenylamine	<	750	R	<	1900	U	<	370	U	<	380	U	<	350	U	<	340	U
Phenanthrene	98	750	J	<	1900	U	41	370	J	<	380	U	<	350	U	<	340	U
Phenol	<	750		<	1900	U	38	370	J	<	380	U	<	350	U	<	340	U

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

J = Estimated value.

R = Rejected value.

U = Nondetected value.

RL = Reporting Limit

D = Sample was diluted for analysis.

[1]Duplicate sample for the preceeding sample number

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR	CAN048-4806-0015			CAN048-4806-0020			CAN048-4806-0025			CAN048-4806-0030			CAN048-4806-4863[1]			CAN048-4806-0035		
LAB SAMPLE NUMBER	0398000005SA			0398000006SA			0398000008SA			0398000009SA			0398000001SA			0398000010SA		
COLLECT DATE	12/12/94			12/12/94			12/12/94			12/12/94			12/12/94			12/12/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg).																		
Aluminum	3630	22.7	J	3860	22.9	J	4590	22.4	J	5850	11.5	J	2030	10.7	J	2860	10.4	J
Antimony	<	13.6	UJ	14	13.7	J	<	13.4	UJ	<	6.9	UJ	<	6.4	UJ	<	6.3	UJ
Arsenic	1.7	0.57		1.4	0.57		1.6	0.56		0.82	0.58		0.94	2.1	J	0.61	2.1	J
Barium	402	2.3	J	205	2.3	J	518	2.2	J	244	1.2	J	63.6	1.1	J	24.3	1	J
Beryllium	<	0.45	U	<	0.46	U	0.23	0.45	J	0.2	0.23	J	0.12	0.21	J	<	0.21	U
Calcium	210000	45.3	J	170000	45.8	J	173000	44.7	J	33600	23.1	J	23000	21.4	J	27700	20.9	J
Chromium	5.8	2.3	J	2.4	2.3	J	6.5	2.2	J	4	1.2	J	1.3	1.1	J	2.5	1	J
Cobalt	1.6	2.3	J	1.2	2.3	J	1.8	2.2	J	1.2	1.2		0.79	1.1	J	0.82	1	J
Copper	1.4	4.5	J	1.4	4.6	J	2.9	4.5	J	1.6	2.3	J	0.9	2.1	J	1.3	2.1	J
Iron	1980	22.7		2320	22.9	J	2890	22.4	J	4360	11.5	J	1560	10.7	J	2890	10.4	J
Lead	1.8	0.57	J	1.9	0.57		2.1	0.56	J	2.1	0.58	J	2.1	0.53	J	1.6	0.52	J
Magnesium	16200	45.3		15500	45.8		17700	44.7		3330	23.1		2100	21.4		1930	20.9	
Manganese	20.8	2.3		26.8	2.3		28.9	2.2		34.6	1.2		24.5	1.1		32.1	1	
Nickel	8.5	9.1	J	4.4	9.2	J	6.2	8.9	J	3.6	4.6	J	1.7	4.3	J	1.9	4.2	J
Potassium	478	1130	J	483	1140	J	735	1120	J	1310	577		613	534		662	522	
Vanadium	18.9	2.3	J	20	2.3	J	19.8	2.2	J	9.8	1.2	J	5.5	1.1	J	6.8	1	J
Zinc	6.1	4.5	J	5.5	4.6	J	7.1	4.5	J	9	2.3	J	3.7	2.1	J	5.8	2.1	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	3890	907		2080	137		1350	492		199	46.2		172	42.7		<	41.8	U

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

J = Estimated value.

R = Rejected value.

U = Nondetected value.

RL = Reporting Limit

D = Sample was diluted for analysis.

[1]Duplicate sample for the preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CANO48-4806-0040 0398000011SA		
	Result	RL	Qual
Volatile Organicvs (μg/kg)			
Acetone	3.5	11	J
2-Butanone (MEK)	<	11	U
Chlorobenzene	<	5.3	U
Ethylbenzene	<	5.3	U
Methylene chloride	2.1	5.3	J
Toluene	<	5.3	U
Xylenes (total)	<	5.3	U
Semivolatile Organics (μg/kg)			
Acenaphthene	<	350	U
bis(2-Ethylhexyl)phthalate	<	350	U
4-Chloroaniline	<	350	U
Di-n-butyl phthalate	<	350	U
Dibenzofuran	<	350	U
1,2-Dichlorobenzene	<	350	U
1,3-Dichlorobenzene	<	350	U
1,4-Dichlorobenzene	<	350	U
Fluoranthene	<	350	U
Fluorene	<	350	U
2-Methylnaphthalene	<	350	U
Naphthalene	<	350	U
N-Nitrosodiphenylamine	<	350	U
Phenanthrene	<	350	U
Phenol	<	350	U

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

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

U = Nondetected value. RL = Reporting Limit (1) Duplicate for preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
UNDERGROUND STORAGE TANK
SWMU NO. 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CANO48-4806-0040 0398000011SA 12/12/94		
	Result	RL	Qual
Metals (mg/kg)			
Aluminum	2970	10.5	J
Antimony	<	6.3	UJ
Arsenic	0.57	0.53	
Barium	23.1	1.1	J
Beryllium	<	0.21	U
Calcium	33300	21.1	J
Chromium	2.3	1.1	J
Cobalt	0.86	1.1	J
Copper	0.94	2.1	J
Iron	2810	10.5	J
Lead	1.5	0.53	J
Magnesium	2640	21.1	
Manganese	29.9	1.1	
Nickel	2.2	4.2	J
Potassium	625	527	
Vanadium	7	1.1	J
Zinc	5.6	2.1	J
TRPH (mg/kg)			
Total Recoverable Petroleum Hydrocarbons	<	42.2	U

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

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

U = Nondetected value. RL = Reporting Limit (1) Duplicate for preceeding sample number.

Source: Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II (W-C 1995a)

TABLE 2-2
COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND CONCENTRATIONS[1]
UNDERGROUND STORAGE TANK
SWMU 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

Sample ID	Metal	Maximum Detected Concentration [2]	Range of Background Concentrations [2]	Upper Tolerance Limit (UTL) Background Concentration[3]	Reported Level in Clovis, NM Region [4]	Does Maximum Detected Exceed Background
CAN048-4805-0000	Aluminum	15,300	1,410 - 11,000	10,540	50,000	NO**
CAN048-4806-0020	Antimony	14	<4.9 - <13	*	<1	YES
CAN048-4806-0010	Arsenic	3.4	0.67 - 28	15.5	6.5	NO
CAN048-4805-0025	Barium	2390	14.5 - 1200	642	500	YES
CAN048-4805-0000	Beryllium	0.71	0.17 - 0.77	0.73	1-2	NO
CAN048-4805-0000	Chromium	13.8	4 - 15.4	12.5	30	NO**
CAN048-4805-0000	Cobalt	5.9	0.85 - 5.3	4.5	3-7	YES
CAN048-4805-0025	Copper	14.5	<2 - 18.4	*	20	NO**
CAN048-4806-0005	Lead	25.7	1.1 - 46	25.8	15	NO
CAN048-4805-0000	Manganese	245	22.4 - 216	164	500	YES
CAN048-4805-0000	Nickel	13.5	1.3 - 9.8	9	15	YES
CAN048-4805-0010	Vanadium	23.4	5.2 - 28.3	25.3	30-70	NO
CAN048-4805-000	Zinc	33.1	<4.4 - 27.5	21.9	45	YES

TABLE 2-2 (continued)
COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL TO BACKGROUND CONCENTRATIONS[1]
UNDERGROUND STORAGE TANK
SWMU 48A/IRP NO. ST-26
Cannon Air Force Base, New Mexico

[1] All units in mg/kg.

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

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

[4] USGS 1984.

* Data insufficient to calculate UTL of background concentration.

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

Source: Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II (W-C 1995a)

TABLE 3-1
COMPARISON OF MAXIMUM CONCENTRATIONS TO RBCs
UNDERGROUND STORAGE TANK
SWMU NO. 48A/ IRP NO. ST-26
Cannon Air Force Base, New Mexico

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration[1] (mg/kg)	Exceeds RBC?
2-Butanone (MEK)	1.2	47,000	NO
Acetone	0.41	7,800	NO
Chlorobenzene	0.003	1,600	NO
Ethylbenzene	0.89	7,800	NO
Methylene Chloride	0.041	85	NO
Toluene	0.0057	16,000	NO
Xylenes (total)	12	160,000	NO
1,2-Dichlorobenzene	7.5	7,000	NO
1,3-Dichlorobenzene	0.7	7,000	NO
1,4-Dichlorobenzene	1.8	27	NO
2-Methylnapthalene	12	NA(a)	NO
4-Chloroaniline	7.9	310	NO
Acenaphthene	0.088	4,700	NO
Bis(2-ethylhexyl)phthalate	9.1	46	NO
Di-n-butylphthalate	0.41	7,800	NO
Dibenzofuran	0.22	310	NO
Fluoranthene	1.2	3,100	NO

TABLE 3-1(continued)
COMPARISON OF MAXIMUM CONCENTRATIONS TO RBCs
UNDERGROUND STORAGE TANK
SWMU NO. 48A / IRP NO. ST-26
Cannon Air Force Base, New Mexico

Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration[1] (mg/kg)	Exceeds RBC?
Fluorene	0.19	3,100	NO
N-Nitrosodiphenylamine	0.4	130	NO
Naphthalene	5.2	3,100	NO
Phenanthrene	0.4	NA(a)	NO
Phenol	0.038	47,000	NO
TRPH	17,300	NA(a)	NO
Antimony	14	31	NO
Barium	2,390	5,500	NO
Cobalt	5.9	4,700	NO
Manganese	245	390	NO
Nickel	13.5	1,600	NO
Zinc	33.1	23,000	NO

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

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

Source: Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II (W-C 1995a)

FIGURES

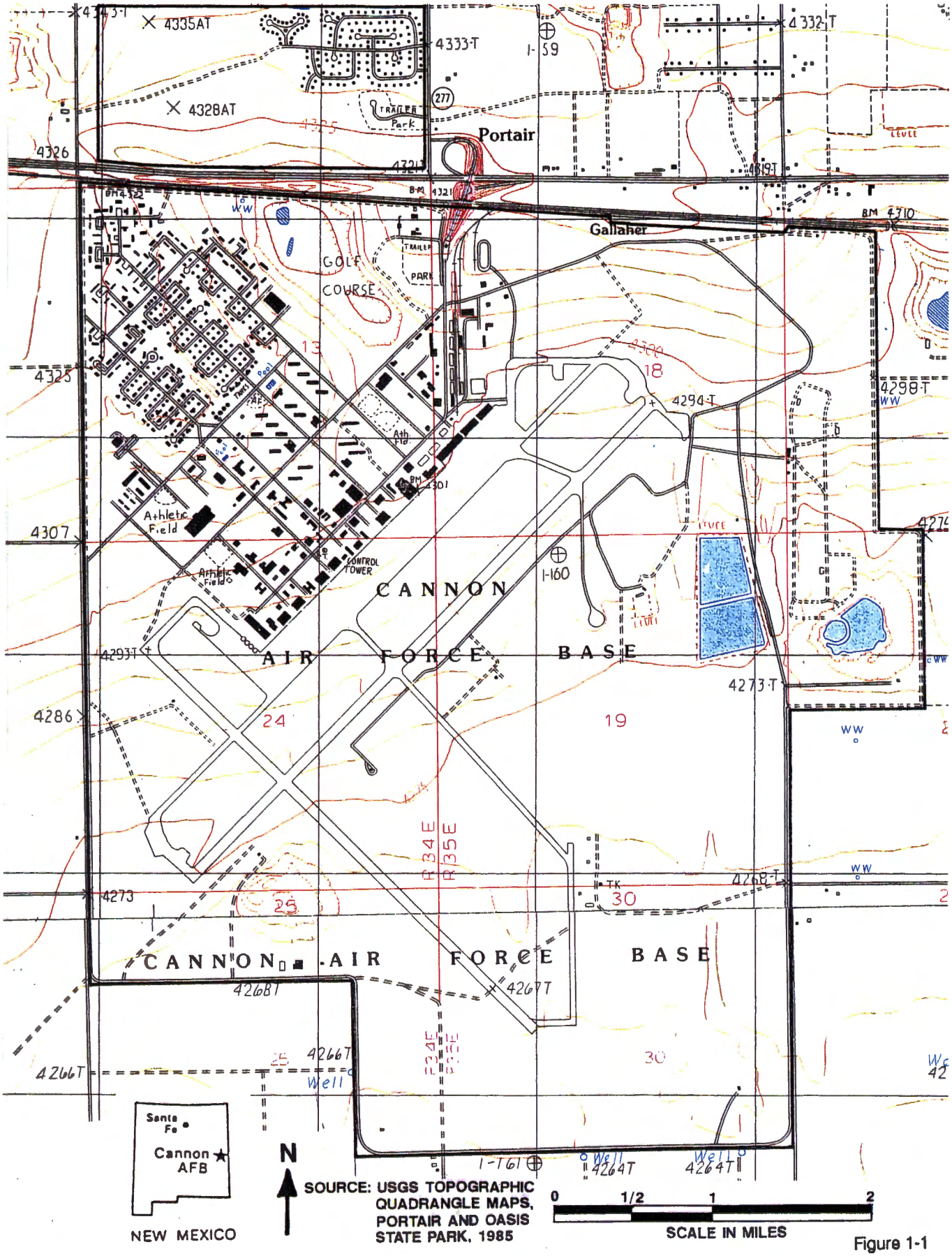

Figure 1-1

GENERAL VICINITY MAP

UNDERGROUND STORAGE TANK
SWMU No. 48A / IRP No. ST-26
Cannon Air Force Base, New Mexico

SOURCE: Woodward-Clyde, February1996

HARZA *Consulting Engineers and Scientists*

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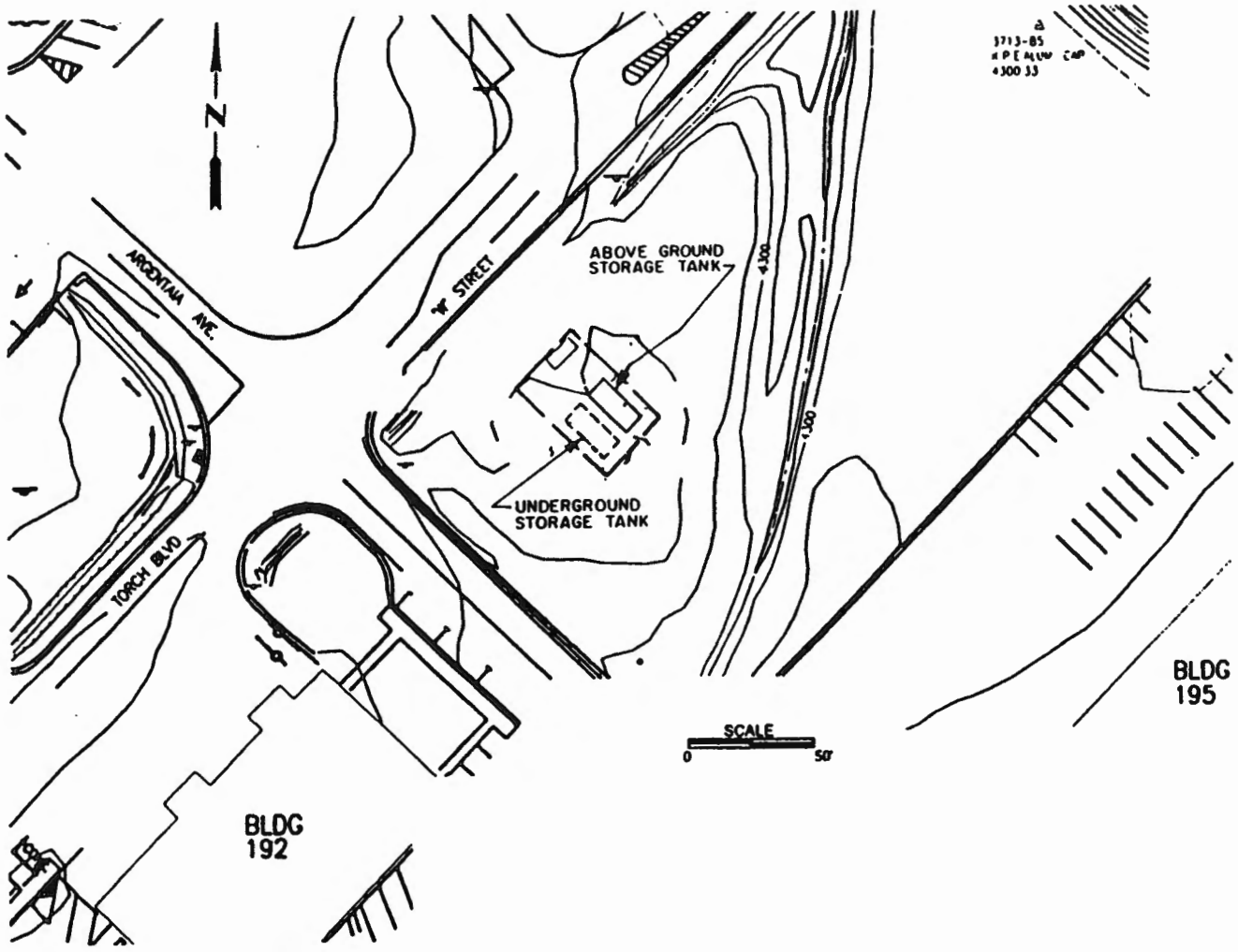

SOURCE: Woodward-Clyde, 1995

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Figure 1-2

IRP/ SWMU SITE LOCATION MAP

UNDERGROUND STORAGE TANK
SWMU No. 48A / IRP No. ST-26
Cannon Air Force Base, New Mexico

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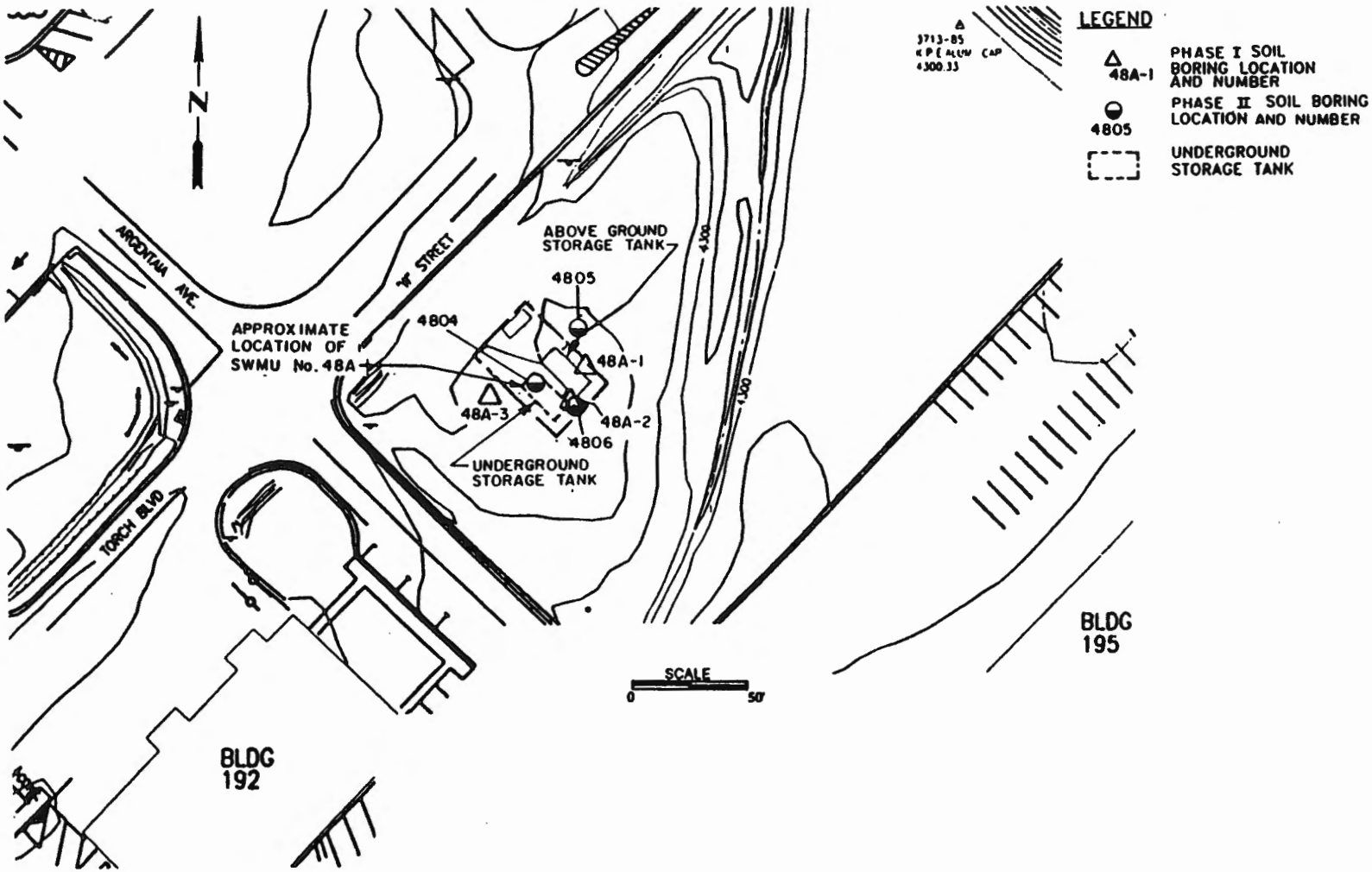


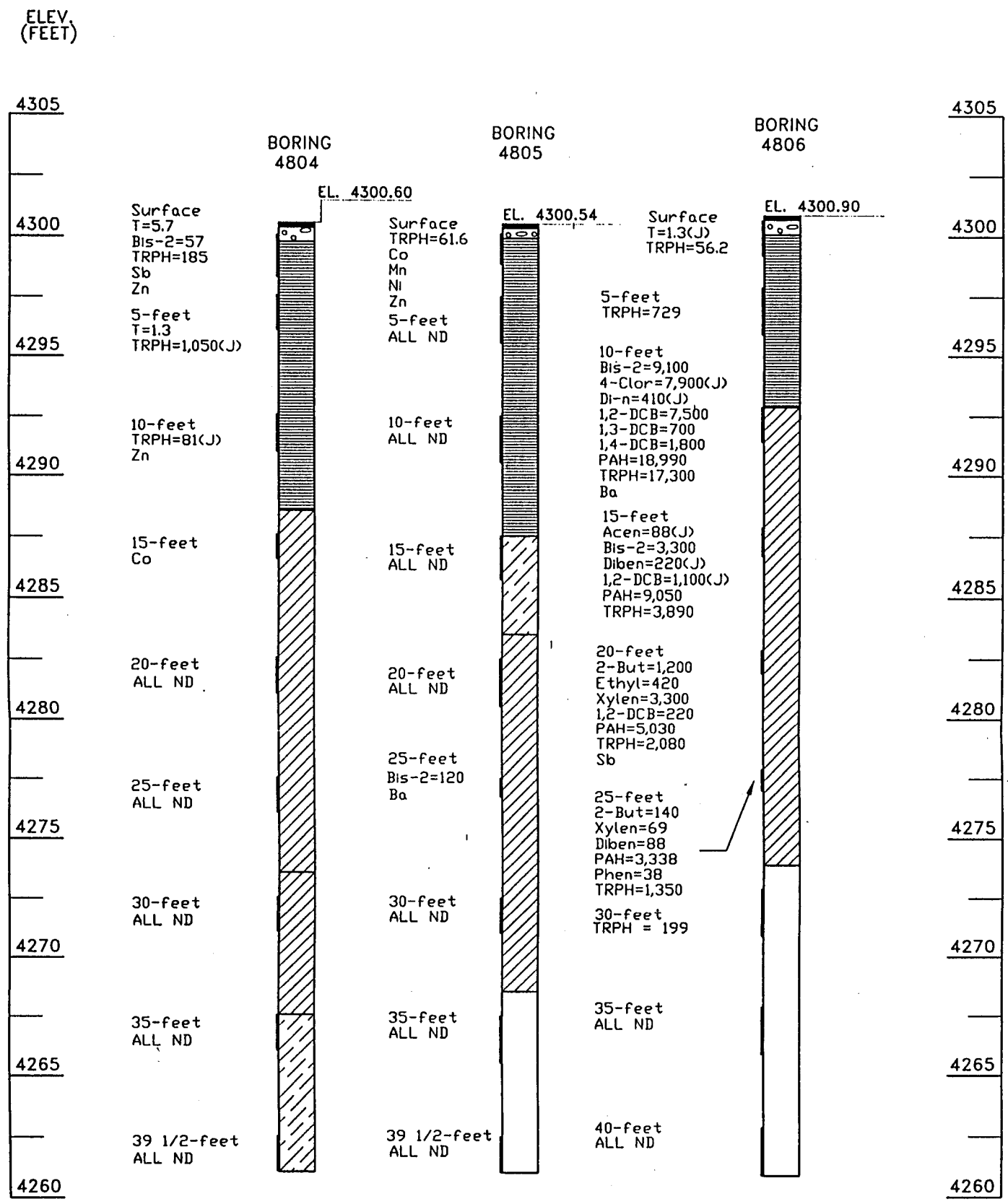
SOURCE: Woodward-Clyde, 1995

HARZA Consulting Engineers and Scientists

Figure 1-3

LOCATION OF SOIL BORINGS (Phase I and II)

UNDERGROUND STORAGE TANK
SWMU No. 48A / IRP No. ST-26
Cannon Air Force Base, New Mexico



SWMU-048A LEGEND

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

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

SCALE: 1" = 5' VERTICAL
NO SCALE HORIZONTAL

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

SOURCE Woodward-Clyde, 1995

HARZA Consulting Engineers and Scientists

Figure 2-1
SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
UNDERGROUND STORAGE TANK
SWMU No. 48A / IRP No. ST-26
Cannon Air Force Base, New Mexico

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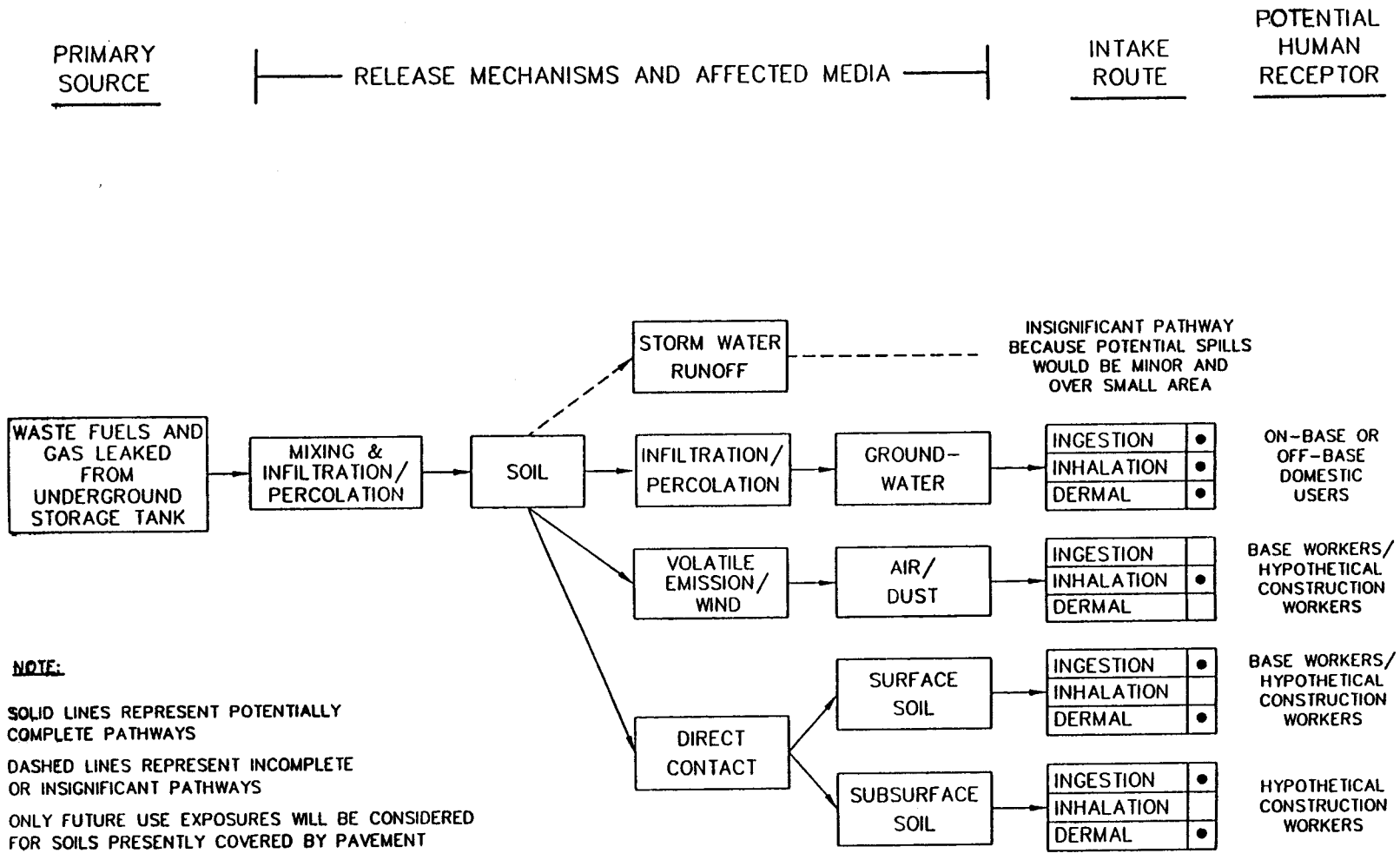

SOURCE: Woodward-Clyde, 1995

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Figure 2-2

CONCEPTUAL SITE MODEL

UNDERGROUND STORAGE TANK
SWMU No. 48A / IRP No. ST-26
Cannon Air Force Base, New Mexico

APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the RCRA Facility Investigation (RFI) performed by Woodward-Clyde (W-C 1995a). The RFI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RFI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Appendix II RCRA Facility Investigation, RFI Report, Volume I, Cannon AFB, New Mexico. LRL Sciences, Inc. 1993. Prepared for United States Army Corps of Engineers, Albuquerque District.

- Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II, Cannon Air Force, New Mexico. Omaha, Nebraska. W-C. April 1995.

  This report documents the Phase II investigation of the RFI for Appendix II SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C. August 1995.

  This is the Management Action Plan for the IRP Program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Abandoned Sump
SWMU No. 83 / IRP No. ST-27

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Abandoned Sump
SWMU No. 83/IRP No. SD-27
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Abandoned Sump
SWMU No. 83/IRP No. ST-27

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the Abandoned Sump (SWMU No. 83/IRP No. ST-27) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the RCRA Facility Investigation (RFI) Phase II for the Abandoned Sump site (SWMU No. 83/IRP No. ST-27) performed by Woodward-Clyde (W-C) in 1995, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the Abandoned Sump (SWMU No. 83/IRP No. ST-27) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendices

Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Chemical of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PAH	Polychlorinated Aromatic Hydrocarbons
RBC	Risk Based Concentrations
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
SVOC	Semi-volatile Organic Compound
TAC	Tactical Air Command

LIST OF ACRONYMS

TAL	Target Analytical List
TCL	Target Compound List
TRPH	Total Recoverable Petroleum Hydrocarbons
UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USCS	Unified Soil Classification System
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTL	Upper Tolerance Limit
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.1 SITE LOCATION AND DESCRIPTION

The Abandoned Sump site, designated as Solid Waste Management Unit (SWMU) No. 83 and Installation Restoration Program (IRP) No. ST-27, is located about 90 feet northwest of Building 120. The sump was removed in 1993 and formerly received rainwater, washwater, and dilute waste oil generated from flight line operations. The sump was constructed from a 12 by 14-foot slab. The depth of the former sump is unknown.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. The Abandoned Sump site (SWMU No. 83) is located in the central western portion of the base, just off the south edge of the south ramp. The site location is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The abandoned sump has been removed and the area is now surrounded by concrete pavement or concrete pads on the north, east and south. The 22 foot by 22 foot site is grass covered, deliberately left uncovered to facilitate further investigations. The site is located in an area of the base designated as Aircraft

Operations and Maintenace Facilities in the Base Comprehensive Plan (W-C 1995). The site is characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The Abandoned Sump site (SWMU No. 83) is located just off the south edge of the south ramp between the telephone pole to the north and the new hazardous waste storage area to the south. The site is approximately ½ mile from on-base family housing areas. These housing areas include on-base facilities at the northwest corner of the base and the Chaves Manor Housing Area, north of U.S. Highway 60/84. Other residences are scattered along the highway in the vicinity of the base and are further from the Abandoned Sump site.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The Abandoned Sump site (SWMU No. 83) is a level area 22 foot by 22 foot and is covered with dirt and grass. The area is surrounded by concrete pavement or concrete pads on the north, east and south. To the east is the new concrete ramp constructed around the new 3-bay small aircraft maintenance dock and to the north is the old concrete ramp.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The sump was self-contained and measured approximately 6 feet long by 8 inches wide by 5 inches deep and was constructed in a 12- by 14-ft concrete pad. During the construction of a small aircraft maintenance dock the only thing found to remain was a "French drain" that was apparently constructed in the bottom of the sump. This French drain consisted of a gravel pit one foot wide and at least five feet long; however, the total depth was not uncovered and

the depth is unknown. The gravel was completely covered with black oily wastes and is now covered with one to two feet of clean soil (W-C 1995b).

The following is the investigative history of the site. Further discussion of the investigation is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at the Abandoned Sump site (SWMU No. 83) was evaluated by reviewing existing information and conducting an analysis of installation records.

- During 1993, a Phase I RFI was conducted by LRL Sciences (LRL). During this investigation, three soil borings (Borings 83-1, 83-2, and 83-3) were drilled and sampled to a depth of 10 feet BGL at the site of the former sump to determine whether the sump had released any SWMU-related chemicals (LRL 1993).

- In 1995, W-C conducted a Phase II RFI at the Abandoned Sump site (SWMU No. 83). Two new soil borings (Borings 8305 and 8306) were drilled to a sample depth of 25 feet BGL. Target analytes for both Phase I and Phase II samples included Target Compound List (TCL) Volatile Organic Compounds (VOCs), Target Analytical List (TAL) metals, and Total Recoverable Petroleum Hydrocarbons (TRPH) (W-C 1995a). The boring locations from both the Phase I and Phase II investigations are shown in **Figure 1-2**. Results of the investigations are summarized in Section 2.2.

1.2.2 Period of Operation

The dates of installation and initial use of the sump (SWMU No. 83) are unknown. It is believed that the sump was operated during the 1960s and 1970s. The sump was removed in 1993.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that the sump (SWMU No. 83) received rainwater, wash water, and dilute waste oil generated from flight line operations.

1.2.5 Type of Permits Applied For and/or Approved

A Resource Conservation and Recovery Act (RCRA) Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

There is no known record of releases from the sump (SWMU No. 83). Potential contaminants include petroleum and synthetic lubricating oils, fuels, greases, solvents, and metals washed down from the flight apron.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995b):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
3. 1994 Appendix II and III Phase I Reports approved by EPA Region VI.
4. 1994 RFI Appendix II and III Phase II Work Plans approved by EPA Region VI.

The RFI at the Abandoned Sump site (SWMU No. 83) was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005 (c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. As discussed in Section 3, results of the 1995 RFI of the Abandoned Sump site (SWMU No. 83) indicate that remediation is not required under RCRA or the USAF IRP.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995b):

- Publication and release for public comment of the RCRA hazardous waste permit application;

- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

The Abandoned Sump site (SWMU No. 83/IRP No. ST-27) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Geologic units immediately underlying the Abandoned Sump site (SWMU No. 83) are Tertiary (Miocene to Pliocene) fluvial deposits of the Ogallala Formation (W-C 1992). These consist predominantly of well-sorted sands with scattered thin caliche layers and, based on regional information, may be up to 390 feet thick in the general area.

Logs from the two Phase II borings (W-C 1995a) show a subsurface lithology consisting of Ogallala Formation sediments in a fining upward sequence. A 4-inch thick asphalt pavement at the surface was encountered at Boring 8306, underlain by a 3 to 4-inch layer of sandy gravel fill placed as a foundation for the pavement. Below this level, silty clay fill material (soil type CL per the Unified Soil Classification System (USCS) with some gravel and black staining was encountered to a depth of 4.2 feet. At Boring 8305 there was no pavement, and the same silty clay fill material was encountered from the ground surface to a depth of 3.8 feet. Below the fill layer in both borings, a silty clay alluvium (soil type CL) was found to depths of around 18 feet. The silty clay was typically light brown or red, medium plastic, medium stiff to stiff, and moist. Some calcium carbonate and caliche cementation was present in isolated zones. Silt (soil type ML) was encountered below the silty clay layer in both borings to total boring depths of approximately 25 feet. The silt was light brown and was typically dry and hard with numerous calcium carbonate nodules and caliche cemented zones. A simplified view showing the borings in stick log format is provided in **Figure 2-1**.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inches in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985 (Hale 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations were conducted at the Abandoned Sump site to analyze the chemical contaminants in the soil. Soil samples were analyzed for VOCs, SVOCs, metals, and TRPH. The Phase I investigation (LRL 1993) collected soil samples from three borings (Borings 83-1, 83-2 and 83-3). Analysis resulted in the finding of TRPH in all three borings at the surface and in Borings 83-1 and 83-2 at 2.5 and 5 feet. The highest concentration, 5,000 mg/kg, occurred at 2.5 feet in Boring 83-2. Aluminum, iron, nickel, potassium, zinc, copper, and manganese were detected in low concentrations in the surface and subsurface samples in all the borings.

Soil samples were collected from two borings (Borings 8305 and 8306) in the Phase II investigation by W-C (1995a). Boring 8305 was located about 20 feet west of the sump, and Boring 8306 was located about 10 to 15 feet south of the sump (**Figure 1-2**). The borings assessed the presence of contamination to a depth of 25 feet, 15 feet deeper than the previous investigation. A simplified stick-log view of the borings along with a summary of the analytical results is shown in **Figure 2-1**.

Beginning at 20 feet of depth, Boring 8305 was non-detect for all chemicals tested. Boring 8306 was non-detect at 15 and 20 feet BGL for all contaminants tested. Cadmium was detected at a depth of 25 feet BGL. No other samples contained cadmium above the reporting limit.

The only VOCs detected were toluene and 2-butanone. The toluene was present at the 15-foot interval in Boring 8305 at a concentration of 1.4 μg/kg and the 2-butanone was detected only in the 10-foot interval at a concentration of 1.5 μg/kg (**Figure 2-1** and **Table 2-1**). The surface samples from both borings contained reportable concentrations of SVOCs in the form of PAHs. Total PAH concentrations in the surface samples were 825 μg/kg and 885 μg/kg, respectively. PAHs are contaminants commonly present in asphalt and in Boring 8305 could be attributed to the asphalt overlying the boring. However, Boring 8306 had similar PAH results and is not overlain by asphalt, indicating that the PAHs are probably site-related.

The only non-PAH SVOC encountered was phenol in subsurface samples from Boring 8306. Phenol was detected at the 5 and 10-foot depth intervals of Boring 8306 at concentrations of 1,700 μg/kg and 59 μg/kg, respectively.

TRPH was detected in the surface samples of Borings 8305 and 8306 at concentrations of 325 μg/kg and 127 μg/kg, respectively. All soil samples below 15 feet of depth in Boring 8305 and 10 feet of depth in Boring 8306 had no reported concentrations of any analytes.

Table 2-2 shows a comparison between the maximum detected SWMU concentrations of metals and background levels. Background levels for metals were defined by the Upper Tolerance Limit (UTL) concentrations from 37 background soil samples collected at Cannon AFB (W-C 1995a) and by literature values for regional soils (USGS 1984). The background UTL was defined as the mean plus two times the standard deviation. The maximum detected concentrations of aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc did not exceed background levels. Therefore, these metals were not retained for further evaluation as chemicals of concern.

The maximum concentrations of aluminum (10,800 mg/kg) and zinc (23.3 mg/kg) exceeded the background UTLs of 10,540 mg/kg and 21.9 mg/kg, respectively. However, these concentrations were within the range of detected base-wide background concentrations and were consistent with the literature values for aluminum and zinc in the region (50,000 mg/kg

and 45 mg/kg, respectively). Therefore, both aluminum and zinc were considered to be within background levels and were not retained for further evaluation.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays

in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during the W-C RFI and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to the Abandoned Sump site (SWMU No. 83); therefore, no surface water information was collected as part of the Remedial Investigation (RI) performed by W-C. Additional discussion on the surface water pathway is provided in Section 2.6 and 3.4.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with the Abandoned Sump site (SWMU No. 83). No air sampling was performed as part of this RFI. Additional discussion of the air contamination pathway is provided in Section 3.5.

2.6 POTENTIAL RECEPTORS/PATHWAYS

General site models for human exposure at the Abandoned Sump site (SWMU No. 83) are shown in **Figure 2-2**. The primary sources of contaminant release are waste fuels and liquids that could have potentially leaked from the sump. Once mixed with surface or subsurface soil, the chemicals may then be released to other media (e.g., air or groundwater). There are three potentially complete and significant exposure pathways at these sites: direct contact with soil(i.e., ingestion and dermal contact), inhalation of airborne emissions from soil, and domestic use of groundwater on the base and the base boundary.

Potential receptors include base workers (e.g. military and base personnel, and base contractors), hypothetical future construction workers, occasional base visitors (e.g., families of military personnel, visitors at these sites without restricted access), and residential receptors at the base boundary that may use groundwater on the base and at the base boundary.

The soil exposure pathways (including soil ingestion, dermal contact, and inhalation of airborne contaminants) are potentially complete and significant pathways for SWMU workers and hypothetical future construction workers. Potential exposure to occasional base visitors to contaminants in soils at this SWMU is considered to be insignificant because these sites are located in areas where visitors are not likely to be present on a regular basis.

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

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

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was the RFI at Cannon AFB, performed under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Under RCRA guidance, the concentrations of site chemicals were compared to non-site-specific screening levels.

There are three potentially complete exposure pathways at the Abandoned Sump site (SWMU No. 83): direct contact with soil; inhalation of soil; and domestic use of groundwater at the base or at the base boundary. Potential receptors include base workers (e.g. military and base personnel, and base contractors), hypothetical future construction workers, occasional base visitors (e.g., families of military personnel, visitors at these sites without restricted access), and residential receptors at the base boundary that may use groundwater on the base and at the base boundary. A discussion of potentially complete exposure pathways was provided in Section 2.6.

3.2 SOILS

Maximum detected soil concentrations of organic compounds and metals which exceeded background concentrations (see Section 2.2.2) were compared to conservative EPA Region III RBCs for residential soil (EPA 1994) to evaluate whether a significant release (i.e., that could pose a significant risk to human health) had occurred at the Abandoned Sump site. 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 methodologies. A comparison of maximum soil concentrations to RBCs for residential soil is provided in **Table 3-1**.

Potential receptors include base workers, hypothetical future construction workers, occasional base visitors, and residential receptors that may use groundwater on the base and at the base boundary.

Organic Contaminants. The Abandoned Sump site is partially paved with asphalt, so PAHs encountered in the surface soil beneath the asphalt (Boring 8306) could be related to the asphalt and not SWMU activities. However, the surface soil sample from the area not covered with asphalt (Boring 8305) also contained concentrations of PAHs at levels similar to Boring 8306 and therefore contamination may be site-related. To be conservative, the highest detected PAH concentrations were used to estimate potential risk at this SWMU.

Benzo(a)pyrene was the only chemical detected at a concentration (0.12 mg/kg) which slightly exceeded the RBC of 0.088 mg/kg. The potential carcinogenic risk from this concentration is 1.4×10^{-6}. The estimated risk is within EPA target risk range of 1×10^{-6} to 1×10^{-4} for exposure to chemicals released from a hazardous waste site (EPA 1990a, 1990b, 1991a, 1992a). This potential risk is based on residential exposure assumptions; however, SWMU No. 83 is a sump located within an industrial area of the base. This area is likely to remain industrial; therefore, using residential RBCs significantly overestimates likely risks at this SWMU. The maximum detected concentration of benzo(a)pyrene (0.12 mg/kg) did not exceed the industrial soil RBC of 0.39 mg/kg (see **Table 3-1**). Therefore, no chemicals were detected at concentrations which are likely to pose a potentially significant human health risk based on the most likely future land use scenario for SWMU No. 83.

TRPH is a complex mixture of hundreds of branched, straight chain, cyclic, and aromatic carbon compounds, most of which are not known to be toxic. However, a small fraction of the TRPH constituents are known to have toxic or carcinogenic properties. In the RFI, the TRPH constituents that are known to be potentially hazardous (such as benzene, toluene, naphthalene, and pyrene) were analyzed for individually in the soil samples collected at the SWMU. TRPH was only detected in two of fifteen samples at a maximum concentration of 325 mg/kg, which exceeds the State of New Mexico TRPH action level of 100 mg/kg in soil. Benzo(a)pyrene was the only toxic constituent of TRPH detected at a concentration exceeding the RBC for residential soil and its concentration was below the RBC for industrial soil, as discussed above, indicating that no risk is likely for the given use of the site. In addition, it is not likely that other TRPH constituents would contribute significantly to risks at the site. Finally, the site is mostly paved which significantly limits exposure to the soil.

Inorganic Contaminants. The maximum concentrations of metals were all either within the range of base-wide background concentrations (**Table 2-2**) or were below the RBCs for residential soil (**Table 3-1**), as in the case of cadmium.

3.3 GROUNDWATER

Groundwater beneath Cannon AFB is potable and used for domestic purposes both on and off the base. Therefore, exposures to groundwater by current and future residents is possible. However, the Ogallala Aquifer is approximately 270 feet deep and groundwater monitoring well data elsewhere at Cannon AFB has revealed no aquifer contamination.

The fate and transport properties of the chemicals detected in the soil samples does not indicate high mobility, the local geology/hydrogeology (which includes clay and caliche layers) appear to be protective of the groundwater, and a groundwater monitoring program is in place elsewhere at Cannon AFB and is expected to continue. In addition, the area where the sump was located has been partially paved, so future infiltration will be limited.

Although the groundwater exposure pathway is not likely to be a significant path of human exposure, non-site-specific potential risks for exposure to groundwater are included in the RBCs used in Section 2.1.

3.4 SURFACE WATER

Surface water runoff is considered to be an insignificant pathway at this SWMU because the site covers a relatively small area, it is no longer active, and the area is flat with no developed drainage ways and is partially paved. Therefore, it is unlikely that significant quantities of contaminants in the surface soil will be transported by surface water runoff from this SWMU. Concentrations in surface soil at the site also are expected to be higher than those in any transported soils; therefore, evaluation of surface soils at the site would be protective of the runoff pathway without the separate evaluation of surface waters.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. The non-site-

specific risk of exposure to airborne contaminants is included in the RBCs discussed for soil in Section 3.2.

3.6 SUMMARY

Twelve soil samples were collected from the two 25-foot soil borings drilled at this SWMU during the W-C RFI (1995). A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and RBCs. Fourteen organic compounds (nine of them PAHs) and one metal were reported in the SWMU samples.

Toluene was detected in only one sample at a depth of 15 feet. PAHs and TRPH were detected only in surface samples. Other non-PAH VOCs were detected, but only at the 5 and 10 foot depths in one boring. There were no other chemicals of concern (COCs) below 15 feet in either boring. The vertical distribution of contaminants has been adequately defined, and potential impact to the groundwater is considered low. Only one compound, benzo(a)pyrene, slightly exceeded RBCs. However, the estimated health risk due to this compound is between the EPA's target risk of 10^{-4} to 10^{-6}. Because no unacceptable health risk exists, no further evaluation of the SWMU is recommended.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the investigation for the Abandoned Sump (SWMU No. 83), the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the investigation, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RFI for the Abandoned Sump site, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
ABANDONED SUMP
SWMU NO. 83/IRP NO. ST-27
Cannon Air Force Base, New Mexico

LOCATOR	CAN083-8305-0000			CAN083-8305-0005			CAN083-8305-0010			CAN083-8305-8362[1]			CAN083-8305-0015			CAN083-8305-0015		
LAB SAMPLE NUMBER	0398670001SA			0398670002SA			0398670003SA			0398670008SA			0398670004SA			0398670005SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (μg/kg)																		
Acetone	<	11	U	<	11	U	3.4	11	J	<	11	U	3.1	11	J	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U	<	11	U
Methylene chloride	2.1	5.4	J	1.9	5.5	J	4.2	5.6	J	<	5.6	U	3.6	5.6	J	4.5	5.7	J
Toluene	<	5.4	U	<	5.5	U	<	5.6	U	<	5.6	U	1.4	5.6	J	<	5.7	U
Semivolatile Organics (μg/kg)																		
Benzo(a)anthracene	64	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	78	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	120	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Benzo(g,h,i)perylene	58	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Chrysene	84	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Fluoranthene	160	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Indeno(1,2,3,-cd)pyrene	58	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Phenanthrene	73	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Phenol	<	360	U	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Pyrene	130	360	J	<	370	U	<	370	U	<	370	U	<	370	U	<	380	U
Metals (mg/kg)																		
Aluminum	10800	10.8		8450	11.1		7980	22.6		7210	22.6		7570	11.3		5530	57.3	
Arsenic	3.2	0.54		2.4	0.55		2.6	0.56		2.7	0.56		2	1.1		1	0.57	
Barium	92.6	1.1	J	83.8	1.1		633	2.3	J	454	2.3	J	90.8	1.1		234	5.7	J
Beryllium	0.44	0.22		0.41	0.22		0.54	0.45		0.37	0.45	J	0.45	0.23		<	1.1	U
Cadmium	<	0.54	U	<	0.55		<	1.1	U	<	1.1	U	<	0.56	U	<	2.9	U
Calcium	8660	21.5		95400	22.2		135000	45.2		132000	45.2		80900	22.6		233000	115	
Chromium	11	1.1		7.3	1.1		5.3	2.3		3.7	2.3		6.4	1.1		<	5.7	U

TABLE 2-1 (continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
ABANDONED SUMP
SWMU NO. 83/IRP NO. ST-27
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CAN083-8305-0000 0398670001SA 12/13/94			CAN083-8305-0005 0398670002SA 12/13/94			CAN083-8305-0010 0398670003SA 12/13/94			CAN083-8305-8362[1] 0398670008SA 12/13/94			CAN083-8305-0015 0398670004SA 12/13/94			CAN083-8305-0015 0398670005SA 12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg) (cont'd)																		
Cobalt	3.8	1.1		3.1	1.1		2.8	2.3		2.8	2.3		3.4	1.1		3.4	5.7	J
Copper	8.1	2.2		5.2	2.2		4.6	4.5		4.1	4.5	J	4.4	2.3		<	11.5	U
Iron	10200	10.8		7200	11.1		6470	22.6		6000	22.6		6990	11.3		4040	57.3	
Lead	12.9	2.7		4.7	0.55		4.9	0.56		5.5	0.56		5.1	0.56		2.2	0.57	
Magnesium	1790	21.5		2430	22.2		4120	45.2		3860	45.2		4000	22.6		5830	115	
Manganese	157	1.1		85.6	1.1		106	2.3		95.1	2.3		116	1.1		40.3	5.6	
Nickel	9	4.3		8.7	4.4		5.9	9	J	5.5	9	J	7.3	4.5		<	22.9	U
Potassium	1800	539		1430	554		1400	1130		1210	1130		1840	565		852	2860	J
Vanadium	19.8	1.1		15.9	1.1		17.1	2.3		16.4	2.3		19.5	1.1		14.4	5.7	
Zinc	23.3	2.2		17.3	2.2		16	4.5		14.6	4.5		17	2.3		8.9	11.5	J
TRPH (mg/kg)																		
Total Recoverable Petroleum Hydrocarbons	325	43.1		<	44.3	U	<	45.2	U	<	45.2	U	<	45.2	U	<	45.8	U

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

J = Estimated value.

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

U = Nondetected value. RL = Reporting Limit

[1] Duplicate for preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
ABANDONED SUMP
SWMU NO. 83/IRP NO. ST-27
Cannon Air Force Base, New Mexico

LOCATOR	CAN083-8305-0025			CAN083-8306-0000			CAN083-8306-0005			CAN083-8306-0010			CAN083-8306-8361[1]		
LAB SAMPLE NUMBER	0398670006SA			0398670010SA			03986710016SA			0398710015SA			0398670009SA		
COLLECT DATE	12/13/94			12/13/94			12/13/94			12/13/94			12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)															
Acetone	<	12	U	<	11	U	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	12	U	<	11	U	<	11	U	1.5	11	J	<	11	U
Methylene chloride	<	5.8	U	<	5.7	U	<	5.7	U	<	5.7	U	<	5.7	U
Toluene	<	5.8	U	<	5.7	U	<	5.7	U	<	5.7	U	<	5.7	U
Semivolatile Organics (µg/kg)															
Benzo(a)anthracene	<	380	U	85	380	J	<	370	U	<	370	U	<	380	U
Benzo(a)pyrene	<	380	U	120	380	J	<	370	U	<	370	U	<	380	U
Benzo(b)fluoranthene	<	380	U	160	380	J	<	370	U	<	370	U	<	380	U
Benzo(g,h,i)perylene	<	380	U	75	380	J	<	370	U	<	370	U	<	380	U
Chrysene	<	380	U	99	380	J	<	370	U	<	370	U	<	380	U
Fluoranthene	<	380	U	120	380	J	<	370	U	<	370	U	<	380	U
Indeno(1,2,3,-cd)pyrene	<	380	U	68	380	J	<	370	U	<	370	U	<	380	U
Phenanthrene	<	380	U	48	380	J	<	370	U	<	370	U	<	380	U
Phenol	<	380	U	<	380	U	1700	370		59	370	J	<	380	U
Pyrene	<	380	U	110	380	J	<	370	U	<	370	U	<	380	U
Metals (mg/kg)															
Aluminum	5290	23.1		8240	11.4		6810	11.4		8790	22.7		7230	22.8	
Arsenic	1.1	0.58		2.6	1.1		2.4	1.1		1.5	0.57		2.2	0.57	
Barium	133	2.3	J	207	1.1	J	102	1.1		538	2.3	J	1360	2.3	J
Beryllium	<	0.46	U	0.45	0.23		0.49	0.23		0.62	0.45		0.57	0.46	
Cadmium	<	1.2	U	<	0.57	U	<	0.57	U	<	1.1	U	<	1.1	U
Calcium	180000	46.2		72000	22.9		75400	22.7		161000	45.4		173000	45.7	
Chromium	5.2	2.3		7.4	1.1		6.2	1.1		3.9	2.3		4.1	2.3	

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
ABANDONED SUMP
SWMU NO. 83/IRP NO. ST-27
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CAN083-8305-0025 0398670006SA 12/13/94			CAN083-8306-0000 0398670010SA 12/13/94			CAN083-8306-0005 03986710016SA 12/13/94			CAN083-8306-0010 0398710015SA 12/13/94			CAN083-8306-8361[1] 0398670009SA 12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg), cont.															
Cobalt	1.2	2.3	J	3.2	1.1		4	1.1		2.7	2.3		2	2.3	J
Copper	3.5	4.6	J	6.6	2.3		5.7	2.3		3.8	4.5	J	4	4.6	J
Iron	3130	23.1		7530	11.4		6640	11.4		5280	22.7		4660	22.8	
Lead	1.5	0.58		7.5	0.57		6	0.57	J	4.9	0.57	J	5.4	0.57	
Magnesium	16400	46.2		2660	22.9		2360	22.7		4970	45.4		4860	45.7	
Manganese	27.2	2.3		123	1.1		86.1	1.1		71.8	2.3		68.1	2.3	
Nickel	7.2	9.2	J	8.1	4.6		8.9	4.5		8.3	9.1	J	5.8	9.1	J
Potassium	883	1160	J	1330	571		1370	568		1440	1140		1240	1140	
Vanadium	17.1	2.3		15.9	1.1		14.7	1.1		12.1	2.3		11.5	2.3	
Zinc	7.4	4.6		18.2	2.3		15.1	2.3		14.3	4.5		11.6	4.6	
TRPH (mg/kg)															
Total Recoverable Petroleum Hydrocarbons	<	46.2	U	127	45.7		<	45.4		<	45.4		<	45.7	U

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

J = Estimated value.

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

U = Nondetected value. RL = Reporting Limit

[1] Duplicate for preceeding sample number.

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
ABANDONED SUMP
SWMU NO. 83/IRP NO. ST-27
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CAN083-8306-0015 0398710014SA 12/13/94			CAN083-8306-0020 0398710013SA 12/13/94			CAN083-8306-0010 0398710012SA 12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/kg)									
Acetone	<	11	U	<	11	U	<	11	U
2-Butanone (MEK)	<	11	U	<	11	U	<	11	U
Methylene chloride	<	5.6	U	4.5	5.5	J	<	5.6	U
Toluene	<	5.6	U	<	5.5	U	<	5.6	U
Semivolatile Organics (µg/kg)									
Benzo(a)anthracene	<	370	U	<	370	U	<	370	U
Benzo(a)pyrene	<	370	U	<	370	U	<	370	U
Benzo(b)fluoranthene	<	370	U	<	370	U	<	370	U
Benzo(g,h,i)perylene	<	370	U	<	370	U	<	370	U
Chrysene	<	370	U	<	370	U	<	370	U
Fluoranthene	<	370	U	<	370	U	<	370	U
Indeno(1,2,3,-cd)pyrene	<	370	U	<	370	U	<	370	U
Phenanthrene	<	370	U	<	370	U	<	370	U
Phenol	<	370	U	<	370	U	<	370	U
Pyrene	<	370	U	<	370	U	<	370	U
Metals (mg/kg)									
Aluminum	6480	11.2		4750	11.1		7440	11.1	
Arsenic	0.96	2.2	J	0.67	2.2	J	0.56	2.2	J
Barium	620	1.1	J	75.1	1.1	J	377	1.1	J
Beryllium	0.42	0.22		0.31	0.22		0.4	0.22	
Cadmium	<	0.56	U	<	0.55	U	0.46	0.56	J

TABLE 2-1(continued)
SUMMARY OF COMPOUNDS DETECTED IN SOIL SAMPLES
ABANDONED SUMP
SWMU NO. 83/IRP NO. ST-27
Cannon Air Force Base, New Mexico

LOCATOR LAB SAMPLE NUMBER COLLECT DATE	CAN083-8306-0015 0398710014SA 12/13/94			CAN083-8306-0020 0398710013SA 12/13/94			CAN083-8306-0010 0398710012SA 12/13/94		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (mg/kg) (cont'd)									
Calcium	86400	22.4		85700	22.2		62300	22.3	
Chromium	4.7	1.1		4	1.1		5.3	1.1	
Cobalt	2.6	1.1		1.8	1.1		2	1.1	
Copper	2.9	2.2		2.1	2.2	J	2.7	2.2	
Iron	5030	11.2		3830	11.1		5540	11.1	
Lead	3.8	1.1		2.8	1.1	J	2.8	1.1	J
Magnesium	2940	22.4		3080	22.2		4520	22.3	
Manganese	67.9	1.1		41.3	1.1		50.9	1.1	
Nickel	6.5	4.5		5	4.4		6	4.5	
Potassium	1670	560		1280	555		1780	556	
Vanadium	11.1	1.1		10	1.1		12.9	1.1	
Zinc	12.6	2.2		8.8	2.2		13.3	2.2	
TRPH (mg/kg)									
Total Recoverable Petroleum Hydrocarbons	<	44.8	U	<	44.4	U	<	44.5	U

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

J = Estimated value.

R = Rejected value.

U = Nondetected value.

D = Sample was diluted for analysis.

RL = Reporting Limit

(1) Duplicate for preceeding sample number.

Source: Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II (W-C 1995a).

TABLE 2-2
COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL SAMPLES TO BACKGROUND[1]
ABANDONED SUMP SITE
SWMU NO. 83 / IRP NO. ST-27
Cannon Air Force Base, New Mexico

Sample ID	Metal	Maximum Detected Concentration	Range of Background Concentrations[2]	Upper Tolerance Limit (UTL) Background Concentrations[3]	Reported Level in Clovis, NM Region[4]	Does Maximum Detected Exceed Background
CAN083-8305-0000	Aluminum	10,800	1,410 - 11,000	10,540	50,000	NO**
CAN083-8305-0000	Arsenic	3.2	0.67 - 28	15.5	6.5	NO
CAN083-8305-0010	Barium	633	14.5 - 1,200	642	500	NO
CAN083-8306-0010	Beryllium	0.62	0.17 - 0.77	0.73	1-2	NO
CAN083-8306-0025	Cadmium	0.46	<0.51 - 4.2	*	---	YES
CAN083-8305-0000	Chromium	11	4 - 15.4	12.5	30	NO
CAN083-8306-0005	Cobalt	4	0.85 - 5.3	4.5	3-7	NO
CAN083-8305-0000	Copper	8.1	<2 - 5.3	*	20	NO
CAN083-8305-0000	Lead	12.9	1.1 - 46	25.8	15	NO
CAN083-8305-0000	Manganese	157	22.4 - 216	164	500	NO
CAN083-8305-0000	Nickel	9	1.3 - 9.8	9	15	NO
CAN083-8305-0000	Vanadium	19.8	5.2 - 28.3	25.3	30-70	NO
CAN083-8305-0000	Zinc	23.3	<4.3 - 27.5	21.9	45	NO**

TABLE 2-2 (continued)
COMPARISON OF MAXIMUM DETECTED METAL CONCENTRATIONS IN SOIL SAMPLES TO BACKGROUND[1]
ABANDONED SUMP SITE
SWMU NO. 83 / IRP NO. ST-27
Cannon Air Force Base, New Mexico

(1) All units in mg/kg.

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

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

(4) USGS 1984.

* Data insufficient to calculate UTL of background concentration.

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

Source: Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II (W-C 1995a).

TABLE 3-1
COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RBCs
ABANDONED SUMP SITE
SWMU NO. 83 / IRP NO. ST-27
Cannon Air Force Base, New Mexico

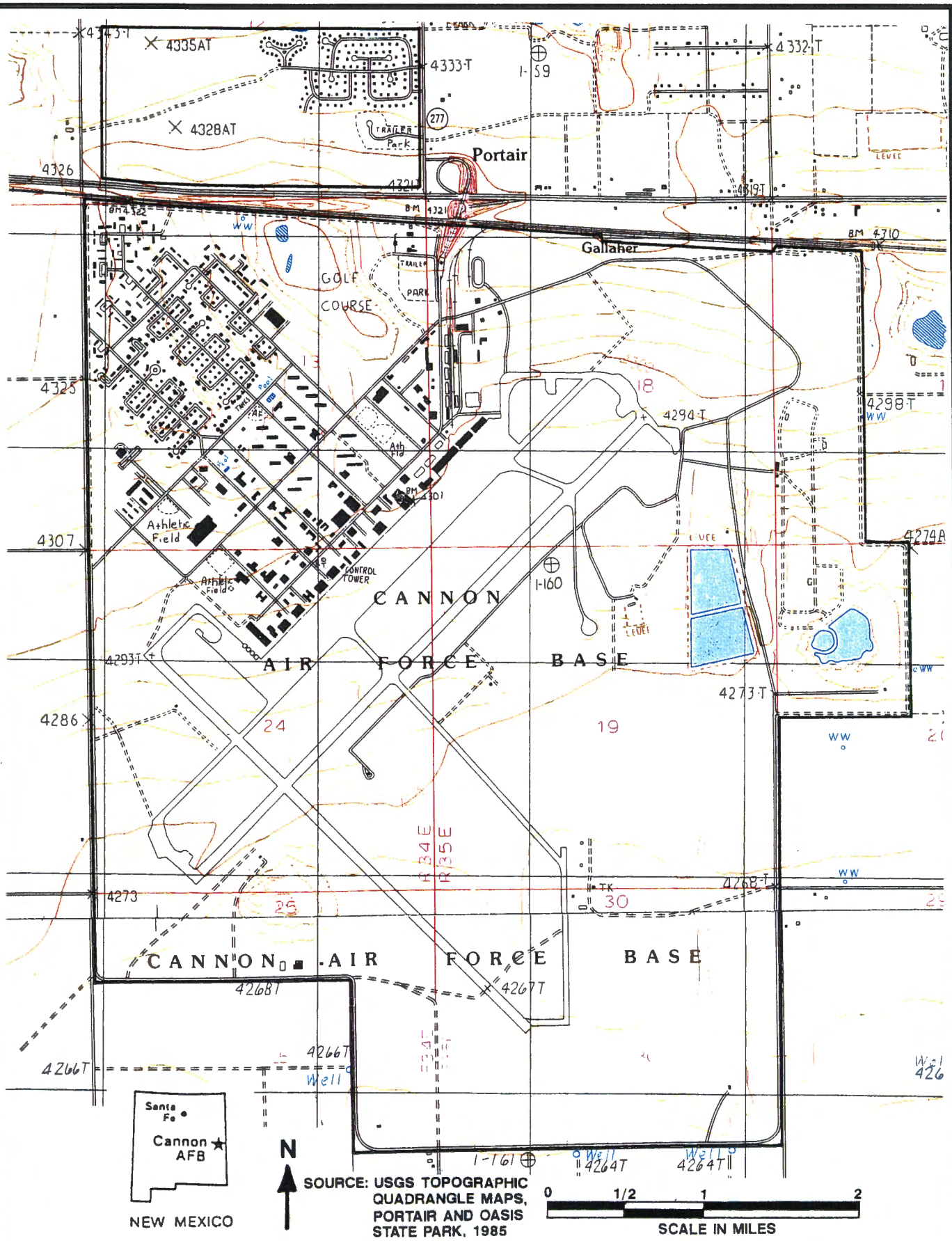
Chemical	Maximum Detected Concentration (mg/kg)	Residential Soil Risk-Based Concentration[1] (mg/kg)	Exceeds RBC?	Estimated Risk	Risk Type	Industrial Soil Risk-based Concentration[2]	Exceeds RBC?
Acetone	0.0034	7,800	NO				
2-Butanone (MEK)	0.0015	47,000	NO				
Methylene Chloride	0.0045	85	NO				
Toluene	0.0014	16,000	NO				
Benzo(a)anthracene	0.085	0.88	NO				
Benzo(a)pyrene	0.12	0.088	YES	1.36×10^{-6}	Carcinogenic	0.39	NO
Benzo(b)fluoranthene	0.16	0.88	NO				
Benzo(g,h,i)perene	0.075	0.88	NO				
Chrysene	0.099	88	NO				
Fluoranthene	0.16	3,100	NO				
Indeno(1,2,3-cd)pyrelene	0.068	NA(a)					
Phenanthrene	0.073	NA(a)					
Phenol	1.7	47,000	NO				
Pyrene	0.13	2,300	NO				
Cadmium	0.46	39	NO				

[1]EPA region III Risk-Based Concentrations for Residential Soil (EPA 1994) [2]EPA Region III risk-Based Concentrations for Industrial Soil (EPA 1994)

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

Source: Appendix II RCRA Facility Investigation, RFI Report, Volume I, Cannon AFB, New Mexico (LRL Sciences, Inc. 1993)

FIGURES



SOURCE: Woodward-Clyde, February1996

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Figure 1-1

GENERAL VICINITY MAP

ABANDONED SUMP
SWMU No. 83 / IRP No. ST-27
Cannon Air Force Base, New Mexico

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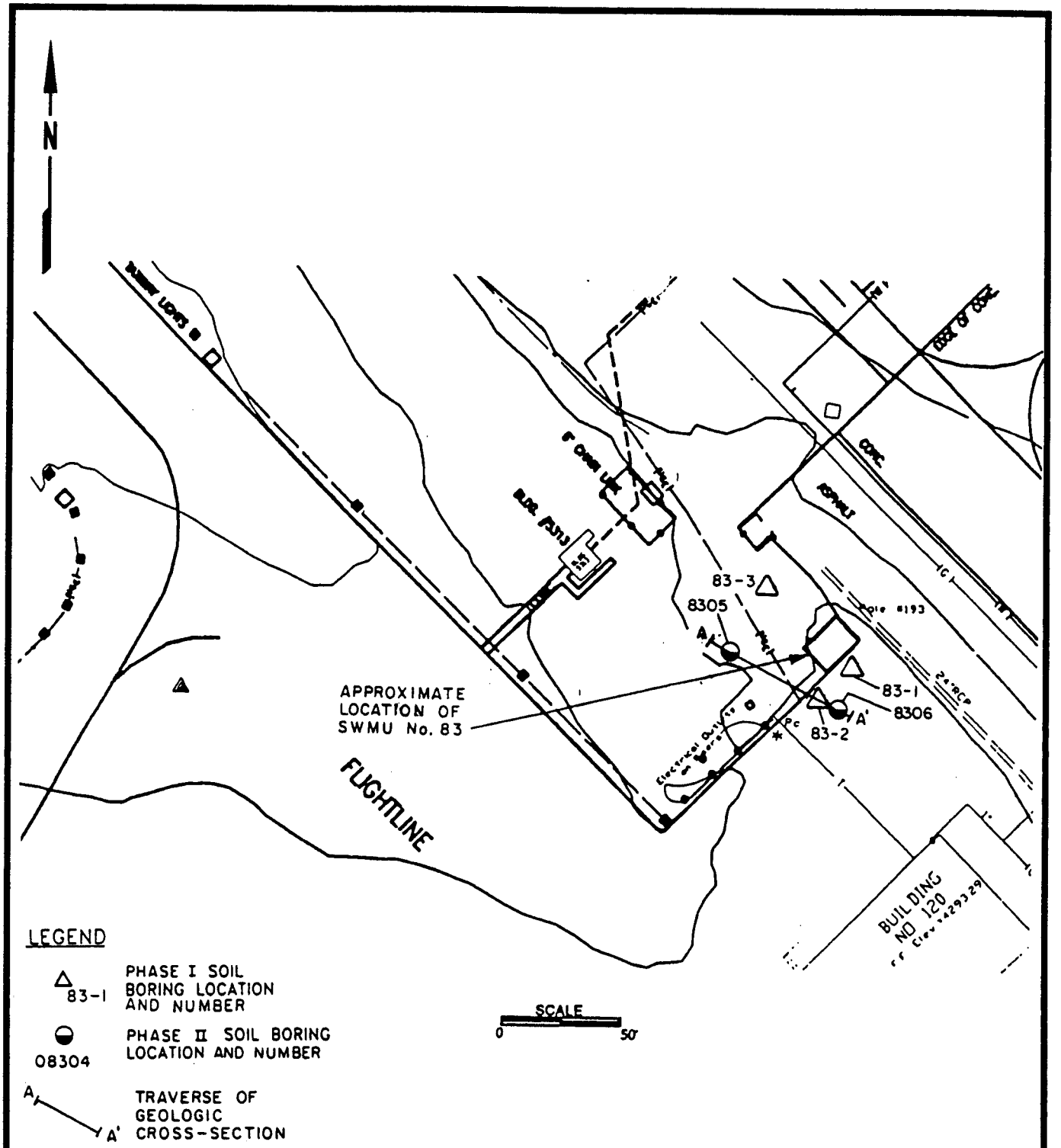

SOURCE: Woodward-Clyde, 1995

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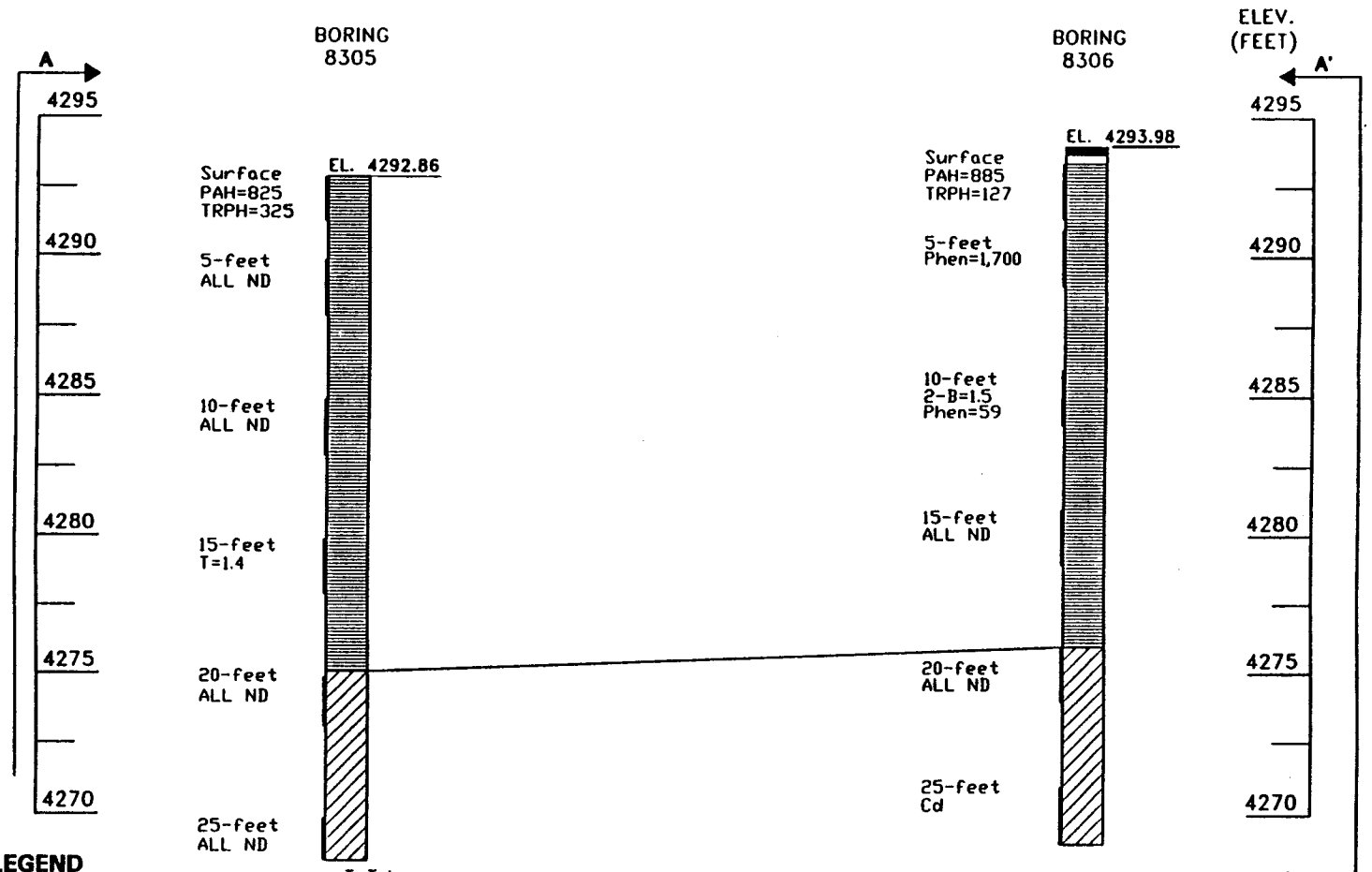
Figure 1-2

IRP/ SWMU SITE LOCATION MAP

ABANDONED SUMP
SWMU No. 83 / IRP No. ST-27
Cannon Air Force Base, New Mexico

c:\pm5\misc\newmex1.pm5

c:\pm5\misc\newmex2.pm5



SWMU-83 LEGEND

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

T=Toluene
PAH=Polycyclic Aromatic Hydrocarbons
Phen=Phenol
2-B=2-Butanone (MEK)
TRPH=Total Recoverable Petroleum Hydrocarbons
Cd=Cadmium
ND=Not Detected
Note: All results reported in µg/kg except for TRPH (mg/kg)
Only those metals that exceeded UTLs and background levels are listed

SCALE: 1" = 5' HORIZONTAL
1" = 10' VERTICAL

SOURCE: Woodward-Clyde, 1995

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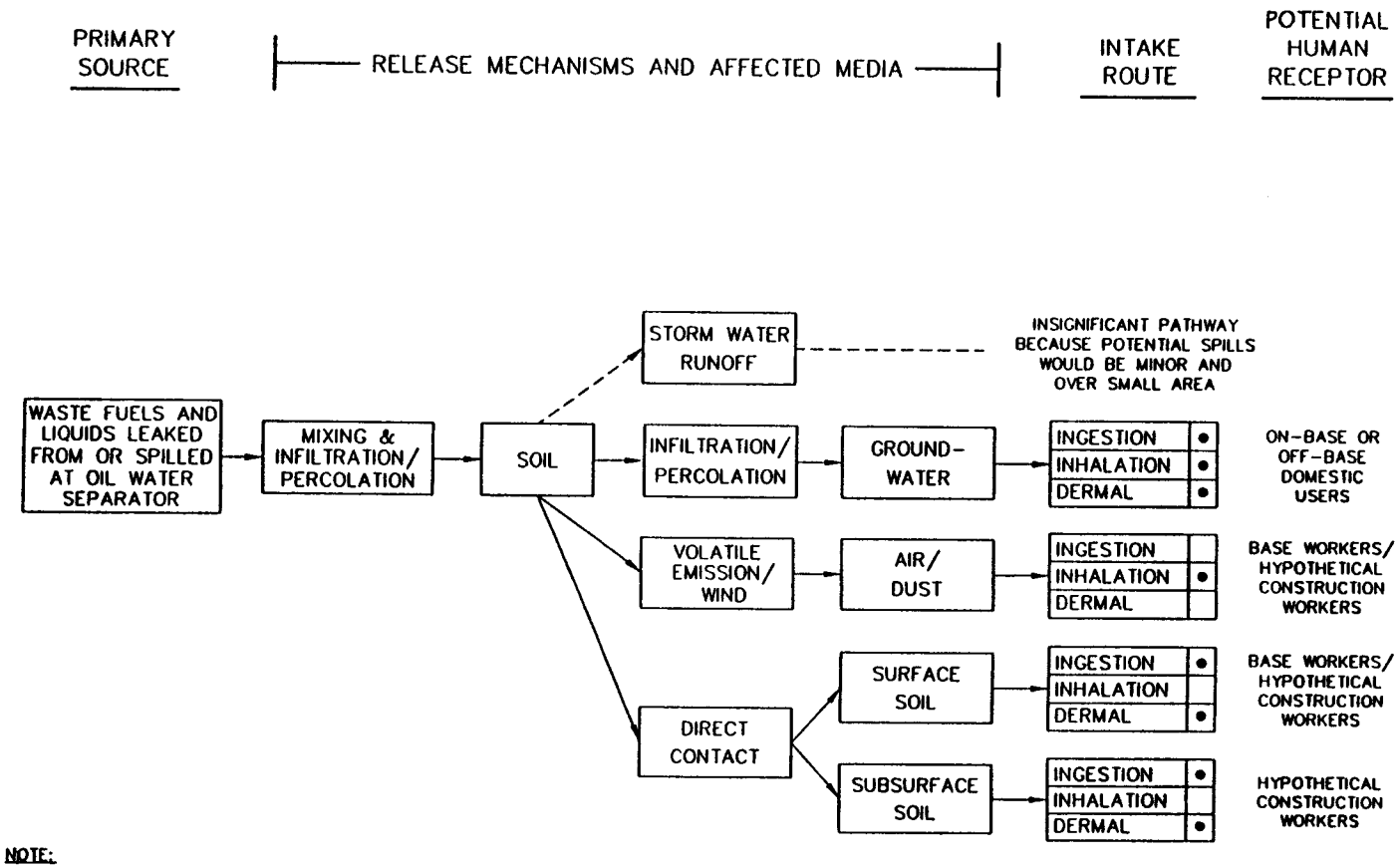
Figure 2-1
SIMPLIFIED BORING LOGS AND SUMMARY OF ANALYTICAL RESULTS
ABANDONED SUMP
SWMU No. 83 / IRP No. ST-27
Cannon Air Force Base, New Mexico



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

SOURCE: Woodward-Clyde, 1995

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Figure 2-2

CONCEPTUAL SITE MODEL

ABANDONED SUMP
SWMU No. 83 / IRP No. ST-27
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the RFI performed by W-C. The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RFI included performance of a risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Appendix II RCRA Facility Investigation, RFI Report, Volume I, Cannon AFB, New Mexico. LRL Sciences, Inc. 1993. Prepared for United States Army Corps of Engineers, Albuquerque District.

- Pre-Draft RFI Report, RCRA Facility Investigation, Appendix II SWMUs-Phase II, Cannon Air Force, New Mexico. Omaha, Nebraska. W-C. April 1995.

  This report documents the Phase II investigation of the RFI for Appendix II SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C. August 1995.

  This is the Management Action Plan for the IRP Program at Cannon AFB.

CAFB ~~03~~ 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
MOGAS Spill
AOC A / IRP No. SS-19

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

MOGAS Spill
AOC A/IRP No. SS-19
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

MOGAS Spill
AOC A/IRP No. SS-19

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the MOGAS Spill (AOC A/IRP No. SS-19) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the IRP Phase II -Confirmation/Quantification study for the MOGAS Spill (AOC A/IRP SS-19) performed by Radian in 1985, and the outcomes of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the MOGAS Spill (AOC A/IRP No. SS-19) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from past releases of contaminants. The investigations performed for this site followed the Department of Defense (DOD) IRP and were conducted, to the extent applicable, to be consistent with CERCLA, SARA, and the NCP. The statutory preference for further treatment is not satisfied because further treatment was not found to be necessary.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendices

Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Chemical of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
gpm	Gallons per Minute
HARM	Hazard Assessment Rating Methodology
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
MOGAS	motor gasoline
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service

LIST OF ACRONYMS

USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

The MOGAS Spill, designated as Area of Concern (AOC) A and Installation Restoration Program (IRP) No. SS-19, is a ditch approximately 400 feet by 200 feet in size where two motor gasoline (MOGAS) spills occurred in the early 1960s due to overturned fuel trucks. Response action consisted of a washdown of the area by the fire department. The present location is at Argentia Avenue east of the gymnasium (Bldg. 444). A portion of the spill site is now under Argentia Avenue.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. The MOGAS Spill site is located at Argentia Avenue east of the gymnasium (Bldg. 444). A portion of the spill site is now under Argentia Avenue. The site location is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The MOGAS Spill site (AOC A/SS-19), is located in an area of the base designated as Community (Service) in the Base Comprehensive Plan (W-C 1995). The site is characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative. The area includes the gymnasium. The MOGAS Spill

site lies west of an Industrial area of the base and east of an Open Area. Part of the site is under Argentia Avenue.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The MOGAS Spill site (AOC A/SS-19) is located in the northwestern part of the Base where activity is relatively high. The western corner of the site is within a few feet of the gymnasium. Building 374 is about 10 feet northeast of the site. An outdoor recreation area is approximately 200 feet from the site and the closest housing units are about 1,000 feet away.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The MOGAS Spill site is partially covered by Argentia Avenue. Runoff from the site is routed southeast to the AGE Drainage Ditch via a small ditch.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The MOGAS Spill site is the location of two spills of MOGAS from overturned fuel trucks. The site is approximately 400 by 200 feet. The spills occurred in the early 1960s at the present location of Argentia Avenue southeast of the gymnasium (Bldg. 444). The total quantity of both spills is estimated to have been 2,000 to 3,000 gallons.

In 1977, construction of the gymnasium and associated pavements along Argentia Avenue modified the site. Part of the ditch is apparently below the pavement. There is no evidence that contaminated soil was detected or removed during construction of the gymnasium or pavement.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). The relative hazardous substance problem potential to human health or the environment at this site was evaluated using Hazard Assessment Rating Methodology (HARM) during the IRP Phase I studies. This model considers four aspects of the hazard posed by a specific site: 1) the possible receptors of the contamination, 2) the waste and its characteristics, 3) the potential pathways for waste contaminant migration, and 4) any efforts to contain the contamination. The overall HARM rating score of 47 was one of the lowest (range 42 to 66) for IRP sites at Cannon AFB.

- MOGAS Spill site was investigated during the Phase II, Stage 1 study by Radian to define the hydrogeologic setting and to evaluate the environmental impact of the MOGAS spills. Two boreholes (19A and 19B) were drilled to 60 feet each. Contaminants of concern (COCs) were oil and grease, lead, and purgeable aromatics and halocarbons.

1.2.2 Period of Operation

The MOGAS Spill (AOC A/SS-19) was the site of two accidental spills, of approximately 2,000 to 3,000 gallons of MOGAS in the early 1960's.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

SS-19 is the former site of a ditch where fuel trucks overturned on two separate occasions in the 1960s causing MOGAS to spill into the soil. The physical features of the site were changed in 1977 during the construction of Building 444. Presently, the site is partially covered by Argentia Avenue.

1.2.5 Type of Permits Applied For and/or Approved

A Resource Conservation and Recovery Act (RCRA) Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs; and
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

Approximately a total of 2,000 to 3,000 gallons of MOGAS spilled on two occasions in the early 1960s when fuel trucks overturned into a ditch located at this site. No attempts were made to recover the fuel. Response action consisted of the wash down of the area by the fire department.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/Visual Site Inspection (VSI), RCRA Facility Assessment (RFA) conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1994 Appendix II and III Phase I Reports approved by EPA Region VI.
5. 1994 RFI Appendix II and III Phase II Work Plans approved by EPA Region VI.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are

awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

The MOGAS Spill (AOC A/SS-19) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Ninety percent of Cannon AFB is covered by surface soil of the Amarillo series. The soils were formed in the Blackwater Draw Formation of unconsolidated alluvium deposits of Pleistone age. Permeability of these loams is moderate and ranges from 1E-3 to 4E-4 cm/sec. The Amarillo soils overlie a 25-50 foot thick white chalky caliche zone that occurs at about 4 feet below the surface and is part of the Ogallala Formation. The caliche is underlain by sand, silts, and clay which may extend up to 400 feet below land surface. Where the sediments are saturated they form part of the High Plains Aquifer (Ogallala Aquifer). The base of the aquifer is predominantly sandstone beds of Triassic age Dockum Group.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985 (Hale 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

Soil borings for this site showed buff-brown silty sandy loam topsoil ranging from 4 to 5 feet thick. The caliche profile ranges from 42 to 45 feet in thickness. The caliche is composed of cemented caliche and silt, with occasional hard cemented sands. Poorly sorted sand deposits occur below the caliche at a depth of 47 feet. Soil Boring 19A, **Figure 1-3**, bottomed in a hard cemented sand and chert unit at 47.5 feet depth.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5,

dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Two boreholes (19A and 19B) were drilled at the site, during the IRP Phase 2 investigation, to a total depth of 59.5 and 47.5 feet, respectively. Boring 19A was drilled in the ditch where topsoil appeared to be discolored from organic contaminants. Boring 19B was located on a grassy area about two feet higher in elevation. The boring locations are shown in **Figure 1-3**. Soil samples were collected immediately above, 5 feet into, and just below the caliche layer. None of the samples contained oil or grease above the background levels; however, lead was detected in one surface sample at 35 mg/kg, and 1,2-dichloroethylene (DCE), a solvent, was detected at 237 μg/kg in duplicate sample 19A-1a, as shown in **Table 2-1**. The 1,2-DCE is not a component of MOGAS.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

The IRP Phase II Stage 1 study determined that the low level of contamination, limited areal occurrence, and intrinsically low permeability of the underlying sediments create a low potential for groundwater contamination. The depth to groundwater is approximately 270 feet BGL and there is a substantial caliche layer which inhibits vertical migration. Therefore, no hydrogeologic investigation was planned or conducted at this site.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually

high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

The general slope of the land at the SS-19 site is to the north. Runoff from Argentia Avenue and the MOGAS spill area is routed to the southeast in a small ditch.

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to the MOGAS Spill site (AOC A/SS-19). No surface water information was collected as part of the investigations at the MOGAS Spill site.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to be a risk to the environment or public health due to air emissions from the MOGAS Spill site (AOC A/SS-19). No air sampling was performed as part of the investigations.

2.6 POTENTIAL RECEPTORS/PATHWAYS

The MOGAS Spill site was incorrectly identified as an SWMU in the RFA report (A.T. Kearney 1987) since the definition of SWMU does not include accidental spills. Therefore, a discussion of potential receptors and pathways are not applicable to this site.

3.1 RISK ASSESSMENT APPROACH

Because no unacceptable health risk exists, no further evaluation of the SWMU is recommended. The isolated occurrence of 1,2-DCE in a single duplicate sample may merit further investigation, but since it is not associated with the MOGAS spill, further assessment under the IRP is inappropriate.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the investigation for the MOGAS Spill site (AOC A/SS-19) the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the investigation, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

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TABLES

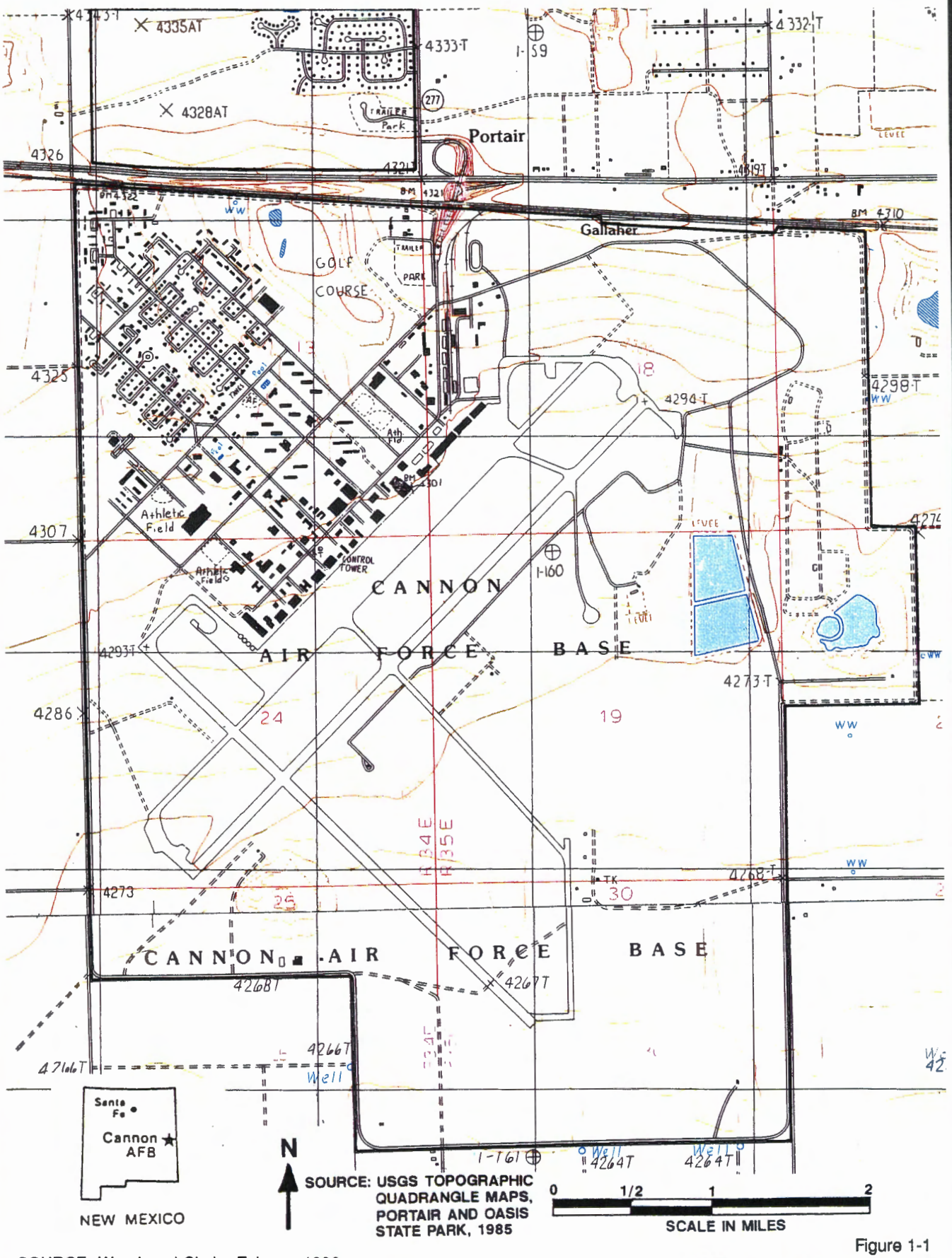
TABLE 2-1
OIL AND GREASE, LEAD, AND PURGEABLE ORGANIC COMPOUNDS IN SOIL SAMPLES
MOGAS SPILL
SWMU NO. AOC A/ IRP NO. SS-19
Cannon Air Force Base, New Mexico

Sample No.	Depth (ft)	O & G (mg/kg)	Pb (mg/kg)	Purgeable Organic Compounds (EPA 8010/8020) (μg/kg)
19A-1	3.0-4.0	ND	1.50	ND
19A-2	8.0-9.0	ND	2.30	ND
19A-3	45.0-47.0	ND	1.10	ND
19B-1	0.0-1.0	ND	35.00	ND
19B-2	9.0-10.0	ND	0.95	ND
19B-3	57.5-59.5	ND	0.99	ND
19A-1a*	3.0-4.0	ND	2.30	1,2 - DCE=237

*duplicate analysis of 19A-1
ND = not detected

Data from the IRP Phase II Stage 1 investigation by Radian, 1985.
Source: EA Engineering, Science, and Technology, Inc. 1990

FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

MOGAS SPILL
AOC A / IRP No. SS-19
Cannon Air Force Base, New Mexico

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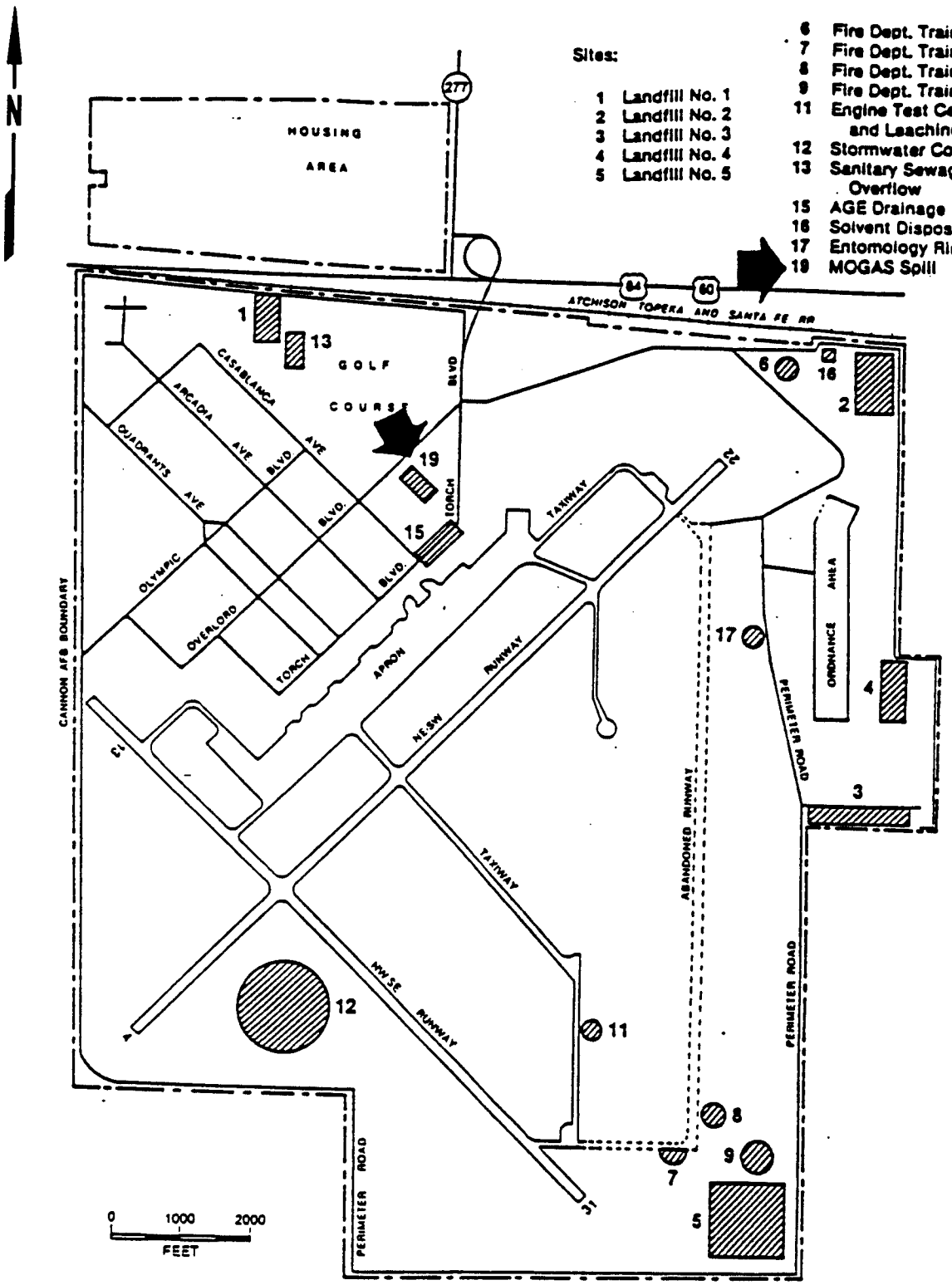

SOURCE: EA Engineering, Science and Technology, Inc., November 1990

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Figure 1-2

IRP/SWMU SITE LOCATION MAP

MOGAS SPILL
AOC A / IRP No. SS-19
Cannon Air Force Base, New Mexico

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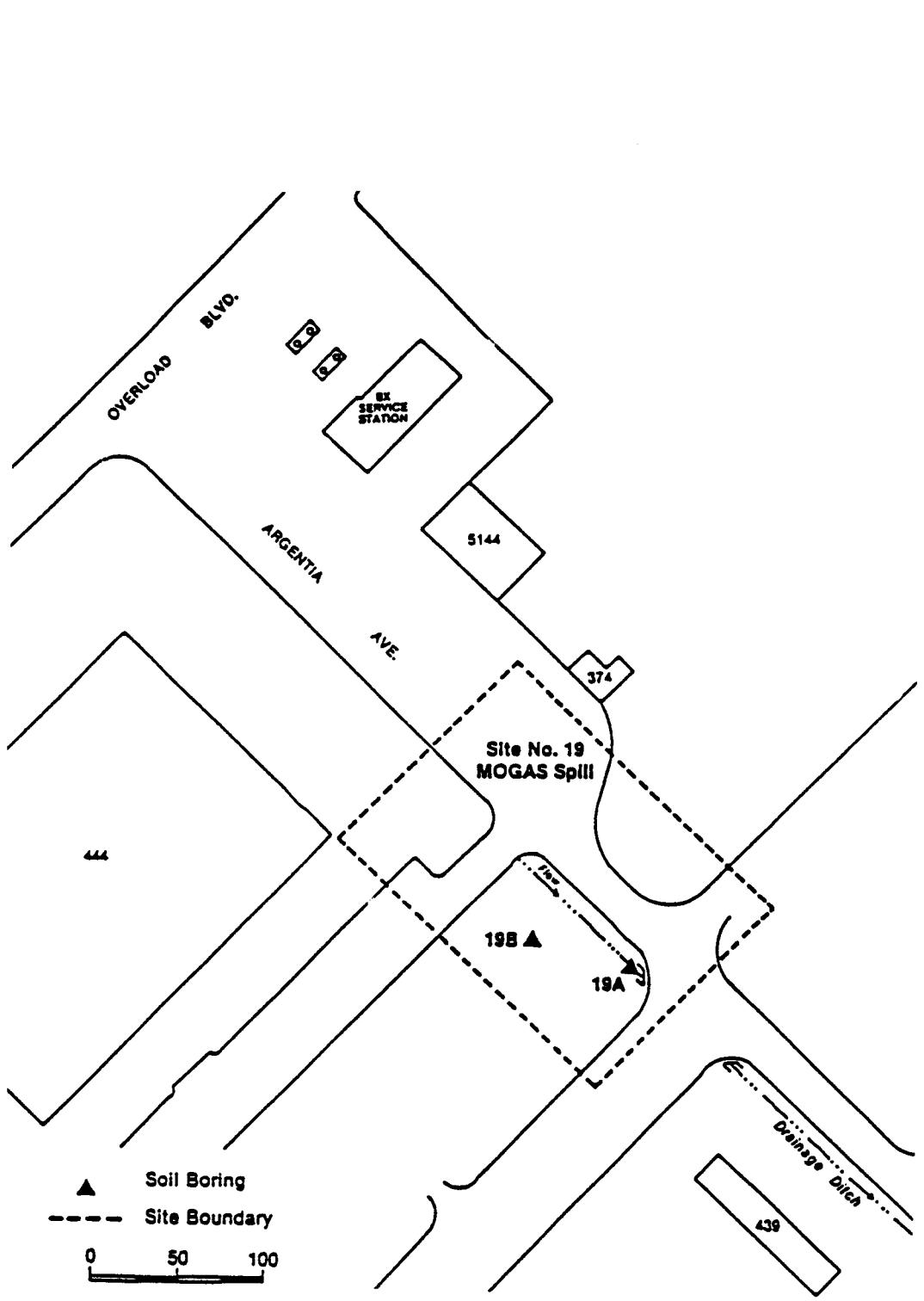

SOURCE: EA Engineering, Science and Technology, Inc., November 1990

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Figure 1-3
LOCATION OF SOIL BORINGS
MOGAS SPILL
AOC A / IRP No. SS-19
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico performed by CH_2M Hill under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for the MOGAS Spill site (AOC A/SS-19) in 1983 and a analysis of soil borings obtained during the IRP Phase II Stage I in June of 1985. The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Volume 1, Final Report for Cannon Air Force Base, New Mexico. Radian Corporation. September 1986. Volumes 2 and 3, Appendix A-M, Draft Report for Cannon AFB, New Mexico. Radian Corporation. June 1985.

  These reports are the second phase of a four part IRP and are designed to determine if environmental contamination has resulted from base activities.

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This report is the final phase of a four part IRP investigation of SD-17.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Sludge Weathering Pit
SWMU No. 76 / IRP No. WP-14

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Sludge Weathering Pit
SWMU No. 76/IRP No. WP-14
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Sludge Weathering Pit
SWMU No. 76/IRP No. WP-14

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Sludge Weathering Pit (SWMU No. 76/IRP No. WP-14) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the Sludge Weathering Pit (SWMU No. 76/IRP No. WP-14) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Sludge Weathering Pit (SWMU No. 76/IRP No. WP-14) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Chemicals of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
POL	Petroleum, Oil and Lubricants
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command

LIST OF ACRONYMS

TAL	Target Analytical List
TCL	Target Compound List
UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

Sludge Weathering Pit, designated as Solid Waste Management Unit (SWMU) No. 76 and Installation Restoration Program (IRP) No. WP-14, is the site where sludge from leaded gas tanks was weathered. The site is located near Building 396 on the northern boundary of the base. SWMU No. 76 covers approximately 200 square feet.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. Sludge Weathering Pit (SWMU No. 76) is located near the northern boundary of the base approximately 2,800 feet west of Fire Department Training Area No. 1 (SWMU No.78). The site is shown as Area 7 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Sludge Weathering Pit occupies an area of approximately 200 square feet and is essentially flat. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The Sludge Weathering Pit is within an area characterized in the Cannon AFB Base Comprehensive Plan as an Open Area. Open Areas are defined as conservation areas and required buffer space. The site is also characterized as Open

Space according to the U.S. Air Force's Rational National Standards Initiative. To the south of the pit is an Industrial Area, and to the east and west of the pit are Open Spaces. To the north of the pit is the base property boundary. The Sludge Weathering Pit was previously used for weathering sludge from leaded gas tanks. The site has been covered with fill material and is no longer active. Ground maintenance contractors mow the pit area once per month for approximately 5 to 10 minutes, for 6 months of the year.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Sludge Weathering Pit is located in an open field located adjacent to the petroleum, oil, and lubricant (POL) bulk storage area. The site is located approximately 2,000 feet from on-base housing, and 3,000 feet from the Chaves Manor Housing Area, which is across from U.S. Highway 60/84.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Sludge Weathering Pit occupies approximately 200 square feet. The area now appears as an open field covered with grass.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The Sludge Weathering Pit is a shallow depression near the POL Tank number 396 and adjacent to the north installation boundary fence. The pit, last used in 1980, was used to weather sludge from leaded gas storage tanks. The sludge was landfilled after it was judged to be sufficiently weathered.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- 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 Sludge Weathering Pit by reviewing the existing information and conducting an analysis of installation records. The Phase I IRP Records Search indicated that a soil sample was analyzed in 1981 for lead, and extractable oil and grease.

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the U.S. EPA at Cannon AFB by A.T. Kearney, Inc. (Kearney 1987). The purpose of this investigation was to identify and evaluate Solid Waste Management Units to assess the potential for hazardous waste or constituent releases to the environment.

- In September 1991, Woodward Clyde (W-C) investigated this site as part of the RI for 18 SWMUs at Cannon AFB as part of a Remedial Investigation (RI) conducted for 18 IRP/SWMU sites at Cannon AFB. Four soil borings (Borings 0760, 0761, 0762, and 0763) were drilled and samples collected for chemical and geotechnical analyses. Surface samples were collected at depths ranging from 4 to 31 feet BGL. Results of the W-C investigation are summarized in Section 2.2.

1.2.2 Period of Operation

Sludge Weathering Pit (SWMU No. 76) was used in the 1960s and 1970s for the weathering of fuel tank sludges. The quantities of sludges weathered at the site or how often it was used are not known. However, W-C estimated the quantities of sludge to be small based on conversations with base personnel. The pit was last used in 1980, at which time it was filled with soil and left to revegetate (USAF 1990).

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC)

and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that the Sludge Weathering Pit was used exclusively for the weathering of sludge throughout its period of operation (approximately 1960 to 1980).

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

During its period of operation (1960 to 1980), Sludge Weathering Pit was used to weather fuel tank sludges. After the sludge was judged to be weathered, it was removed to a landfill for final disposition (USAF 1990). The quantities of sludge weathered and the frequency of use are not known, but are estimated to be small based upon available information.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI at Sludge Weathering Pit was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of Sludge Weathering Pit site indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;

- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Sludge Weathering Pit (SWMU No. 76/IRP No. WP-14) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface (upper 33 feet) stratigraphy at the Sludge Weathering Pit consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation (W-C 1992). These consist predominantly of well sorted sand, with scattered thin (1 to 4 feet thick) layers of caliche. The total thickness of these Ogallala deposits beneath the SWMU is not presently known, but based on regional information, may be as thick as 390 feet.

It would appear from the lithologic descriptions that two fairly distinct sand, sand/caliche units are present beneath this IRP/SWMU site to a depth of 33 feet. The lower fluvial deposits consist of very fine- to medium-grained, moderately sorted, unconsolidated light red-brown sands. These sands are comprised predominantly of subangular to subrounded quartz grains and little or no silt/clay sized particles. This unit was only encountered in Boring 0762 (**Figure 1-3**) at approximately 31 feet BGL. The thickness of this unit cannot be determined at present due to the fact that the unit was not fully penetrated.

The upper fluvial deposits consist of very fine- to fine-grained, well sorted, silty, calcareous light to pale brown sands. These sands are comprised predominantly of subangular to subrounded quartz grains with varying amounts of silt. Occasionally, these sands are moderately to well cemented with calcium carbonate. Thin layers of light to medium brown, silty, sandy caliche are scattered throughout this unit. Grain-size analysis results indicate that this unit is comprised of approximately 45 percent calcium carbonate and/or clay-sized material, 32 percent sand, and 23 percent silt, while the sand sample was comprised of approximately 60 percent sand, 26 percent silt, and 14 percent calcium carbonate and/or clay-sized material. The thickness of this unit is approximately 25 feet at Boring 0762. Approximately 6 feet of backfill exists above this unit. No groundwater was encountered during the drilling of these borings.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum.

Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The soils underlying the Sludge Weathering Pit site consist of sandy loam and loamy sand of the Amarillo Soil Group. The Amarillo fine sandy loam, 0- to 2-percent slope phase is the most common soil type found on Cannon AFB. The USDA-SCS (USDA-SCS 1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry) and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeastern corner of the base. 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 C. Permeabilities in calcic B and C horizons are moderate (USDA-SCS 1958).

During the RI conducted by W-C the soils underlying the Sludge Weathering Pit were not characterized because the material encountered during the drilling of the four soil borings was determined to be backfill used to fill in the pit after it was closed in 1980.

2.2.2 Soil Contamination

Several investigations have been conducted at Cannon AFB including the Sludge Weathering Pit. The Phase I IRP Records Search indicated that a soil sample was analyzed in 1981 for lead and extractable oil and grease. Results for lead were negative and the analysis for oil and grease indicated 0.012 g/kg (CH_2M Hill 1983). Results of the Phase I IRP Records Search indicated that the Sludge Weathering Pit was not considered to present significant concern for adverse effects on health or the environment.

Results from the Preliminary Review/VSI, RFA performed in 1987 by A.T. Kearney, Inc. identified the Sludge Weathering Pit as a potential SWMU. The RCRA Facility Assessment also indicated that potential for releases to the soil is high due to the unlined nature of the IRP/SWMU site and results of soil sampling done to date. 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 additional soil sampling to determine if oil and grease levels have decreased.

W-C conducted further sampling at the Sludge Weathering Pit to evaluate the nature and extent of potential hazardous contaminants. Four soil borings (Borings 0760, 0761, 0762, and 0763) were drilled and samples collected for chemical and geotechnical analysis (**Figure 1-3**). Surface samples were collected from 0 to 0.5 feet BGL near Borings 0760, 0762, and 0763. Subsurface soil samples were collected at depths ranging from 4 to 31 feet BGL. All soil samples were analyzed for Target Compound List (TCL), Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (Semi-VOCs), and Target Analytical List (TAL) metals.

The results of the W-C field investigation, and sampling and analysis results at this SWMU shown in **Tables 2-1** and **2-2**, suggest the possible presence of residual petroleum tank bottom sludge in the pit from a depth of 4 to 6 feet BGL, and underlying native soils containing petroleum compounds from a depth of 6 to possibly 18 feet BGL, particularly in the vicinity of Borings 0762 and 0763. Ethylbenzene and xylenes were detected at estimated concentrations of 4,000 μg/kg and 7,900 μg/kg, respectively, in Boring 0763 at a depth of 8 to 10 feet. Ethylbenzene and xylenes may be present at a depth of 4 to 6 feet BGL in Boring 0761 and at 8 to 10 feet BGL in Boring 0762, but may be masked by high detection limits due to laboratory dilution of samples because of non-target compounds being present. Mercury was the only metal of concern detected at this site, at concentrations of 0.13 mg/kg and 0.85 mg/kg at depths of 4 and 25 feet BGL in soil Boring 0761.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is

evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during the W-C remedial investigation and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the storm water runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and

infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to Sludge Weathering Pit; therefore, no surface water information was collected as part of this RI.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to be a risk to the environment or public health due to air emissions from activities associated with the Sludge Weathering Pit. During soil sampling activities, a total of four air samples (one ambient air blank, three real-time samples) were collected using continuous flow pumps during the drilling of this boring and analyzed for tetraethyl lead. The results of the analyses were non-detect for tetraethyl lead.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. Sludge Weathering Pit is the only area within RAA5.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

<u>Current Exposure Scenario:</u>

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of RAA5 is less than ½ acre and, therefore, future construction or intrusive action was not assumed, nor were future residents. Therefore, Maintenance Workers are the only present and future potential human receptors

2.6.2 Pathways

The primary chemical sources in this RAA include VOCs, SVOCs, and metals. Potential sources of these contaminants are waste fuels, oils, and tetraethyl lead. Release mechanisms from soil include leaching of VOCs to groundwater, and direct contact with subsurface soils. Fugitive dust emissions of COCs in surface soil and transport of chemicals via storm water runoff are not expected because the pit was filled in 1980.

A significant exposure pathways could be the inhalation of fugitive VOCs emanating from subsurface soil. The rate of fugitive VOC emission was judged to be low unless intrusive activities are conducted at this location, which is unlikely because of its small size (less than ½ acre) and proximity to the railroad. VOCs were not detected in surficial soil and the level of metals was comparable to site and regional background levels.

Another potential pathway would involve the leaching of chemicals and subsequent ingestion of groundwater. A well is located approximately 1,200 feet south of this SWMU. Potential exposure to chemicals in groundwater is judged to be insignificant because of the relatively small volume of chemically-impacted soil contained within this RAA. The RI data indicated that VOCs were not detected beyond a depth of 10 feet BGL.

There is a low potential for human exposure to chemical constituents associated with this RAA. All exposure pathways were judged to be either incomplete, insignificant, or not applicable with the exception of the VOC inhalation pathway. Based on the above, current and future potential receptors for this site are Maintenance (general duty) Workers. Based on currently available information, the most important potential exposure pathway is inhalation of volatile organic compounds. A Conceptual Site Model for RAA5 is provided in **Figure 2-1**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI for Cannon AFB, performed by W-C in 1991 under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA5 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA5 were metals and volatile organic chemicals. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors (potential receptors are discussed in Section 2.6). Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA5. Future intrusive action or residential scenarios were not judged to be plausible for RAA5, because it is smaller than ½ acre in area. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, COCs identified at RAA5 were ethylbenzene, toluene, xylenes and lead. Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA5 were well below the current EPA interim guidance (EPA 1994) for residential soil lead cleanup levels (400 mg/kg).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure and potential risks and hazards associated with groundwater use were not evaluated in the BRA.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization part of the BRA (W-C 1992), the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are nonexistent for both current and future Maintenance Workers at this site.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA5 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for each receptor. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

The noncarcinogenic hazard among the COCs which contributed the most to the noncarcinogenic hazard for the inhalation pathway was xylene. However, xylene was detected out of the six soil samples tested at the Sludge Weathering Pit.

Carcinogenic Risks. Carcinogenic risks were calculated to be zero due to the absence of carcinogenic chemicals identified as COCs for RAA5.

Lead as a Potential Risk/Hazard. The maximum level of lead detected in soils at RAA5 was 12.6 mg/kg in surficial soil. The EPA Uptake Biokinetic (UBK) model is

not applicable to this RAA since residential exposure is not likely to occur. The 95% UCL concentration for lead in surficial soil at RAA5 was 12.6 mg/kg, well below the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994).

Air modeling was performed to determine the lead concentrations in ambient air. The estimated (RME) ambient air concentration for lead was 0.0012 $\mu g/m^3$, well below the EPA-estimated background concentration (0.20 $\mu g/m^3$) (EPA 1991b).

3.7 ECOLOGICAL RISK ASSESSMENT

Included in the BRA was the performance of an Ecological Risk Assessment (ERA); however, for the Sludge Weathering Pit, lead is the only COC to which the following ERA summary is applicable. Concentrations of chemicals in soils at Cannon were also evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are the kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) and one semi-volatile organic compound (benzo(a)pyrene) were detected in soils at levels which were considered to be above background. Benzo(a)pyrene, because of its relatively low concentration at near background levels, was not considered to be a chemical of concern. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals in soil to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA5, the Sludge Weathering Pit. The total noncarcinogenic HIs for all receptors were below the EPA's level of concern (1.0) at RAA5 for both the average exposure and RME scenarios. There was no detectible carcinogenic risk for the average and RME exposure for workers at this site.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA5.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for Sludge Weathering Pit, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for Sludge Weathering Pit, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
ETHYLBENZENE AND XYLENE CONCENTRATIONS IN SOIL SAMPLES
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

Boring	Depth (Ft-BGL)	Ethylbenzene (μg/kg)	Xylenes (μg/kg)
0761	4 - 6	29,000 U	29,000 U
	10 - 12	11 U	11 U
	25 - 27	12 U	12 U
0762	0 - 0.5	3 J	11 U
	8 - 10	7,300 U	7,300 U
	14 - 16	12 U	12 U
	31 - 33	11 U	11 U
0763	0 - 0.5	11 U	11 U
	8 - 10	4,000 J	7,900 J
	18 - 20	11 U	11 U
	22 - 24	12 UJ	12 UJ

Ft-BGL = Feet below ground level
μg/kg = Micrograms per kilogram
CRQL = Contract Required Quantitation Limit

J = Estimated concentration
U = Non-detect at the concentration given
UJ = Estimated as a non-detect at the CRQL

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 2-2 (continued)
METAL CONCENTRATIONS IN SOIL SAMPLES[1]
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

	Boring 0761 Sample Depth (Ft-BGL)			Boring 0762 Sample Depth (Ft-BGL)				Boring 0763 Sample Depth (Ft-BGL)				Background[2]
Element	4	10	25	0	8	14	31	0	8	18	22	($\bar{x}$ + 2 σ)
Mercury	0.13	0.11U	0.85	0.11U	0.12U	0.12U	0.11U	0.11U	0.12U	0.13U	0.11U	-- - --
Nickel	7.8J	6.2J	5.9J	8.4J	7J	5.4J	4.4J	8.4J	8.3J	5.6J	5.3J	3.57-8.49
Potassium	1,510J	1,570J	1,070J	1,810	951J	1,030J	1,240	1,830	1,470	5,92J	1,130J	632-2,613
Selenium	0.23UJ	0.23UJ	0.24UJ	0.21U	0.23UJ	0.23UJ	0.21UJ	0.22U	2.4UJ	0.25UJ	2.3UJ	0.00-1.35
Silver	1J	0.91U	1.2J	0.85U	1.1J	0.93U	0.86U	0.88U	0.96U	1U	0.91U	0.86-0.94
Sodium	309U	299U	312J	280U	307U	307U	304J	289U	315U	330U	361J	154-540
Thallium	0.23UJ	0.23UJ	0.24UJ	0.21UJ	0.23UJ	0.23UJ	0.21UJ	0.22UJ	0.24UJ	0.25UJ	0.23UJ	0.20-0.24
Vanadium	16.3	14.4	11.2J	20	10	11.8	13.3	19.8	15.5	16.9	16.4	9.26-26.74
Zinc	15	12.6	7.7	22.2J	7.9	9.2	10.9	24.9	15	9.3	10.2	4.58-21.82

UJ = Estimated as non-detect at the instrument detection limit
J = Estimated concentration
U = Not detected at concentration given
NA = Not analyzed in background samples

-R = Rejected
-- - -- = No range could be calculated
Ft-BGL = Feet below ground level

[1] All concentrations are in milligrams per kilogram (mg/kg).
[2] Background range calculated from values in Table 2-7 of W-C 1992.

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1(continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level

(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI
CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI
CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL

(1) = MCL for total trihalomethanes (2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

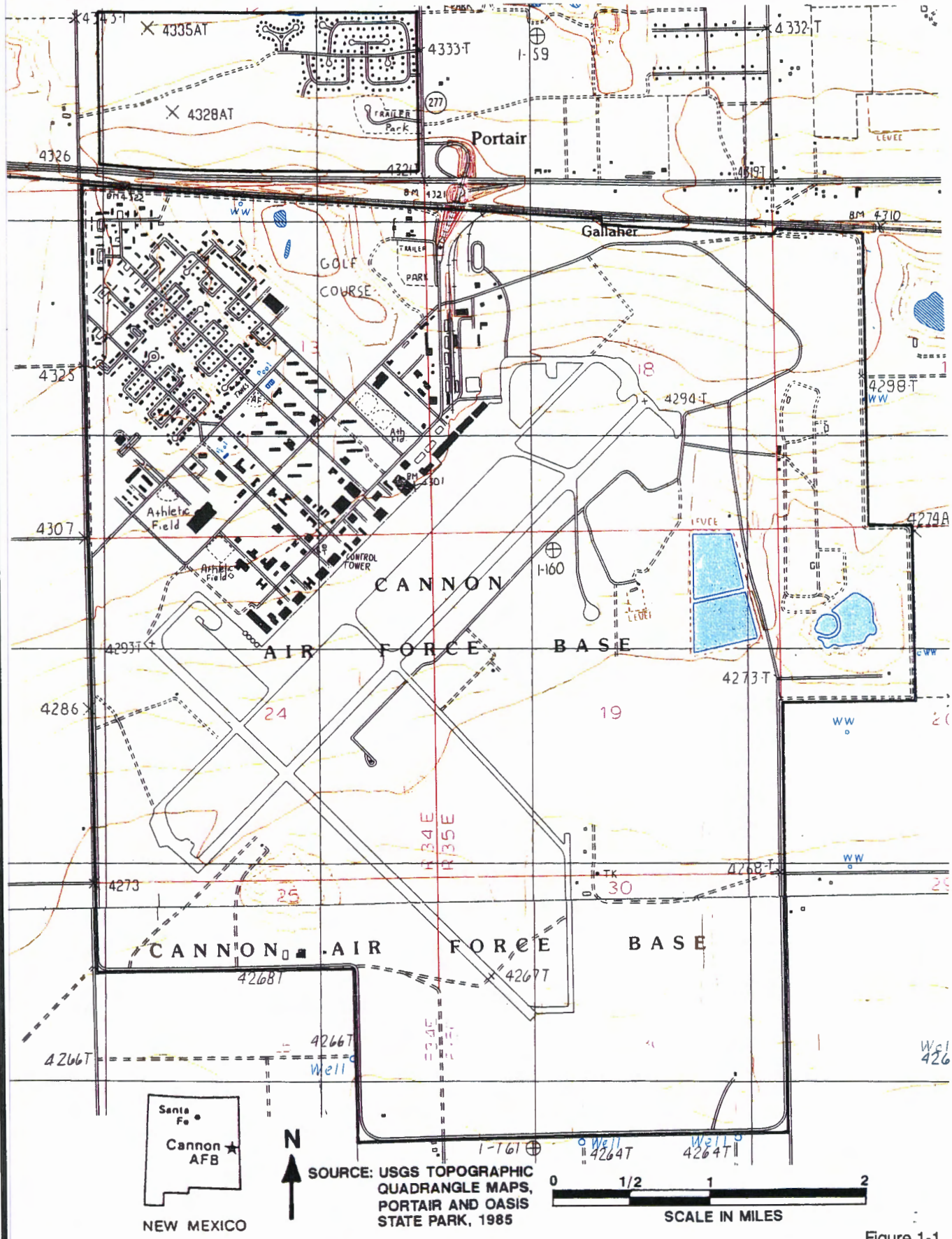
TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA5
SLUDGE WEATHERING PIT
SWMU NO. 76/IRP NO. WP-14
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk[1]**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Current Worker - Maintenance						
-- Inhalation - VOCs	0.00E+00	3.96E-02	3.96E+02	0.00E+00	3.36E-01	3.36E+01
Total	0.00E+00	3.96E-02	3.96E-02	0.00E+00	3.36E-01	3.36E-01
Future Worker - Maintenance						
-- Inhalation - VOCs	0.00E+00	3.96E-02	3.96E-02	0.00E+00	3.36E-01	3.36E-01
Total	0.00E+00	3.96E-02	3.96E-02	0.00E+00	3.36E-01	3.36E-01

[1]No carcinogenic chemicals of concern were identified.

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

SLUDGE WEATHERING PIT
SWMU No. 76 / IRP No. WP-14
Cannon Air Force Base, New Mexico

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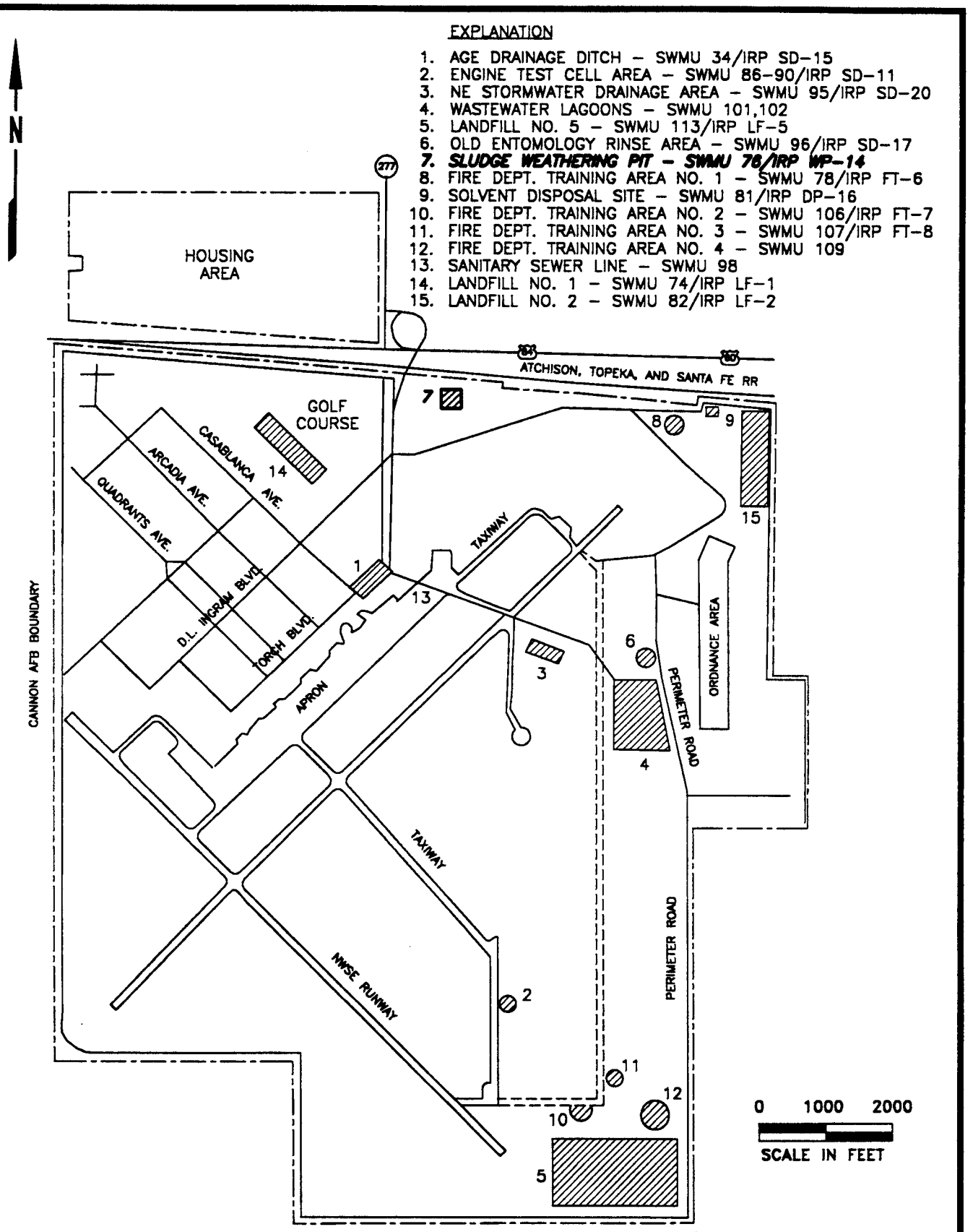

SOURCE: Woodward-Clyde, February1996

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Figure 1-2

IRP/SWMU SITE LOCATION MAP

SLUDGE WEATHERING PIT
SWMU No. 76 / IRP No. WP-14
Cannon Air Force Base, New Mexico

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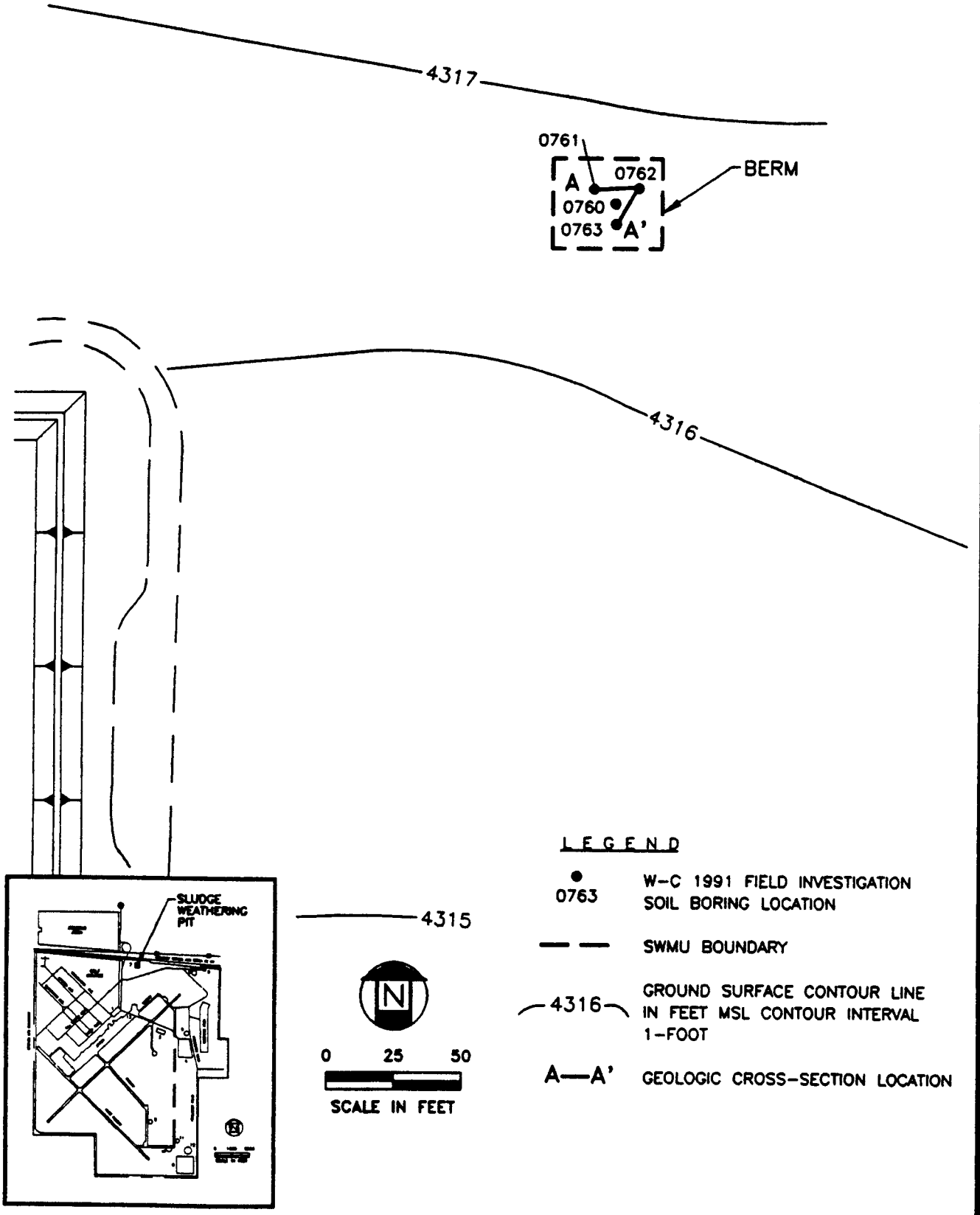

SOURCE: Woodward-Clyde, February1996

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Figure 1-3

LOCATION OF SOIL BORINGS

SLUDGE WEATHERING PIT
SWMU No. 76 / IRP No. WP-14
Cannon Air Force Base, New Mexico

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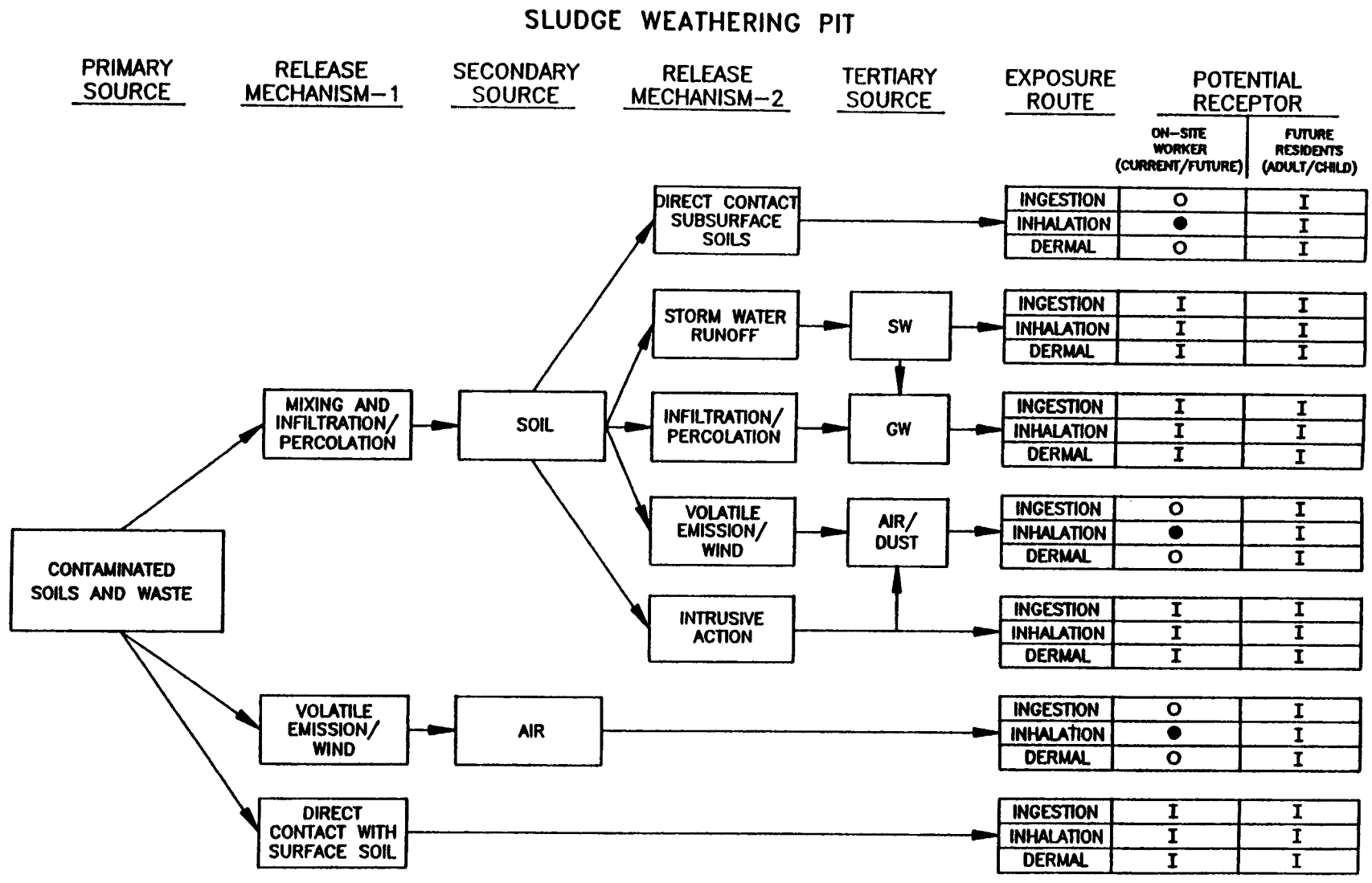

LEGEND

- I INCOMPLETE EXPOSURE PATHWAYS
- ● SIGNIFICANT EXPOSURE PATHWAY
- O RELATIVELY INSIGNIFICANT EXPOSURE PATHWAY

SOURCE: Woodward-Clyde, October 1992

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Figure 2-1

CONCEPTUAL SITE MODEL

SLUDGE WEATHERING PIT
SWMU No. 76 / IRP No. WP-14
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Sludge Weathering Pit (SWMU No. 76) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

  This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Old Entomology Rinse Area
SWMU No. 96 / IRP No. SD-17

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Old Entomology Rinse Area
SWMU No. 96/IRP No. SD-17
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Old Entomology Rinse Area
SWMU No. 96/IRP No. SD-17

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Old Entomology Rinse Area (SWMU No. 96/IRP No. SD-17) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the Old Entomology Rinse Area (SWMU No. 96/IRP No. SD-17) performed by Woodward-Clyde (W-C) in 1991 (W-C 1992), including the baseline risk assessment and results of past investigations, and the Phase II RCRA Facility Investigation (RFI) conducted by W-C in 1993 (W-C 1995a) indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Old Entomology Rinse Area (SWMU No. 96/IRP No. SD-17) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

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Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Chemicals of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
GRO	Gasoline Range Organics
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
POL	Petroleum, Oil and Lubricants
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment

LIST OF ACRONYMS

RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
TAL	Target Analytical List
TCL	Target Compound List
TCO	Total Chromatograph Organics
TRPH	Total Recoverable Petroleum Hydrocarbons
UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USCS	Unified Soil Classification System
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.1 SITE LOCATION AND DESCRIPTION

Old Entomology Rinse Area, designated as Solid Waste Management Unit (SWMU) No. 96 and Installation Restoration Program (IRP) No. SD-17, is the site of a former pesticide storage building where pesticide and herbicide application equipment and containers were rinsed in the sink. The sink drained to a 3-foot-square and 2-foot-deep open pit in the rear of the building. The bottom pit was open to the soil (USAF 1990).

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. Old Entomology Rinse Area (SWMU No. 96) is in the east central part of the base, approximately 200 feet north of the wastewater lagoons and west of the perimeter road. The site is shown as Area 6 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Old Entomology Rinse Area occupies a small, essentially flat area. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. Old Entomology Rinse Area is located within an area characterized by the Cannon AFB Base Comprehensive Plan as an Open Area. Open Areas are defined as conservation areas and required buffer space. To the south and east of the Old Entomology Rinse Area is an Industrial Area (the wastewater treatment system

lagoons to the south and Landfill No. 25 to the east). The site is characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Maintenance workers pass near the site in order to service the wastewater treatment lagoons. The closest base housing is approximately 1 1/4 miles away.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Old Entomology Rinse Area was formerly a small building where pesticide and herbicide application equipment was washed. The sink in the building drained to a 3-foot-square and 2-foot-deep open pit in the rear of the building. The bottom of the pit was open to the soil (USAF 1990). The area is enclosed by a fence.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The Old Entomology Rinse Area was the site of the former pesticide storage Bldg. 2160. Pesticide and herbicide application equipment was rinsed in a sink behind Bldg. 2160. The sink drained to a shallow depression on the ground surface. Potential contaminants include dieldrin, toxaphene, 2,4-D, and DDT.

The following is the investigative history of the site. Further discussion of the investigation is provided in Section 2.2.

- 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 on 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 Old Entomology Rinse Area by reviewing the existing information and conducting an analysis of installation records.

- During 1984 and 1985, a Phase II (Stage 1) investigation was conducted by Radian Corporation (Radian) to determine if environmental contamination had resulted from pesticide laden rinse water at the Old Entomology Rinse Area (Radian 1986). During the Radian investigation three deep soil borings (Borings 17A, 17B, and 17C) were drilled and samples collected for chemical analyses at this SWMU to evaluate the impact of past activities. Boring locations are shown on **Figure 1-3**. Soil samples collected during this investigation were analyzed for arsenic, mercury, herbicides, pesticides, purgeable halogenated organics, and aromatic organics.

- In 1987, a Preliminary Review/ Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) 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 SWMUs to assess the potential for releases to the environment of hazardous waste or constituents. Results of this investigation identified the Old Entomology Rinse Area as a potential SWMU.

- In November and December 1986, Walk, Haydel & Associates (WH&A 1988), conducted a Phase IV-A investigation involving soil borings, surface sediments, sewage lagoon sediment and water, and groundwater sampling and analyses. During the Phase IV-A investigation, eight soil borings (Borings B1-B8) were drilled at the Old Entomology Rinse Area. In addition, one 356-foot-deep monitoring well was installed downgradient of the Old Entomology Rinse Area (**Figure 1-3**).

- In September 1991, W-C investigated this site as part of the RI for 18 IRP/SWMU sites at Cannon AFB. In a meeting with Cannon AFB, USACE, New Mexico Environment Department (NMED), and the EPA held on 17 September 1992 in Dallas, Texas to discuss results of the 18 SWMU RI, EPA Region VI requested additional investigation prior to completion of the RI for Appendix I SWMUs. The requested supplemental work was described in a letter dated 29 November 1992 from EPA Region VI to Cannon AFB. In November 1993 W-C performed a supplemental investigation (Phase II RFI) at the location of the sink rinse pit within the Old Entomology Rinse Area to further characterize the nature and extent of contamination

(if any) at this SWMU. Summary results of both investigations are contained in Section 2.2 of this document.

1.2.2 Period of Operation

The Old Entomology Rinse Area (SWMU No. 96) resulted from operations at the former Pesticide Storage Building 2160. Start-up on this unit is suspected to have been in 1968, although it could have been earlier. The building was abandoned in October 1983 and demolished in September 1984.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U.S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

The Old Entomology Rinse Area is the site of former small Bldg. 2160 which was used to store pesticides. Pesticide and herbicide application equipment was rinsed in a sink in the building from 1968 to 1983, according to available information. The rinse water drained directly to an unlined pit located in the rear of the building.

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;

- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

Pesticide and herbicide application equipment was routinely rinsed at the site of the Old Entomology Rinse Area throughout its period of operation, approximately 1968 to 1983. The liquid waste products drained to an unlined, open pit in the back of the building.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995b):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI of this SWMU at Cannon AFB was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the

1991 RI and the 1993 supplemental investigation (Phase II RFI) of the Old Entomology Rinse Area indicate that no additional characterization is required. Work Plans and RI and RFI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Old Entomology Rinse Area (SWMU No. 96/IRP No. SD-17) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface (upper 102 feet) stratigraphy at the Old Entomology Rinse Area consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation. Based on information contained in the field log for Boring 0962, the SWMU is underlain by Ogallala fluvial deposits consisting primarily of well sorted sand, with scattered (1 to 11 feet thick) layers of caliche or clay lenses. The total thickness of these Ogallala deposits beneath the SWMU is not presently known, but based on regional information, may be as thick as 390 feet.

It would appear from the lithologic descriptions from Boring 0962 that three fairly distinct sand, sand/caliche units (i.e., lower, middle, and upper fluvial deposits) are present beneath the SWMU to a depth of approximately 102 feet. The lowermost fluvial deposits from 70 to 102 feet BGL consist of medium-grained, well sorted, unconsolidated light to medium orange sand deposits. These sand deposits are comprised predominantly of subrounded to subangular quartz grains. This unit is classified under the Unified Soil Classification System (USCS) as poorly graded clean sands (SP). Overall, these sands are non-calcareous; however, there are occasional thin layers and pockets of calcareous sands. The gradation was determined for one sample collected within this unit at 85 feet BGL. The results indicate that this sample was comprised of approximately 80 percent sand, 12 percent silt, and 8 percent clay. This unit was encountered in Boring 0962 between approximately 70 and 102 feet BGL. The thickness of this unit is unknown at present since the unit was not fully penetrated, but is at least 32 feet thick at this SWMU.

The middle fluvial deposits from 52 to 70 feet BGL consist of fine- to medium-grained, well sorted, silty to slightly silty, pale orange to orange sands. These sands are comprised predominantly of subangular to subrounded quartz grains, and are classified under the USCS as silty sand (SM). These sands are generally non-calcareous and become siltier toward the top of the unit. The gradation was determined for one sample collected within this unit at 55 feet BGL. The results indicate that this sample was comprised of approximately 88 percent

sand, 8 percent silt, and 4 percent clay. This unit was encountered between approximately 52 and 70 feet BGL in Boring 0962. Based on the log for Boring 0962, the thickness of this unit is approximately 18 feet.

The upper fluvial deposits from 5 to 52 feet BGL consist of fine-grained, well sorted, silty, calcareous, medium to pale orange to tan-orange sands, and orange to red-orange, silty clays. The sands are comprised predominantly of subangular to subrounded quartz grains with varying amounts of silt and calcium carbonate. This unit is classified under the USCS as silty sand (SM). Occasionally, these sands are moderately to well cemented with calcium carbonate. Thin layers (ranging from a few inches to several feet in thickness) and small pockets or nodules of tan-orange, silty, sandy, clayey caliche are scattered throughout this unit. The gradation was determined for one sample collected within this unit at 25 feet BGL. The results indicate that this sample was comprised of approximately 63 percent sand, 26 percent silt, and 11 percent clay-sized material. Based on the log for Boring 0962, the thickness of this unit is approximately 47 feet. Approximately 4 to 5 feet of native material exists above this unit. No groundwater was encountered during the drilling of Boring 0962.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inches in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The shallow soils underlying the Old Entomology Rinse Area consist of sandy loam and loamy sand of the Amarillo Soil Group (U.S. Department of Agriculture - Soil Conservation Service [USDA-SCS] 1958) with a total thickness of approximately 4 to 5 feet. The soils consist primarily of fine-grained, well sorted, silty, clayey, brown sands. The sands are dry to slightly moist at depth. One gradation was determined for a sample collected from this soil unit at 0.5 feet BGL in Boring 0961. The results indicate that this soil sample was comprised of approximately 53 percent sand, 23 percent silt, and 34 percent clay.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The USDA-SCS describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil

is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base, but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeastern corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations have been conducted at Cannon AFB covering the Old Entomology Rinse Area. Results of the Phase I IRP Records Search indicate this site was not recommended for a Limited Phase II Monitoring Program. A Phase II (Stage 1) investigation was conducted by Radian Corporation in 1984 and 1985 during which three deep soil borings (Boring Nos. 17A, 17B, and 17C), shown in **Figure 1-3**, were drilled and samples for chemical analyses collected. Results of samples collected during the Radian investigation indicated the presence of the herbicide compound 2,4-D (Radian 1986). A summary of the sample results is contained in **Table 2-1**. Based on the results of the Phase II (Stage 1) investigation, Radian recommended that further soil sampling and analysis be conducted at the Old Entomology Rinse Area.

The Preliminary Review/Visual Site Inspection, RCRA Facility Assessment performed in 1987 by A.T. Kearney, Inc. identified the Old Entomology Rinse Area as a potential SWMU. The RCRA Facility Assessment also indicated that the potential for releases to the soil is high due to the past disposal of hazardous wastes and the unlined nature of the SWMU. 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 continue monitoring under the Air Force IRP Program.

Results of the Phase IV-A investigation by WH&A indicated the presence of the pesticides 4,4-DDE, 4,4-DDD, 4,4-DDT, and chlordane at almost all of the soil boring locations at the 0.5-foot sample depth, with concentrations decreasing with depth (Borings B1-B8, **Table 2-1**). The highest concentration detected was 2600 μg/kg in Boring B1 at a depth of 0.5 feet BGL. Most borings only showed contamination to a depth of 1.0 foot, except for Boring B8, located near the open pit adjacent to Building 2160. This boring showed pesticide detections to a

depth of 6.0 feet. No herbicides were detected in any of the samples collected during this investigation. Based on this data, WH&A concluded that the conditions at this site were not conducive to downward contaminant migration.

Surface Soil. W-C conducted further sampling (W-C 1992, W-C 1995a) to evaluate the nature and extent of potential hazardous contaminants that may be present. One surface soil sample, 0961, was collected from 0 to 0.5 feet BGL by W-C during the 1991 RI for risk assessment purposes at the approximate location of the sink rinse pit behind Building 2160. The sample was analyzed for pesticides and polychlorinated biphenyls (PCBs).

Results of the surface soil sample indicated that the pesticides 4,4-DDE and 4,4-DDT were present at estimated concentrations of 66 μg/kg and 110 μg/kg, respectively (**Table 2-2**). The α- and γ-chlordane compounds were also detected and reported at estimated concentrations of 16 μg/kg and 47 μg/kg, respectively. Also, the pesticide heptachlor epoxide was detected at an estimated concentration of 19 μg/kg. No PCBs were detected.

Because pesticides were detected in this surface soil sample, the EPA requested that a deeper boring be drilled and sampled to evaluate potential downward migration of pesticides at the former rinse sink pit location.

Subsurface Soil. During the 1993 supplemental investigation, Phase II RFI (W-C 1995a), W-C drilled one soil boring (Boring 0962) to a depth of 102 feet BGL at the approximate location of the sink rinse pit behind building 2160 (i.e., at the same location where the surface soil sample, 0961, was collected during the 1991 W-C investigation). The soil boring was sampled at 5-foot intervals from the ground surface to the total depth and was described lithologically from the split spoon samples obtained during drilling. Subsurface samples for chemical analysis were collected at 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 feet BGL for a total of 10 subsurface soil samples. The subsurface soil samples were analyzed for the following parameters using SW-846 methods:

- Target Compound List (TCL) volatile organic compounds (VOCs) Method 8240;
- TCL semivolatile organic compounds (semi-VOCs) Method 8270;

- Target Analytical List (TAL) metals Methods 6010, 7060, 7471, 7740;
- TCL pesticides and polychlorinated biphenyls (pesticide/PCBs) Method 8080;
- TCL chlorinated herbicides Method 8150;
- Total recoverable petroleum hydrocarbons (TRPH) Method 418.1.
- Gasoline range organics (GRO) Modified Method 8015; and
- Total chromatographable organics (TCO) Modified Method 8015.

In addition to these analyses, three samples representative of different soil horizons encountered during drilling were collected at 25, 55, and 85 feet BGL for geotechnical gradation analysis. Gradation (ASTM D-421) and hydrometer (ASTM D-422) analyses were performed on the subsurface soil samples.

The following summarizes the nature and extent of contamination found at the Old Entomology Rinse Area based on the data collected during the 1993 RFI.

Volatile Organic Compounds. Analytical results from Boring 0962 soil samples indicate that three of the TCL VOCs, acetone, methylene chloride, and toluene, were reported as detected in subsurface soil samples from SWMU No. 96 (**Table 2-3**). Two of these compounds, acetone and methylene chloride, are known laboratory contaminants. The concentrations of acetone (ranging from 26 to 240 μg/kg) and methylene chloride (4.5 and 3.1 μg/kg) are extremely low and are probably due to laboratory contamination, not actual soil contamination. Additionally, the concentrations of these organic compounds, as well as toluene (ranging from 1.9 to 10 μg/kg), are several orders of magnitude lower than both the RCRA Subpart S Corrective Action Levels for soils (i.e., 6,000,000 μg/kg for acetone; 90,000 μg/kg for methylene chloride; and 20,000,000 μg/kg for toluene) and the draft CERCLA Soil Screening Levels (i.e., 44,000 μg/kg for methylene chloride; and 150,000 μg/kg for toluene), and, therefore, are not a concern at the Old Entomology Rinse Area.

Pesticides. None of the TCL semi-VOCs, TCL pesticides/PCBs, or chlorinated herbicides were detected in the ten subsurface soil samples. However, two pesticides, 4,4-DDE and 4,4-DDT, were detected at estimated concentrations of 2.6 and 17 μg/kg, respectively, in the field duplicate sample (CAN096-0962-0661) collected at 10 feet BGL (**Table 2-3**). The 4,4-DDE field duplicate result (2.6 μg/kg) and 4,4-DDT result (17 μg/kg) are lower than the concentrations reported for 4,4-DDE and 4,4-DDT (66 and 110 μg/kg, respectively) in the surface soil sample, 0961, collected at the

former rinse sink pit location during the investigation (W-C 1992) at the Old Entomology Rinse Area.

The source of contamination at the rinse sink pit could be related to general pesticide application at the base. Although the presence of pesticides found in soil at the rinse sink pit could be related to past pesticide container rinsing, the pesticide concentrations are similar to or lower than those found at two other SWMUs, for which no further action was required for certification of closure under Cannon AFB's RCRA Part B Permit (i.e., at Fire Department Training Area No. 1 and at Landfill No. 2). Additionally, the concentrations of these pesticide compounds are several orders of magnitude lower than both the RCRA Subpart S Corrective Action Levels for soils (i.e., 2,000 μg/kg for DDE and 2,000 μg/kg for DDT) and the draft CERCLA Soil Screening Levels (i.e., 1,900 μg/kg for DDT), and, therefore, are not a concern at the Old Entomology Rinse Area.

Petroleum Hydrocarbons. TRPH were detected in one sample at a depth of 40 feet BGL at a concentration of 64.9 mg/kg (**Table 2-3**). However, since no gasoline range organics or total chromatographable organics were detected in this sample, and no petroleum hydrocarbons were detected either above or below this sample interval, the presence of petroleum hydrocarbons at this sample interval is suspect. Additionally, the concentration of TRPH in this one sample is below the New Mexico Environmental Department regulatory limit for total petroleum hydrocarbons (i.e., an underground storage tank [UST] cleanup level of 100 mg/kg for soil).

GRO were present in three of the ten samples at depths of 10, 90, and 100 feet, and in the field duplicate sample at 10 feet at concentrations below the reporting limit or at estimated concentrations (i.e., 0.54, 0.52, 0.53, and 0.53 mg/kg, respectively, **Table 2-3**). TCO were present at 4.0 mg/kg in three samples at depths of 20, 70, and 100 feet BGL at estimated concentrations and was reported as PRESENT in a duplicate sample at 10 ft BGL, as shown in **Table 2-3**. Since the analytical methods for GRO and TCO are considered to be qualitative, and the concentrations detected for GROs and TCOs (i.e., 0.5 and 4.0 mg/kg, respectively) are significantly lower than any NMED regulatory limits for petroleum hydrocarbon constituents (i.e., a UST cleanup level of 10 mg/kg for benzene and 50 mg/kg for aromatics for soil), the presence of these petroleum range organics is not a concern at the Old Entomology Rinse Area.

Metals. Analytical results from Boring 0962 soil samples indicate that seventeen metals (i.e., aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, silver, sodium, and vanadium) were detected at varying concentrations in the ten subsurface soil samples collected at Boring 0962 (**Table 2-4**). All of these metals concentrations are within the range of naturally occurring metals at Cannon AFB as determined by background studies (W-C 1994).

Additionally, the concentrations of those metals, for which action levels exist (i.e., metals with high toxicity), are significantly lower than both the RCRA proposed Subpart S Corrective Action Levels, 40 CFR part 264 as specified in Appendix A, "Examples of Concentrations Meeting Criteria for Action Levels", FR, V.55, July 27, 1990, pp. 30865-30869) for soils (i.e., 80 mg/kg for arsenic, 4,000 mg/kg for barium, 20 mg/kg for beryllium, 400 mg/kg for chromium [as CrVI], and 2,000 mg/kg for nickel) and the draft CERCLA Soil Screening Levels (i.e., 390 mg/kg for chromium and 1,600 mg/kg for nickel), and, therefore, are not a concern at the Old Entomology Rinse Area.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1,600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

One groundwater sample was collected from monitoring well 096K (**Figure 1-3**) during the 1991 RI and analyzed for TAL metals and pesticides/PCBs. Analytical results indicated the presence of seven metals above the detection limits for TAL metals (**Table 2-5**). The metals detected were arsenic, barium, copper, lead, nickel, vanadium, and zinc. The concentrations at which these metals were detected were below established maximum contaminant levels (MCLs) for groundwater quality. No pesticides or PCBs were detected in the groundwater sample collected at this monitoring well location.

In addition, one groundwater sample was collected from monitoring well 096K (**Figure 1-3**) during the 1995 RFI Appendix III SWMUs (Phase II) investigation at Landfill No. 25 and analyzed for the following parameters using SW-846 methods:

- VOCs Method 8240;
- Semi-VOCs Method 8270;
- Total TAL Metals Methods 6010, 7060, 7471, 7740, and 7471;
- Pesticides and PCBs (pesticide/PCB) Method 8080;
- Chlorinated herbicides Method 8150 (Appendix IX); and
- GRO/TCO Modified Method 8015.

Analytical results from the groundwater sample indicate that two of the VOCs, carbon disulfide and toluene, were reported as detected at very low concentrations (i.e., carbon disulfide at 36 μg/L and toluene at 12 μg/L). Carbon disulfide was reported as not detected in the field duplicate of this sample. Both of these compounds are known laboratory contaminants. Although neither of these compounds was detected in associated laboratory method blanks, historical data from the contracted laboratory indicate that carbon disulfide had been detected in previous method blanks. Based on this information, the presence of these organics, particularly carbon disulfide, is probably due to laboratory contamination, not actual groundwater contamination.

Analytical results also indicated the presence of eight TAL metals (**Table 2-5**) and only one semi-VOC (2-methylphenol at and estimated concentration of 1.2 μg/L). The metals detected were arsenic, barium, copper, lead, nickel, selenium, vanadium, and zinc. The concentrations at which these metals were detected were below established maximum contaminant levels (MCLs) for groundwater quality. No pesticides, PCBs, or GROs/TCOs were detected in the groundwater sample collected at this monitoring well location.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be an impact to surface water from activities related to the Old Entomology Rinse Area due to low annual rainfall, minimal relief, and absence of any drainages at this SWMU. The nearest surface water bodies are the wastewater lagoons, which have 3-foot high berms surrounding them, and the playa lake southeast of the lagoons, which serves as a low-point collection area for the lagoons and surface runoff. The water collected in the playa lake (i.e., which does not have any surface outlet) is lost to evapotranspiration and infiltration. Therefore, no surface water information was collected as part of the RI conducted by W-C (1992).

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to be a risk to the environment or public health due to air emissions from activities associated with the Old Entomology Rinse Area since no intrusive construction work at this site is planned, and since access to the site and adjacent wastewater lagoons is restricted by a locked gate. No air sampling was performed as part of this RI, with the exception of OVA screening of the soil samples for potential contamination. However,

air modeling was performed in support of the baseline risk assessment (W-C 1992, Section 18.0) and supported the conclusion that there does not appear to be a risk to the environment or public health.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. Old Entomology Rinse Area is within RAA3, which also includes the NE Stormwater Drainage Area and the Wastewater Lagoons.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

Current Exposure Scenario:

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower

than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of RAA3 is greater than ½ acre and, therefore, future construction or intrusive action were considered plausible. Future construction workers and residents were assumed in these areas.

2.6.2 Pathways

The primary chemical sources in RAA3 include oily waste, alkaline aircraft cleaning compounds, pesticides and herbicides. Release of chemicals from soil include leaching of chemicals into groundwater, strom water runoff to surface water, and direct contact with soils, fugitive VOC and dusts emissions.

Secondary release mechanisms from soil include leaching of chemicals to groundwater, storm water runoff to surface water, direct contact with subsurface soils, fugitive VOC and dust emissions, and intrusive actions such as site excavation and construction. As a result of intrusive actions, ingestion or dermal absorption via direct contact with chemicals in surface and subsurface soils may occur. Disturbance of soil may result in the generation of fugitive dust, and release of VOC emissions into the air, providing a complete pathway by inhalation. Potential pathways are discussed below.

Soils. Direct contact with soils containing chemicals may result in potentially significant exposure via ingestion or dermal absorption. Such pathways may be particularly important in children. A high frequency of contact with soils by children is not expected under current conditions due to the location of these SWMUs and access limitations. Workers in the vicinity of these SWMUs are the most likely to come into contact with soils from these areas.

Air. Chemicals can be released into the air via volatilization or via fugitive dust emissions, resulting in potential exposures via inhalation.

Stormwater runoff. Storm water runoff may result in migration of chemicals from soil to surface water and from surface water to groundwater. Potential exposure routes for surface water include ingestion, direct contact (dermal contact), and ingestion of fugitive VOC emissions from surface water. These pathways are not expected to be complete due to the intermittent nature of on-site surface water runoff.

Groundwater. Potential exposure to groundwater may occur via ingestion, inhalation, or dermal absorption from showering, bathing, o other domestic uses of groundwater. The groundwater gradient in this area is to the southeast. The groundwater pathway is expected to be incomplete due to the great depth to the groundwater (over 270feet) and the site geology (presence of clay and caliche).

Crop Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils.

Atmospheric Deposition of Airborne Particulates on Edible Crops. Atmospheric deposition of airborne particulates on edible crops located off-site (or within the RAA under the future exposure scenario) is possible due to land use in the area. This exposure pathway is not expected to be significant based on the concentrations of chemicals detected in soils from this RAA. Fugitive dust inhalation

by workers is expected to result in greater levels of chemical intake. If the results of risk characterization from the inhalation routes for workers and future residents in this RAA are acceptable, it is likely that indirect exposure via ingestion of edible crops is also insignificant.

Based on the above, potential receptors for this site are current and future Maintenance Workers, future Construction Workers, and future Adult and Child Residents. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in potential ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA3 is provided in **Figure 2-1**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed in 1991 by W-C under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989a), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA3 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA3 were metals, volatile organic chemicals, and pesticides. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors (potential receptors are discussed in Section 2.6). Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA3. Future intrusive action or residential scenarios were judged to be plausible for RAA3 because it is larger than ½ acre in area. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA3: toluene, heptachlor epoxide, chlordane, DDD, DDE, DDT, PCBs, BEHP, cadmium, cobalt, mercury, barium, chromium, lead, selenium, silver, nickel and zinc. RAA3 includes the Old Entomology Rinse Area (SWMU No. 96), the NE Stormwater Drainage Ditch (SWMU No. 95), and the Wastewater Lagoons (SWMU No. 101 and 102). Of the COCs listed above, only toluene, heptachlor epoxide, chlordane, DDE, DDT, cadmium, cobalt, mercury, barium, chromium, lead, nickel and zinc were found to be present at Old Entomology Rinse Area (SWMU No. 96).

Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA3 were well below the current EPA interim guidance (EPA 1994) for residential soil lead cleanup levels (400 mg/kg).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure and potential risks and hazards associated with groundwater use were not evaluated in the BRA.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 for both current and future Maintenance (general duty) Workers and future adult and child residents.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA3 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for each receptor.

Current and future maintenance workers were assumed to be routinely exposed to site chemicals for 9 to 25 years. The total hazard index calculated for noncarcinogenic health effects due to cumulative exposures to soil via ingestion, dermal contact, and inhalation of VOCs and particulates is 3.4E-02 and 1.6E-01 in the average and RME

conditions, respectively. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

Future construction workers were assumed to be exposed to chemicals 8 hours per day, 20 days per year and 40 days per year for the average and RME exposure scenarios, respectively. The total hazard index is 3.6E-03 and 3.0E-02 in the average and RME conditions, respectively, for noncarcinogenic health effects due to cumulative exposures to soil via ingestion, dermal contact, and inhalation of VOCs and particulates.

Hypothetical future adult and child residents were assumed to be routinely exposed to site chemicals for 9 to 30 years. For the future adult resident, the total hazard index calculated for noncarcinogenic health effects due to cumulative exposures to soil via ingestion, dermal contact, and inhalation of VOCs and particulates is 1.8E-01 and 5.6E-01 in the average and RME conditions, respectively. Average and RME hazard indexes calculated for the future child resident were 7.2E-01 and 8.8E-01, respectively. Hazard Indexes for these two hypothetical future residents are below the EPA level of concern (1.0).

Carcinogenic Risks. Carcinogenic risks are also presented in **Table 3-3**. The total carcinogenic risk (i.e., risks for all pathways combined), for the average and the RME exposures for current and future maintenance workers were 1.2E-9 and 2.6E-8 respectively. These risks are below the EPA's target risk range (1.0E-04 and 1.0E-06) for Superfund sites (EPA 1989b). The primary exposure pathway contributing the majority of the cancer risk was inhalation of particulates.

The lifetime excess cancer risk to future construction workers under the assumed exposure conditions is 2.3E-10 and 1.1E-9 in the average and RME cases, respectively. Soil ingestion is the chief contributor to the risk estimates. These levels are at or below the target risk range of 1 E-06 to 1 E-04 for exposure to chemicals released from RAA3.

The lifetime excess cancer risk to hypothetical future adult and child residents under the assumed exposure conditions is 8.6E-09 and 2.2E-7 for the hypothetical adult resident and 4.5E-08 and 5.1E-07 for the hypothetical child resident in the average and RME cases, respectively. For the average exposure scenario, inhalation of particulates

is the chief contributor to the risk estimates, while the RME scenario has soil ingestion as the primary contributor to the risk estimates. These levels are at or below the target risk range of 1 E-06 to 1 E-04 for exposure to chemicals released from RAA3.

Lead as a Potential Risk/Hazard. The maximum level of lead detected in soils at RAA3 was 147 mg/kg in surficial soil, well below the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994).

Air modeling was performed to determine the lead concentrations in ambient air. For the average and RME exposures, the estimated ambient concentrations of lead were well below the EPA's background value of 0.200 $\mu g/m^3$ (EPA 1991).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) were detected in soils at levels which were considered to be above background (W-C 1992). None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA3. The total noncarcinogenic HIs for all receptors were below the EPA's level of concern (1.0) at RAA3 for both individual exposure pathways and combined exposure pathways. The total carcinogenic risks for the average and RME exposures for workers and residents were below the EPA's target risk range of 1.0E-04 to 1.0E-06 for a Superfund site.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA3, which includes the Old Entomology Rinse Area.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for Old Entomology Rinse Area, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the NFRAP alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for Old Entomology Rinse Area, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

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TABLES

TABLE 2-1 (continued)
PESTICIDE CONCENTRATIONS IN SOIL SAMPLES
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

Sample Depth (Ft-BGL)	Compound	Units	Boring Number								
			17A	17C	B1	B3	B4	B5	B6	B7	B8
7.5 - 9.5	2,4 - D	μg/kg	59	ND	ND	ND	ND	ND	ND	ND	ND
61.5 -	2,4 - D	μg/kg	ND	406	ND	ND	NS	ND	NS	NS	NS
	4,4 - DDT	μg/kg	ND	8[1]	ND	ND	NS	ND	NS	NS	NS
62.5 -	2,4 - D	μg/kg	3,410	ND	NS	NS	NS	NS	NS	NS	NS

Ft-BGL = Feet below ground level
μg/kg = Micrograms per kilogram
NS = Not sampled
ND = Not detected

[1] Detected at concentrations below the reporting limit

Data collected by Radian during the 1985 RI and by Walk, Haydel & Associates during the 1986 RI.
Source: Borings 17A, 17C; Final Report, IRP Phase II (Radian Corporation 1986)
Borings B1-B8; Final Report, IRP Phase IV-A (Walk, Haydel & Associates Inc. 1988)

TABLE 2-2
PESTICIDE/PCB CONCENTRATIONS IN SURFACE SOIL SAMPLES
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

Boring Number	Sample Depth (Ft-BGL)	Compound	Concentration (µg/kg)
0961	0 - 0.5	4,4-DDD	14 UJ
		4,4-DDE	66 J
		4,4-DDT	110 J
		Aldrin	7.4 UJ
		Dieldrin	14 UJ
		Endosulfan I	7.4 UJ
		Endosulfan II	14 UJ
		Endosulfan Sulfate	14 UJ
		Endrin	14 UJ
		Endrin Aldehyde	14 UJ
		Endrin Ketone	14 UJ
		Heptachlor	7.4 UJ
		Heptachlor Epoxide	19 J
		Methoxychlor	74 UJ
		PCB 1016	140 UJ
		PCB 1221	290 UJ
		PCB 1232	140 UJ
		PCB 1242	140 UJ
		PCB 1248	140 UJ
		PCB 1254	140 UJ
		PCB 1260	140 UJ
		Toxaphene	740 UJ
		alpha-BHC	7.4 UJ
		alpha-Chlordane	16 J
		beta-BHC	7.4 UJ
		delta-BHC	7.4 UJ
		gamma-BHC	7.4 UJ
		gamma-Chlordane	47 J

Ft-BGL = Feet below ground level
J = Estimated value
UJ = Estimated as non-detect at the quantitation limit
µg/kg = Micrograms per kilogram

Data collected by W-C during 1993 RFI at Old Entomology Rinse Area.

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 2-3
ORGANIC COMPOUND CONCENTRATIONS IN SUBSURFACE SOIL SAMPLES
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

Boring 0962- Sample Depth (FT-BGL)		10	20	30	40	50	60	70	80	90	100
Analyte	Units										
Acetone	μg/kg	150 J	240J	28 J	39 J	26 J	120 J	15 J	10 UJ	10 UJ	11 UJ
Methylene chloride	μg/kg	4.5 J	3.1 J	5.4 U	5.2 U	5.3 U	5.2 U	5.2 U	5.2 U	5.2 U	5.3 U
Toluene	μg/kg	13 U	9.4 J	5.1 J	2.5 J	5.3 U	10	5.2 J	4.2 J	1.9 J	3.4
4,4-DDE	μg/kg	3.5* U	3.6 U	3.5 U	3.5 U	3.5 U	3.4 U	3.5 U	3.4 U	3.4 U	3.5
4,4-DDT	μg/kg	3.5** UJ	3.6 UJ	3.5 UJ	3.5 UJ	3.5 UJ	3.4 UJ	3.5 UJ	3.4 UJ	3.4 UJ	3.5 UJ
TRPH	mg/kg	42.9 U	43.9 U	43 U	64.9	42.5 U	41.5 U	41.8 U	41.8 U	41.2 U	42.1 U
GRO	mg/kg	0.54 J	0.55 U	0.54 U	0.52 U	0.53 U	0.52 U	0.52 U	0.52 U	0.52	0.53
TCO	mg/kg	4*** UJ	4 J	4 UJ	4 UJ	4 UJ	4 UJ	4 J	4 UJ	4 UJ	4 J

U = Not detected
J = Estimated value
UJ = Estimated as a non-detect at the quantitation limit
μg/kg = Microgams per kilogram
TRPH = Total recoverable petroleum hydrocarbons
GRO = Gasoline range organics
TCO = Total chromatographable organics
mg/kg = Milligrams per kilogram

* 4,4-DDE was reported at 2.6 μg/kg in the field duplicate sample (CAN096-0962-0661) collected at this interval.

** 4,4-DDT was reported at 17 μg/kg in the field duplicate sample (CAN096-0962-0661) collected at this interval.

*** Total chromatographable organics were reported PRESENT in the field duplicate sample (CAN096-0962-0661) collected at this interval.

Data collected by W-C during 1991 RI at Old Entomology Rinse Area

Source: Final Report, RFI Phase II to Appendix I SWMUs (W-C 1995a)

TABLE 2-4
METAL CONCENTRATIONS IN THE SUBSURFACE SOIL SAMPLES
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

Sample Depth			10	20	30	40	50	60	70	80	90	100
Analyte	Units	Background Range*										
Aluminum	mg/kg	0-10,800	7,090	6,460	4,430	2,470	2,600	1,320	1,570	1,460	1,210	1,510
Antimony	mg/kg	0-30	6.4 U	6.6 U	6.5 U	6.3 U	6.4 U	6.2 U	6.3 U	6.3 U	6.2 U	6.3 U
Arsenic	mg/kg	0-10	2.1	2.3	1.1	0.71	0.54	0.4	0.49	0.67	0.86	0.85
Barium	mg/kg	0-550	68 J	89.1 J	15 J	29 J	45.8 J	11.2 J	61.8 J	17.8 J	18.5 J	32.6 J
Beryllium	mg/kg	0-0.6	0.59	0.76	0.29	0.21 U	0.24	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Cadmium	mg/kg	0-2.1	0.54 U	0.55 U	0.54 U	0.52 U	0.53 U	0.52 U	0.52 U	0.52 U	0.52 U	0.53 U
Calcium	mg/kg	0-167,000	5,400 J	70,000 J	19,900 J	62,700 J	52,700 J	15,600 J	28,300 J	12,600 J	12,100 J	17,400 J
Chromium	mg/kg	0.8-12	8.5	10.2	4.5	2.5	7.1	2.3	4.4	2.6	2.4	5.8
Cobalt	mg/kg	0-4	3.3	2.8	1.6	0.94	1.3	0.78	1.1	1.4	1.1	1.4
Copper	mg/kg	0-10	7.2	4.5	3	1.3	2	1.3	1.4	1.9	1.8	1.8
Iron	mg/kg	0-8,600	8,530	5,270	3,880	2,010	2,300	1,990	2,290	2,730	2,440	2,930
Lead	mg/kg	0-18	6.3	3.6	2.8	1	1.1	0.79	0.9	1.7	1.9	1.7
Magnesium	mg/kg	0-9,900	1,370	5,,030	5,490	4,550	4,580	1,140	1,500	1,200	1,000	1,180
Manganese	mg/kg	0-152	59.9 J	194 J	45.9 J	27.1 J	39 J	24 J	30.2 J	43 J	39 J	57.3 J
Mercury	mg/kg	0-0.2	0.11 U	0.11 U	0.11 U	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U	0.1 U	0.11 U
Nickel	mg/kg	0-9.7	6.1	8.2	3.4	2	2.6	1.2	1.6	1.7	1.7	2.3
Potassium	mg/kg	0-2,500	1,310	2,150	1,860	617	577	288	351	365	333	413
Selenium	mg/kg	0-37	0.54 UJ	1.1 UJ	1.1 UJ	1 UJ	1.1 UJ	1 UJ	0.52 UJ	0.52 UJ	0.52 UJ	0.53 UJ
Silver	mg/kg	0-1.8	1.1 U	0.37	1.1 U	1 U	1.1 U	1 U	0.31	1 U	1 U	0.38
Sodium	mg/kg	0-830	205	292	219	90.2	135	68.4	140	136	135	148
Thallium	mg/kg	0-6	0.54 UJ	1.1 UJ	0.54 UJ	1 UJ	1.1 UJ	1 UJ	1 UJ	0.52 UJ	0.52 UJ	0.53 UJ
Vanadium	mg/kg	2-25	16.8	20.4	13.1	7	9.6	6	6.6	7.8	7.1	8.2
Zinc	mg/kg	0-21	16.5 U	11.7 U	8.1 U	4.4 U	4.6 U	3.5 U	4.2 U	5.3 U	6.4 U	0.54 U

U = Not detected J = Estimated value
UJ = Estimated as a non-detect at the quantitation limit

* Background range from Concentrations of Selected Naturally Occurring Constituents in Soil and Groundwater at Cannon AFB (Table 2-6), W-C 1994.

Data collected by W-C during 1993 RFI at Old Entomology Rinse Area

Source: Final Report, RFI Phase II to Appendix I SWMUs (W-C 1995a)

TABLE 2-5

METAL CONCENTRATIONS IN THE GROUNDWATER SAMPLES
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

Element	Units	1991 RI at Old Entomology Rinse Area	1995 Phase II RFI at Landfill No. 25	MCL[1]
Antimony	mg/L	0.06 U	0.06 U	0.01/0.005
Arsenic	mg/L	0.0047 J	0.0014 J	0.05
Barium	mg/L	0.66	0.29	1.0
Beryllium	mg/L	0.002 U	0.002 U	0.01[2]
Cadmium	mg/L	0.005 U	0.005 U	0.005[2]
Chromium	mg/L	0.034 U	0.034 U	0.1
Cobalt	mg/L	0.01 U	0.01U	*
Copper	mg/L	0.15	0.011 J	1.0[3]
Lead	mg/L	0.034 J	0.0013 J	0.05[4]
Mercury	mg/L	0.0002 U	0.0002 U	0.002
Nickel	mg/L	0.029 J	0.01 U	1.0[2]
Selenium	mg/L	0.02 U	0.0048 J	0.05[4]
Silver	mg/L	0.003 U	0.003 U	1.0[3]
Thallium	mg/L	0.01 U	0.01 U	0.022/0.001[2]
Tin	mg/L	0.1 U	0.1 U	*
Vanadium	mg/L	0.035	0.026	*
Zinc	mg/L	0.049	0.013 J	5.0[3]

MCL = Maximum Contaminant Level
J = Estimated value
U = Not detected
mg/L = Milligrams per liter

[1] Primary MCL in effect as of November 13, 1991 (i.e., date monitoring well was sampled).
[2] Proposed primary MCL
[3] Secondary MCL in effect as of November 13, 1991 (i.e., date monitoring well was sampled).
[4] Effective until 12/7/92, at which time action level of 0.015 mg/L became effective.
* No primary or secondary MCL or proposed MCL as of March 1992.

Data collected by W-C from monitoring well 096K during the 1991 RI at Old Entomology Rinse Area and during the 1995 Phase II at Landfill No. 2

Source: Final Report, RI at 18 SWMUs, (W-C 1992); Draft Report, Phase II, Appendix III SWMUs (W-C 1995c)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level

(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL
(1) = MCL for total trihalomethanes (2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA3
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Current Worker - Maintenance						
-- Soil Ingestion	1.11E-10	1.21E-04	1.30E-04	1.02E-08	7.46E-03	7.86E-03
-- Dermal Contact - Soil	4.32E-11	5.27E-06	2.42E-06	3.55E-09	1.56E-05	7.18E-05
-- Inhalation - VOCs	4.76E-11	2.75E-07	2.75E-07	3.48E-10	1.20E-06	1.20E-06
-- Inhalation - Particulates	9.49E-10	3.40E-03	3.40E-02	1.17E-08	1.50E-02	1.50E-01
Total	1.15E-09	3.52E-03	3.41E-02	2.57E-08	2.25E-02	1.58E-01
Future Worker - Maintenance						
-- Soil Ingestion	1.11E-10	1.21E-04	1.30E-04	1.02E-08	7.46E-03	7.86E-03
-- Dermal Contact - Soil	4.32E-11	5.27E-06	2.42E-06	3.55E-09	1.56E-05	7.18E-05
-- Inhalation - VOCs	4.76E-11	2.75E-07	2.75E-07	3.48E-10	1.20E-06	1.20E-06
-- Inhalation - Particulates	9.49E-10	3.40E-03	3.40E-02	1.17E-08	1.50E-02	1.50E-01
Total	1.15E-09	3.52E-03	3.41E-02	2.57E-08	2.25E-02	1.58E-01

TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA3
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

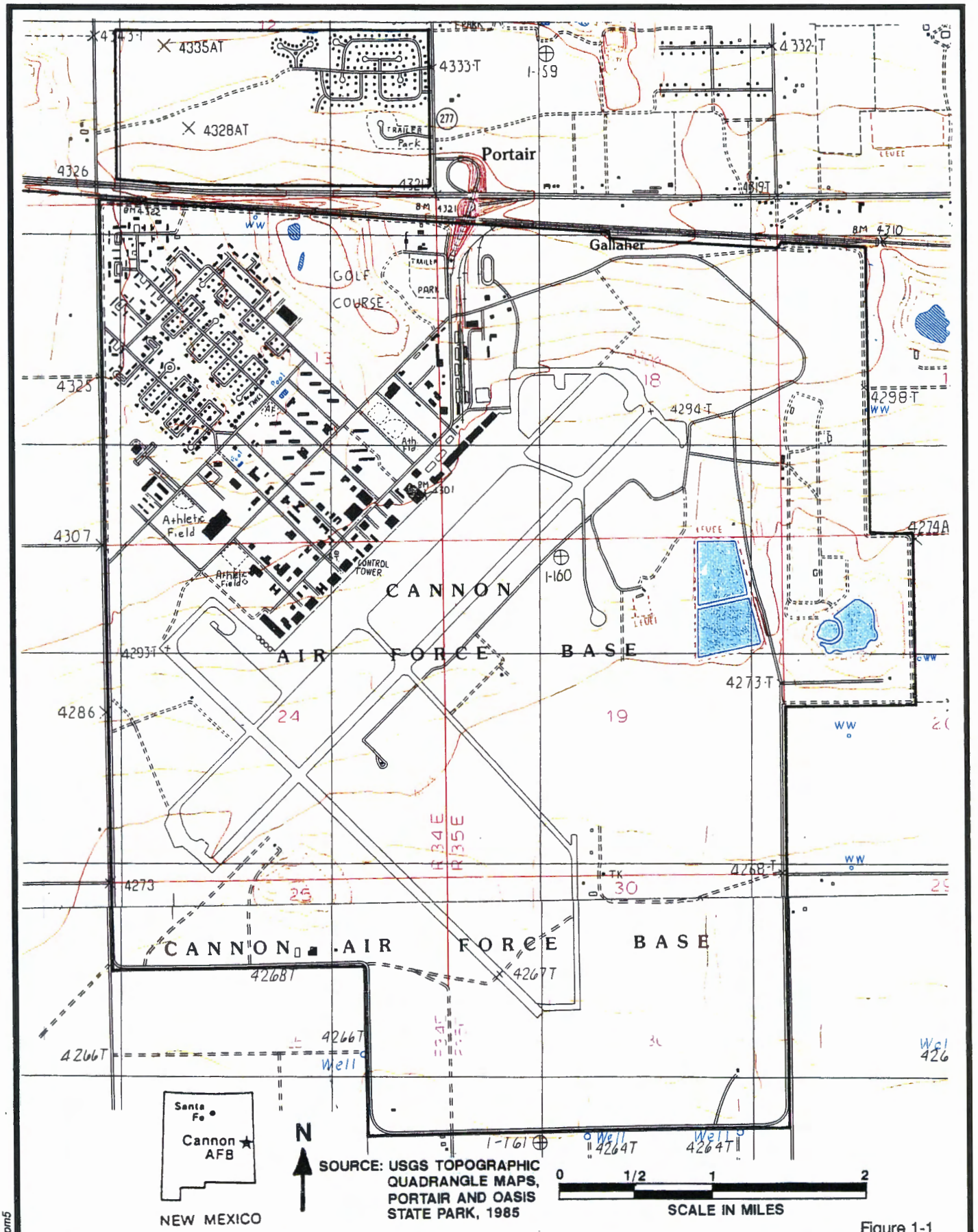
	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Future Worker - Intrusive						
-- Soil Ingestion	1.30E-10	4.06E-04	8.84E-04	5.21E-10	4.21E-03	4.57E-03
-- Dermal Contact - Soil	1.01E-11	1.11E-06	5.11E-06	9.09E-11	1.00E-05	4.60E-05
-- Inhalation - VOCs	0.00E+00	1.90E-07	1.90E-07	0.00E+00	9.48E-07	9.48E-07
-- Inhalation - Particulates	8.51E-11	3.13E-04	3.12E-03	4.51E-10	2.14E-03	2.14E-02
Total	2.25E-10	7.20E-04	3.61E-03	1.06E-09	6.36E-03	2.96E-02
Future Resident - Adult						
-- Soil Ingestion	8.02E-10	2.78E-04	3.31E-04	1.37E-07	3.68E-02	4.00E-02
-- Dermal Contact - Soil	3.11E-10	3.81E-06	1.75E-05	2.39E-08	8.76E-05	4.02E-04
-- Inhalation - VOCs	0.00E+00	4.82E-06	4.82E-06	0.00E+00	1.02E-05	1.02E-05
-- Inhalation - Particulates	7.46E-09	1.83E-02	1.83E-01	5.57E-08	5.20E-02	5.20E-01
Total	8.58E-09	1.86E-02	1.84E-01	2.16E-07	8.90E-02	5.61E-01

TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA3
OLD ENTOMOLOGY RINSE AREA
SWMU NO. 96/IRP NO. SD-17
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Future Resident - Child						
-- Soil Ingestion	1.56E-08	5.41E-03	6.44E-03	3.99E-07	1.07E-01	1.17E-01
-- Dermal Contact - Soil	3.43E-10	4.20E-06	1.93E-05	2.60E-08	9.55E-05	4.38E-04
-- Inhalation - VOCs	0.00E+00	1.87E-06	1.87E-06	0.00E+00	1.49E+05	1.49E-05
-- Inhalation - Particulates	2.90E-08	7.13E-02	7.12E-01	8.12E-08	7.59E-02	7.58E-01
Total	4.50E-08	7.67E-02	7.19E-01	5.06E-07	1.83E-01	8.76E-01

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

OLD ENTOMOLOGY RINSE AREA
SWMU No. 96 / IRP No. SD-17
Cannon Air Force Base, New Mexico

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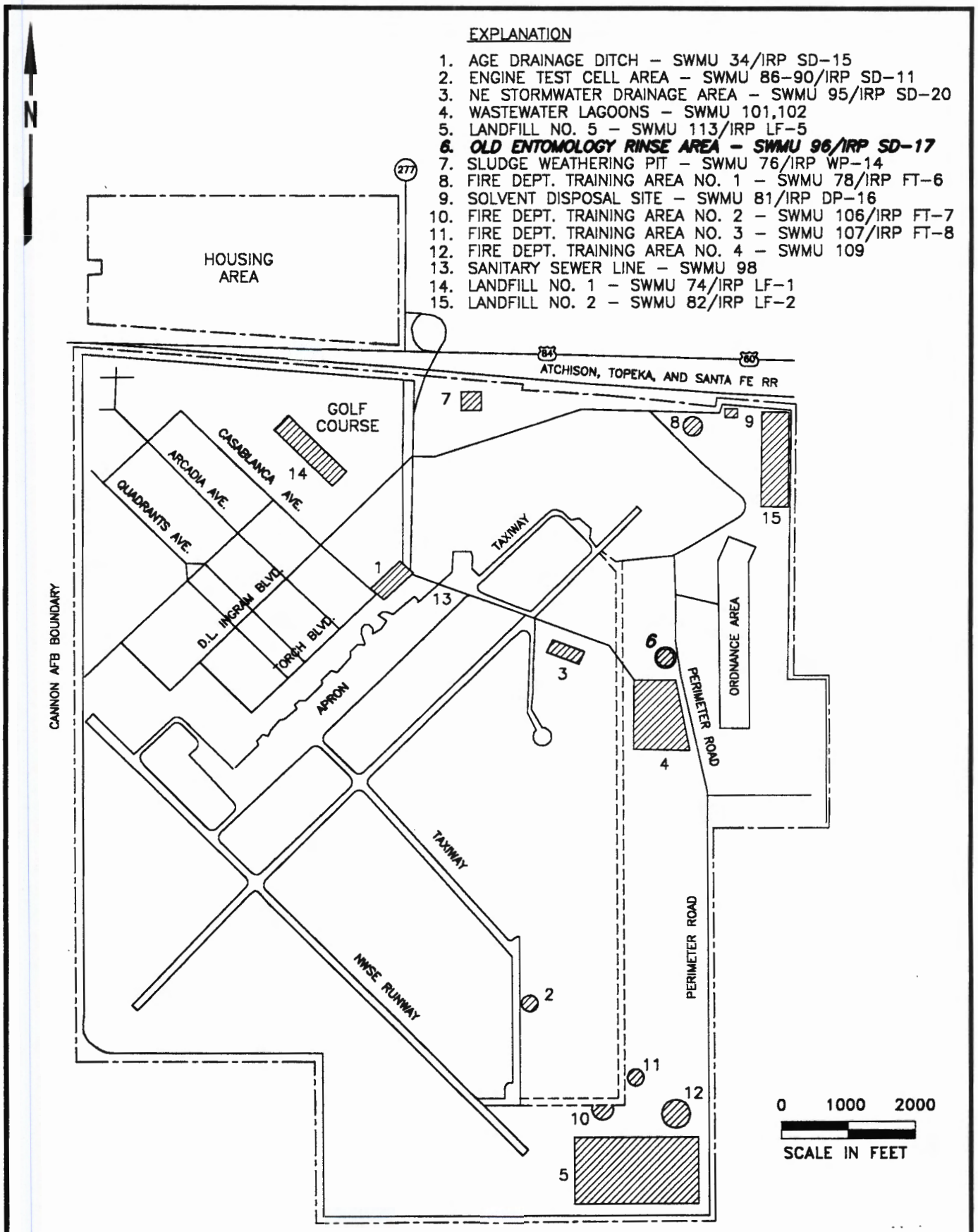

SOURCE: Woodward-Clyde, February1996

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Figure 1-2

IRP/SWMU SITE LOCATION MAP

OLD ENTOMOLOGY RINSE AREA
SWMU No. 96 / IRP No. SD-17
Cannon Air Force Base, New Mexico

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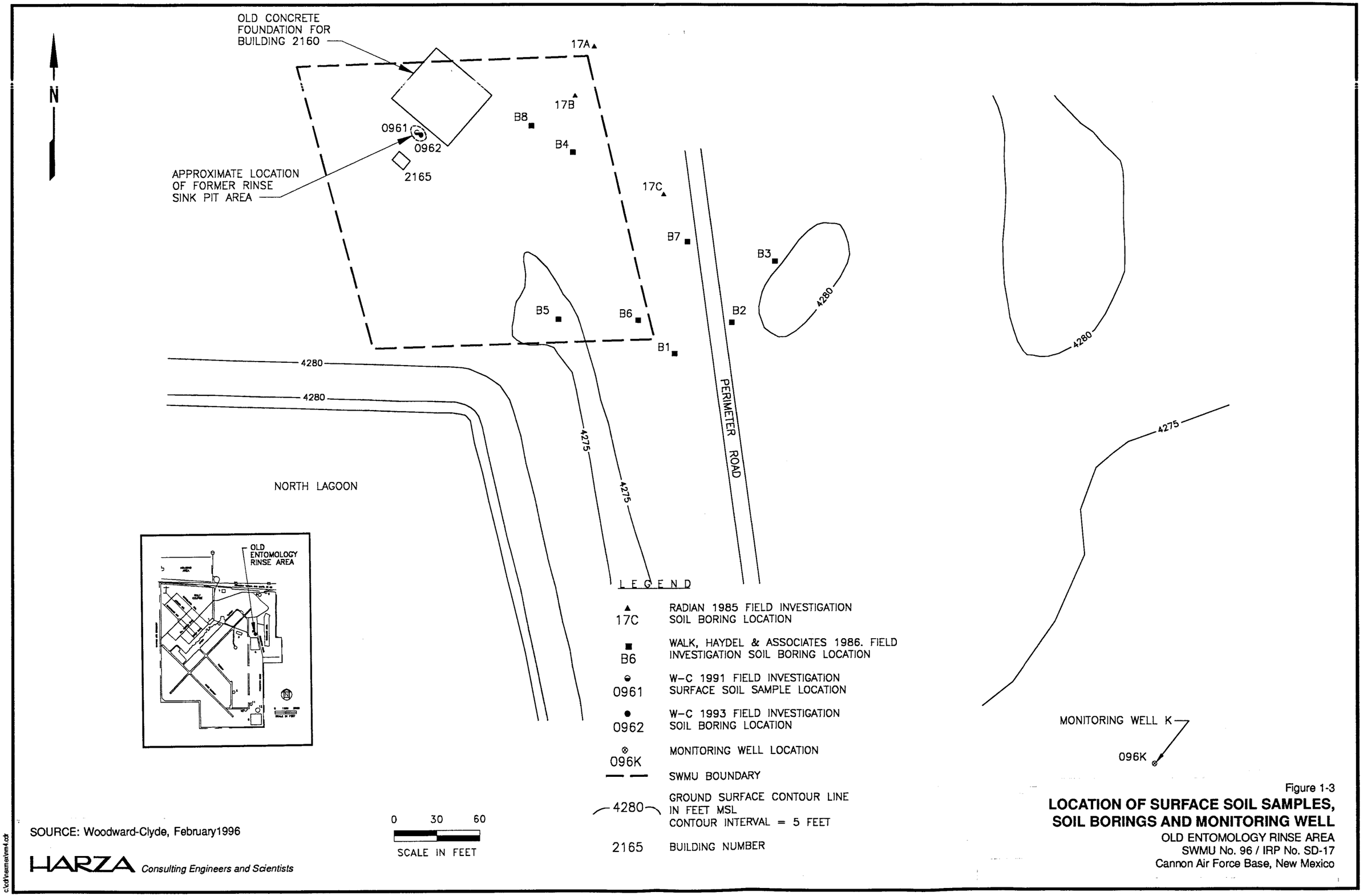

Figure 1-3

LOCATION OF SURFACE SOIL SAMPLES, SOIL BORINGS AND MONITORING WELL

OLD ENTOMOLOGY RINSE AREA
SWMU No. 96 / IRP No. SD-17
Cannon Air Force Base, New Mexico

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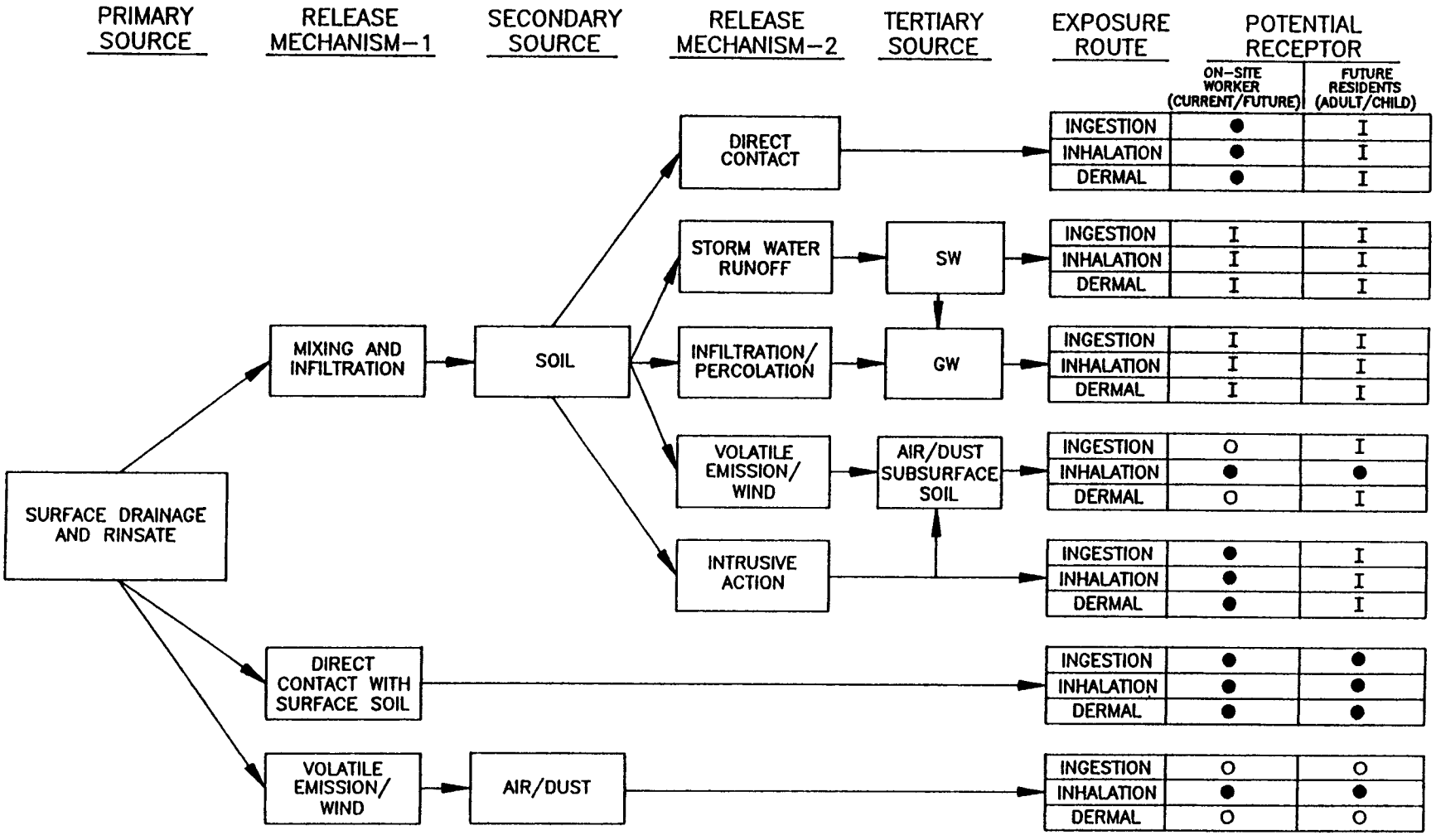
NE STORM DRAINAGE AREA
OLD ENTOMOLOGY RINSE AREA



SOURCE: Woodward-Clyde, October 1992

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LEGEND

I INCOMPLETE EXPOSURE PATHWAYS
● SIGNIFICANT EXPOSURE PATHWAY
O RELATIVELY INSIGNIFICANT EXPOSURE PATHWAY

Figure 2-1
CONCEPTUAL SITE MODEL
OLD ENTOMOLOGY RINSE AREA
SWMU No. 96 / IRP No. SD-17
Cannon Air Force Base, New Mexico

APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Old Entomology Rinse Area (SWMU No. 96) from September 1, 1991 through October 15, 1992 (W-C 1992) and on the Phase II RCRA Facility Investigation (RFI) conducted by W-C in 1993 (W-C 1995a). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Final Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon Air Force Base, Clovis, New Mexico. W-C 1994.

  This report describes the background levels of chemical constituents at Cannon AFB.

- Final (Revised) RCRA Facility Investigation Activities, Phase II to Appendix I Solid Waste Management Units, Supplemental RFI Report, Projects CZQZ 93 7017/CZQZ 95 7002, Cannon Air Force Base, New Mexico. W-C 1995a.

  This report documents the Phase II investigation of the RFI for Appendix I SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995b.

  This is the Management Action Plan for the IRP Program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Landfill No. 2
SWMU No. 82 / IRP No. LF-02

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Landfill No. 2
SWMU No. 82/IRP No. LF-2
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Landfill No. 2
SWMU No. 82/IRP No. LF-2

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Landfill No. 2 (SWMU No. 82/IRP No. LF-2) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the RCRA Facility Investigation (RFI) for the Landfill No. 2 (SWMU No. 82/IRP No. LF-2) performed by Woodward-Clyde (W-C) during March and April 1992, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Landfill No.2 (SWMU No. 82/IRP No. LF-2) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RFI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B permit conditions. The activities performed for this RFI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
gpm	Gallons per Minute
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analysis
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Services
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

Landfill No. 2, designated as Solid Waste Management Unit (SWMU) No. 82 and Installation Restoration Program (IRP) No. LF-2, was reportedly an unlined, inactive, cut-and-fill landfill occupying approximately 15 acres in the northeastern corner of the base.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. Landfill No. 2 is situated near the northeast corner of the base, just beyond the end of the primary southwest-northeast runway, approximately 500 feet northeast of Perimeter Road. Landfill No. 2 is approximately 75 feet west of the base's eastern boundary fence and 75 to 100 feet south of the base's northern boundary fence. The site is shown as Area 15 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Landfill No. 2 occupies an area of approximately 15 acres. Surface depressions and the general configuration of several north-south and one northwest-southeast trending potential landfill cells were observed during the field reconnaissance and investigation activities performed by W-C during the 1992 RFI. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The Landfill No. 2 is within an Open Area, as characterized by the Cannon AFB Base Comprehensive Plan. Open Areas are defined as conservation areas and required buffer space. The site is also characterized as Open Space according to the U.S. Air Force's Rational National Standards Initiative. To the west of Landfill No. 2 is a Civil Engineering Maintenance Facilities area, to the south is a Munitions Storage Area, and to the north and east is the base property boundary (W-C 1995).

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Landfill No. 2 is situated near the northeast corner of the base, just beyond the end of the primary southwest-northeast runway. The on base housing closest to landfill No. 2 is approximately 4,000 feet away. The site is shown as Area 15 on **Figure 1-2**.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Based on a review of aerial photos from 1939 to 1979, it appears that the landfill area is approximately 1,500 feet long and 450 feet wide with seven separate landfill cells. Immediately to the west of the central portion of Landfill No. 2 is an area with a west-east trending feature, approximately 750 long and 500 feet wide, that has shown evidence of surface disturbance.

In its present condition, the site appears as an open field covered with prairie grass species and scattered trees. The general configuration of several north-south and one northwest-southeast trending potential landfill cells were discernible from the aerial photographs as well as from surface depressions observed during the field reconnaissance and investigation activities performed by W-C in the 1992 RFI. An electrical service box is located north of the landfill area.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

Landfill No. 2 was a cut and burn landfill of approximately 15 acres that was active during 1946-47 and 1951-59. The landfill received domestic and industrial wastes including solvents, paint, thinners, waste oils, and peroxide containers. The area is marked by a slightly hilly ground surface and is covered by prairie grasses. There is no evidence of stressed vegetation (W-C 1995).

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.

- A Phase I IRP Records Search was performed in 1982-1983 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 Landfill No. 2 by reviewing the existing information and conducting an analysis of installation records.

- During 1984 and 1985, a Phase II (Stage 1) IRP investigation was conducted by Radian Corporation (Radian) to determine if environmental contamination had resulted from activities at Landfill No. 2 (Radian 1986). This IRP/SWMU site was investigated due to its proximity to the installation boundary and a base drinking water well, and the known past disposal of small quantities of hazardous waste. During the 1985 investigation, five soil borings (2A, 2B, 2C, 2D, 2E) were drilled to depths ranging from 36.5 to 60.0 feet (**Figure 1-3**). Eleven soil samples and one QA duplicate were collected and analyzed for oil and grease, metals, and purgeable and aromatic hydrocarbons (EPA Methods 8010 and 8020). Deep soil samples were not obtained from most of the borings due to the unconsolidated nature of the material (loose sand) (Radian 1986).

- In 1987, a Preliminary Review/ Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the USEPA at Cannon AFB by A.T. Kearney, Inc. (Kearney

1987). The purpose of this investigation was to identify and evaluate Solid Waste Management Units to assess the potential for hazardous wastes or constituent releases to the environment. Results of this investigation identified Landfill No. 2 as a potential SWMU.

- During March and April 1992, W-C investigated this site as part of the RFI for Landfills No. 1 and No. 2 at Cannon AFB. Summary results of that investigation are contained in Section 2.2 of this document.

1.2.2 Period of Operation

Landfill No. 2 reportedly received wastes from 1946 to 1947 and from 1952 to 1959. The inactivity of Landfill No. 2 from 1947 to 1952 coincided with the period during which the base was on deactivated status.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that Landfill No. 2 reportedly received wastes from 1946 to 1947 and from 1952 to 1959.

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B permit was issued to Cannon AFB in 1989. The permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs; and
- Implement corrective measures for each SWMU that requires them.

Under the Part B permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

The apparent mode of operation at this landfill site was for wastes to be placed in trenches, burned and buried. Waste materials received at this landfill reportedly included domestic and industrial wastes. Industrial wastes included waste oils and solvents, paint strippers and thinners, outdated paint, pesticide containers, and various empty cans and drums (Radian 1986).

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (Cannon AFB Management Action Plan 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA.

3. 1989 RCRA Part B storage permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI at Landfill No. 2 was performed to comply with conditions of the base's RCRA Part B permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of Landfill Area No. 2 indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Landfill No. 2 (SWMU No. 82/IRP No. LF-02) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface (upper 76 feet) stratigraphy at Landfill No. 2 consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation. This SWMU/IRP site is underlain by Ogallala fluvial deposits consisting primarily of well-sorted sand. The total thickness of these Ogallala deposits beneath Landfill No.2 is not presently known, but, based on regional information, may be as thick as 390 feet. Stratigraphic correlations of the various fluvial deposits between borings is based primarily on the split-barrel lithologic samples and drill cuttings collected during drilling.

Based on the lithologic information obtained during the W-C RFI (1992), it appears that three fairly distinct sand, sand/caliche units are present beneath this IRP/SWMU site to a depth of 76 feet. The lower most fluvial deposits consist of fine- to medium-grained, well-sorted, unconsolidated light to medium orange sands. These sands are comprised predominantly of subrounded to subangular quartz grains with minor amounts (3 to 5 percent each) of orange and dark-colored grains. These sands are relatively clean (i.e., little or no silt/clay sized particles). Overall, these sands are non-calcareous; however, there are occasional thin layers and pockets of calcareous sands. Nine gradation analyses were performed on samples collected within this unit at depths ranging from 59 to 74 feet BGL. The results indicate that these samples were comprised of approximately 84 to 92 percent sand, 6 to 11 percent silt, and 0 to 7 percent clay and/or calcium carbonate. This unit was encountered in all 15 W-C borings at depths ranging from 58 to 62 feet BGL. The thickness of this unit is unknown at present due to the fact that the unit was not fully penetrated, but is at least 17 feet thick at this SWMU.

The middle fluvial deposits consist of fine-grained, well sorted, silty to slightly silty, pale orange to orange sands. These sands are comprised predominantly of subangular to

subrounded quartz grains with minor amounts (1 to 5 percent) of dark-colored grains. These sands are slightly calcareous with occasional small pockets of tan-orange to pale-orange caliche and scattered calcium carbonate cemented sands. Seven gradation analyses were performed on samples collected within this unit at depths ranging from 29 to 45 feet BGL. The results indicated that these samples were comprised of approximately 57 to 81 percent sand, 12 to 25 percent silt, and 6 to 18 percent calcium carbonate and/or clay-sized material. This unit was encountered at depths ranging from 28 to 43 feet BGL in all 15 W-C borings and in all 5 Radian borings. Based on the above information, this unit varies from 18 feet to 33 feet in thickness beneath this IRP/SWMU site.

The upper fluvial deposits consist of fine-grained, well-sorted, silty, calcareous, medium-to-pale orange to tan-orange sands. These sands are comprised predominantly of subangular to subrounded quartz grains with varying amounts of silt and calcium carbonate. Occasionally, these sands are moderately to well cemented with calcium carbonate. Thin to moderately thick layers (ranging from a couple of feet to 25 feet in thickness) and small pockets or nodules of tan-orange to pale-orange, silty, sandy, clayey caliche are scattered throughout this unit. Twenty-eight gradation analyses were performed on samples collected within this unit (2 from the caliche and 26 from the sands) at depths ranging from 11 to 34 feet BGL. The results indicate that the caliche samples were comprised of approximately 35 to 36 percent sand, and 27 to 38 percent silt. The sand samples were comprised of approximately 46 to 66 percent sand, 14 to 29 percent silt, and 12 to 32 percent calcium carbonate and/or clay-sized material. The thickness of this unit ranges from 24 feet to 40 feet at this IRP/SWMU site.

Approximately 3 to 7 feet of native topsoil exists above this unit. No groundwater was encountered during the drilling of these borings.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inches in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985 (Hale 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The soils underlying Landfill No. 2 consist of sandy loam and loamy sand of the Amarillo Soil Group. The total thickness of the soil zone is approximately 1 to 5 feet. The soils consist primarily of fine-grained, well-sorted, silty, clayey, unconsolidated dark brown sands. The sands are comprised predominantly of subangular to subrounded quartz grains, and are generally dry to slightly moist at depth.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The USDA - Soil Conservation Service (USDA-SCS 1958) describes this soil as consisting of a thin sandy A horizon, well-defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base, but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeastern corner of the base. The A and B horizons of Amarillo and Clovis fine sandy loams are rapidly to moderately permeable (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations have been conducted at Cannon AFB including Landfill No. 2. Results of the Phase I IRP Records Search recommended that a limited Phase II program be conducted to confirm or rule out the presence and/or migration of hazardous contaminants at Landfill No. 2.

A Phase II (Stage 1) investigation was conducted by Radian Corporation in 1984 and 1985 during which five soil borings (Boring Nos. 2A, 2B, 2C, 2D, 2E), shown in **Figure 1-3**, were drilled and samples for chemical analyses collected. Analytical results of samples collected during the Radian investigation indicated elevated oil and grease concentrations in one sample

(2D-2). No purgeable halocarbons were detected in the samples. The total concentrations for metals were within the normal soil ranges, except for selenium, which was moderately elevated in the shallow samples from borehole 2C (Radian 1986). A summary of the sample results is contained in **Table 2-1**.

An RFI was conducted by W-C in 1992. Prior to drilling soil borings, landfill cells were located and delineated by a review of aerial photographs from 1951 through 1979, performance of a geophysical survey, and excavation of a trench within a landfill cell. Twelve soil borings, GT50 through GT61, were drilled to depths ranging from 4 to 20 feet BGL (**Figure 1-3**). These soil boring locations were originally scheduled to be analytical soil borings. However, because no landfill materials were encountered, these boreholes were abandoned and alternative locations were chosen for the analytical soil borings. Fifteen analytical soil borings, 8201 through 8215, were drilled to depths ranging from 75.5 to 76 feet BGL (**Figure 1-3**). Ten of the analytical soil borings, 8204 through 8211, 8214, and 8215, were drilled within seven landfill cells located in the eastern portion of the surveyed landfill area. The extent of these landfill cells was estimated from aerial photographs, geophysical anomalies, and topographic surface depressions observed in the field. Burned landfill material was encountered in the 10 analytical soil borings at the following intervals:

•	Cell 1	- Boring 8204	- 4 to 13 feet BGL
		- Boring 8206	- 4 to 13 feet BGL
•	Cell 2	- Boring 8207	- 1.5 to 9 feet BGL
•	Cell 3	- Boring 8211	- 4 to 13.5 feet BGL
•	Cell 4	- Boring 8208	- 3.5 to 15 feet BGL
•	Cell 5	- Boring 8209	- 3.9 to 9.2 feet BGL
		- Boring 8210	- 3.9 to 9 feet BGL
•	Cell 6	- Boring 8214	- 3 to 9 feet BGL
•	Cell 7	- Boring 8205	- 3 to 10.5 feet BGL
		- Boring 8215	- 2.7 to 7 feet BGL

The remaining five analytical soil borings, 8201, 8202, 8203, 8212, and 8213, were drilled outside of landfill cells in areas where no previous soil borehole information was available. Borings 8201 and 8202 were drilled in the western portion of the surveyed landfill area and

provided background information on the metals concentrations for soils at Landfill No. 2. The analytical results from soil samples collected during drilling are discussed below.

Inorganic Parameters. Metals detected in soil samples were compared with the estimated site-specific and regional background concentration ranges. This comparison revealed that 45 samples appear to exceed regional and/or site-specific background ranges for 13 different metals as shown below:

• Aluminum	- 1 sample in 1 boring	- 10,500 mg/kg
	- 1 sample at surface	- 11,000 mg/kg
• Barium	- 10 samples in 7 borings	- 509 to 5,600 mg/kg
• Cadmium	- 1 sample at surface	- 1.4 mg/kg
• Calcium	- 8 samples in 7 borings	- 185,000 to 358,000 mg/kg
• Chromium	- 1 sample in 1 boring	- 117 mg/kg
• Cobalt	- 1 sample in 1 boring	- 10.2 mg/kg
• Copper	- 1 sample in 1 boring	- 61.7 mg/kg
• Lead	- 1 sample in 1 boring	- 20.2
	- 2 samples at surface	- 16.1 to 72.6 mg/kg
• Magnesium	- 12 samples in 9 borings	- 11,800 to 23,200 mg/kg
• Nickel	- 1 sample in 1 boring	- 330 mg/kg
• Potassium	- 1 sample in 1 boring	- 2,430 mg/kg
	- 1 sample at surface	- 2,460 mg/kg
• Silver	- 1 sample in 1 boring	- 2.6 mg/kg
• Zinc	- 1 sample in 1 boring	- 53.1 mg/kg
	- 1 sample at surface	- 87.3 mg/kg

Most of these elevated metal concentrations occur either at the surface, or within a 20-foot thick layer in the uppermost geologic unit (i.e., the very calcareous sand/sandy caliche zone) between approximately 14 and 34 feet BGL (4,274 and 4,294 feet above mean sea level [msl]). The trend of increasing metal concentrations at approximately 14 to 34 feet BGL appears to coincide with the presence of increased caliche and calcium carbonate cemented sands. The fact that these increased concentrations are present in borings located outside of landfill cells (i.e., 8202, 8203, 8212, 8213) as

well as those that penetrated landfill materials (i.e., 8204 through 8211, 8214, and 8215) would suggest that they are probably naturally occurring.

The concentrations of certain metals (cadmium, lead) observed at the surface could be due to the presence of metal fragments on the ground surface in this area of Cannon AFB. The elevated level for cadmium (1.4 mg/kg) and lead (72.6 mg/kg) in surface soil samples shown in the list above, occurred at boring location 8206. At this boring location, metal fragments were observed on the ground surface. The lower elevated level for lead (16.1 mg/kg) in the other surface soil sample in the above list occurred at boring location 8201, west of any known activity at Landfill No. 2. The 16.1 mg/kg concentration is an estimated value and is slightly above the concentration for lead in soil in this region of New Mexico, and is likely not associated with landfill activities.

The sample collected at 28 feet BGL in Boring 8203 contained very high concentrations of aluminum (10,500 mg/kg), chromium (117 mg/kg), cobalt (10.2 mg/kg), nickel (330 mg/kg), iron (9,040 mg/kg), calcium (358,000 mg/kg), and magnesium (19,000 mg/kg). Based on the calcium and magnesium concentrations and the extremely high blow counts (i.e. 860 blows for 15 inches), this sample was probably collected from a caliche layer. Since this boring was located outside of any known landfill cell, it is possible that a highly mineralized rock fragment was collected during the sample collection, mixed in with the soil, and subsequently analyzed.

The ten metals that were detected but not above the estimated site-specific and regional background ranges included antimony, arsenic, beryllium, iron, manganese, mercury, selenium, sodium, thallium, and vanadium.

Organic Parameters. Toluene was the only volatile organic compound (VOC) detected above the reporting limit in soil samples collected at Landfill No. 2. This occurred in seven instances: three in surface soil samples from Borings 8206 (14 μg/kg), 8209 (13 μg/kg), and 8213 (6.4 μg/kg); and four in subsurface soil samples from Boring 8209 at 28 feet BGL (16 μg/kg) and at 34 feet BGL (35 μg/kg), Boring 8201 at 24 feet BGL (5.5 μg/kg), and Boring 8210 at 34 feet BGL (6.5 μg/kg). A

number of results for toluene were reported below the reporting limit. Toluene appears to be the only VOC detected consistently throughout Landfill No. 2. It was detected in all borings, with the exception of Borings 8203 and 8213, at varying depths, all at estimated concentrations below the reporting limits with the exceptions discussed above.

Semi-volatile organic compounds (SVOCs) were detected primarily in Boring 8206 and, to a lesser degree, in Borings 8213, 8210, and 8204. The organic compounds 2-methylnaphthalene, acenaphthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, dibenzofuran, fluorene, indeno(1,2,3-c,d)pyrene, and naphthalene were detected in Boring 8206 at 18 and 22 feet BGL only. Anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, phenanthrene and pyrene were detected in Boring 8206 at 18 and 22 feet BGL, and at significantly lower concentrations in the samples collected at 30, 34, 39, and 49 feet BGL. The compounds detected between 18 and 49 feet BGL may be a result of creosote compounds since charred fragments of railroad ties were observed in samples collected during drilling. Benzo(a)anthracene and pyrene were also detected in Boring 8213. Benzo(a)anthracene was detected in the surface sample (55 μg/kg) and at 14 feet BGL (43 μg/kg), while pyrene was detected at 40 feet BGL (81 μg/kg). During the drilling of Boring 8213, there was no evidence of a landfill cell at this location. Pyrene was the only SVOC detected in Boring 8204 and was reported in the surface soil sample at 56 μg/kg.

Several other SVOC compounds were detected at Boring 8213. They include 4-nitrophenol at 14 and 40 feet BGL, benzoic acid at 14 feet BGL, chrysene at the surface and at 14 feet BGL, and pentachlorophenol at 40 feet BGL. For Boring 8210, only 4-nitrophenol was detected at 21 feet BGL (75 μg/kg).

The pesticides 4,4-DDE and 4,4-DDT were detected in surface soil samples from Borings 8201, 8204, 8206, and 8209. All reported concentrations were relatively low, the highest being 29 μg/kg and 17 μg/kg, respectively, in Boring 8206. It appears that the source of this contamination is probably general pesticide application at the base, and/or may have also originated from applications to adjacent agricultural fields.

Therefore, the presence of pesticides in surface soil samples is not necessarily related to landfilling activities.

The PCB compound, Aroclor 1254, was detected in Boring 8206 at 39 feet BGL (360 μg/kg), and below the reporting limit (estimated concentration) at 59 feet BGL (18 μg/kg) and 74 feet BGL (22 μg/kg).

Petroleum hydrocarbons were detected in Boring 8203 at 18 feet BGL (97.2 mg/kg). Total petroleum hydrocarbons were not detected in any other samples collected at Landfill No. 2. Total organic carbon was not detected in the soil samples collected from Landfill No. 2.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during W-C's 1992 RFI and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the storm water runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) permit since the requirement for a NPDES permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The

valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to Landfill No. 2; therefore, no surface water information was collected as part of the RFI performed by W-C in 1992.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with Landfill No. 2. No air sampling was performed as part of this RFI, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination.

2.6 POTENTIAL RECEPTORS/PATHWAYS

2.6.1 Receptors

Potential receptors were identified in a BRA completed by W-C in 1992. Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

Current Exposure Scenario:

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

2.6.2 Pathways

As shown in the Conceptual Site Model (CSM) (**Figure 2-1**), there are two primary release mechanisms by which COCs could be released from Landfill No. 2. These are volatile

emissions from buried wastes and mixing and infiltration/percolation of waste-related chemicals with surface or subsurface soil. Once mixed with subsurface soils, waste-related chemicals could be released by direct contact (if excavation occurred), by infiltration to groundwater, and by volatilization or wind erosion if subsurface soils were exposed. If waste materials are mixed with surface soils, secondary release mechanisms include direct contact, transport in storm runoff, and volatilization or wind erosion. All these have been determined to be insignificant exposure pathways; however, two (direct contact and infiltration to groundwater) are evaluated in the risk assessment in Section 3. Each potential pathway is discussed below in more detail.

Direct Contact with Subsurface Soils. Under current use, direct contact with subsurface soils is an incomplete pathway because no contact occurs due to the 1.5 to 4 feet of vegetated soil cover. It is unlikely that future construction would occur at the landfill due to the required clear zone for aircraft runway operations (extreme northeast corner of the base at the end of the main runway), and the instability of the area that has been landfilled makes it unsuitable for construction. However, future construction cannot be ruled out completely. Therefore, this exposure pathway is shown as a potentially complete but unlikely or insignificant pathway. It is evaluated qualitatively in Section 3.

Infiltration from Subsurface Soils to Groundwater. There is potential for dissolved COCs to percolate down through the vadose zone and into the groundwater. However, the potential for this site to impact groundwater is negligible because: the groundwater is approximately 270 feet BGL; a clay and caliche layer that is present within the vadose zone would impede mobility of infiltrate; the annual infiltration rate is very low because of the low rainfall rate and high evapotranspiration rate; and percolation into the deep aquifer results primarily from storm runoff held primarily in playas. Currently, there is no evidence of groundwater contamination at Cannon AFB except around SWMU 101 where nitrate levels exceeding background levels are being witnessed.

Volatilization/Wind Erosion from Subsurface Soils. Subsurface soils are not exposed to air since the landfill has 1.4 to 4 feet of vegetated soil cover. Therefore, this is judged to be an incomplete exposure pathway.

Direct Contact with Surface Soils. Exposure of COCs via direct contact with surface soils is an incomplete pathway because the landfill has 1.4 to 4 feet of vegetated soil cover.

Storm Water Runoff. Storm water runoff at Landfill No. 2 would not be likely to contain any of the COCs from Landfill No. 2 because the landfill has 1.4 to 4 feet of vegetated soil cover. Furthermore, there are no surface water features near the landfill that would provide an exposure point with runoff. Therefore, this is an incomplete pathway.

Volatilization/Wind Erosion of Water-Related Chemicals from Surface Soils. This pathway has been determined to be incomplete because the landfill has 1.4 to 4 feet of vegetated soil cover.

Volatilization of Landfill Wastes. Volatilization of organic waste materials and upward migration of hazardous chemicals in soil gas is not considered to be a significant pathway and Landfill No. 2 because of the types of wastes received (largely domestic and industrial solid wastes which were commonly burned upon placement in the trenches), the age of the wastes (the landfill was closed in 1959), and the presence of the 1.5 to 4 foot vegetated soil cover. These factors effectively reduce any transport of COCs by volatile emissions to insignificant (and possibly nonexistent) levels. Therefore, this is not considered to be a complete pathway and is not further addressed in this BRA.

Based on review of site-specific conditions and potential exposure pathways, it was determined by W-C in the 1992 RFI that only two potentially complete exposure pathways exist at Landfill No.2 (**Figure 2-1**) : (1) direct exposure to subsurface soils through future excavation activities and (2) exposure to groundwater, if groundwater were to become contaminated.

The probability that the groundwater pathway is complete is very low. This conclusion is based on an assessment of site hydrogeological and infiltration characteristics, evaluation of nature and extent of contamination, evaluation of solubility and soil adsorption parameters for the chemicals of concern, and lack of evidence of current groundwater contamination from other SWMUs at the base where monitoring wells have been installed. The weight of evidence indicates that the potential for migration to groundwater is low, and therefore no vadose-zone and groundwater fate and transport modeling was performed.

The likelihood for construction is also low, for the reasons given above. However, the potential does exist and the potential risk to construction workers will be evaluated qualitatively in Section 3 in the BRA by comparison of reasonable maximum exposure concentrations to RCRA Action Levels for residential exposures published by EPA. Concentrations that are protective under maximum lifetime residential exposure conditions are also more protective for shorter-term construction and occupational exposures.

3.1 RISK ASSESSMENT APPROACH

A screening level BRA was performed by W-C to assess potential adverse human health or ecological effects that would occur with exposure to chemicals, if they were released to the environment from waste sources. The BRA was based on the RFI at Cannon AFB, performed under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA Action Levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of chemicals of concern
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for Landfill No. 2 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that risks would not be underestimated. The BRA used validated soil data collected as part of the RFI to identify and select chemicals of concern for the quantitative characterization of risk.

Based on the soil data collected during the RFI, organic and inorganic COCs were identified in Landfill No. 2. Organic COCs include toluene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, crysene, fluoranthene, fluorene, indeno(1,2,3-4,d)pyrene, naphthalene, and Aroclor 1254 (PCB). Inorganic COCs include barium, cadmium, chromium, lead, nickel, silver, and zinc.

Most of the COCs are polynuclear aromatic hydrocarbons (PAHs), which were detected in samples from two borings in relatively low concentrations (0.04 to 5.1 mg/kg). PAHs were probably derived from the practice of burning trash in the trenches or from decaying wood rather than from hazardous materials placed in the landfill.

3.2 SOILS

For purposes of a screening-level risk assessment, reasonable maximum concentrations (95% upper confidence limit [UCL]) of organic chemicals of concern and maximum metals concentrations were compared to RCRA Action Levels for soils. Benzo(a)pyrene was the only compound whose 95% UCL concentrations exceeded the Action Level. The 95% UCL concentration for benzo(a)pyrene of 0.21 mg/kg is slightly higher than the Action Level of 0.12 mg/kg as shown in **Table 3-1**. This exceedance by less than a factor of two is considered to be unimportant because (1) the Action Levels are based on chronic (70-year) residential exposures and only short-term construction exposures are likely to occur at the landfill, and (2) the frequency and areal extent of benzo(a)pyrene detection is very limited and the limited area is not a significant exposure source.

The only metal of concern whose maximum concentration exceeds its corresponding RCRA Action Level for soil is barium as seen in **Table 3-2**. The highest barium concentration detected at this site was 5,600 mg/kg at Boring 8210 at a depth of 34 feet BGL. The RCRA

Action Level for barium is 4,000 mg/kg. It should be noted that the Action Level for barium was exceeded in only one sample. The next highest value for barium was 1,800 mg/kg detected at borehole 8206 at a depth of 18 feet. This value is well below the proposed RCRA Action Level. For further comparison, the 95% UCL concentration was calculated for barium. This value of 323 mg/kg is well below the RCRA Action Level for soils. Potential exposures to barium in soils is not considered to be of concern at this site based on the following:

- Only one sample had a barium concentration greater than the 4,000 mg/kg Action Level.
- This sample was taken from the caliche zone discussed in Section 2.2.1.
- The 95% UCL concentration for barium of 323 mg/kg is well below the Action Level.
- The likelihood of exposure to barium at a depth of 34 feet is negligible.

Based on the findings of the baseline risk assessment and comparison of soil data with risk-based RFI criteria/proposed RCRA Action Levels, it was concluded that potential adverse health impacts to humans under long-term exposure conditions from Landfill No. 2 are not expected.

3.3 GROUNDWATER

The potential for chemicals of concern in soils to impact groundwater is very low. This conclusion is based on evaluation of site hydrogeologic and infiltration characteristics, nature and extent of contamination, physical/chemical parameters affecting chemical mobility, and lack of evidence of groundwater contamination in monitoring wells at other SWMUs (W-C 1992b). Evidence suggests that chemicals of concern in Landfill No. 2 would not be likely to leach through 270 feet of vadose zone to groundwater.

3.4 SURFACE WATER

As discussed in Section 2.6, there is no complete surface water pathway. Therefore, the surface water pathway was not included in the BRA.

3.5 AIR

As discussed in Section 2.6, there is no complete air pathway. Therefore, the air pathway was not included in the BRA.

3.6 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of source-related chemicals at Landfill No.2 were evaluated specifically in terms of potential risk to species such as Peromyscus, which is the genus name for mice. Two organic compounds, pyrene and toluene, were detected in surface soil that were considered to be potentially related to the buried waste. Concentrations of these two chemicals is soil were extremely low and were not considered to pose a risk to small ground-dwelling rodents. Species of concern, such as raptors, which may occur at this site and feed on small mammals, were also not considered to be at risk due to the insignificant potential for pyrene and toluene to bioaccumulate. A number of other chemicals and metals were detected in surface soil at levels above background, but in most cases they were not detected at depth and, therefore, not considered to be related to the buried waste.

3.7 SUMMARY

After reviewing site-specific information, including site hydrogeology, physical and chemical characteristics of the contaminants, and current and potential future uses of the site, it has been concluded that the only potentially complete exposure pathways for COCs at Landfill No. 2 are (1) direct contact with subsurface soils if excavation occurs, and (2) exposure to groundwater, if the groundwater were to become contaminated with chemicals from Landfill No. 2.

The potential for COCs from Landfill No. 2 to impact groundwater is low, based on the concentrations and physical-chemical properties of the COCs and the hydrogeological characteristics of the site. Exposure to COCs in subsurface soil through excavation activities has also been determined to be an insignificant pathway based on comparison of RME concentrations to RCRA Action Levels derived for chronic residential exposures. COCs at this site do not occur at concentrations and/or frequencies that would be expected to adversely impact human health under current or likely future exposure conditions. Therefore, it is recommended that the NFRAP alternative be considered for Landfill No. 2.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RFI for Landfill No. 2, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RFI, including the BRA, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for Landfill No.2, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
METAL AND PURGEABLE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
LANDFILL NO. 2
SWMU NO. 82/IRP NO. LF-2
Cannon Air Force Base, New Mexico

Sample Number	Depth	Ag	As	Ba	Cd	Cr	Cu	Fe	Hg	Ni	O/G	Pb	Se	Zn	Purgeable Organics (EPA 9010/8020) (µg/kg)
		(Concentrations in mg/kg)													
2A-1	4.0-5.0'	1.0	1.6	89	0.50	9.5	5.3	9,100	0.13	7.5	ND	7.4	ND	25.0	ND
2A-2	9.0-10.0'	ND	1.3	80	ND	7.1	4.0	6,800	ND	4.7	ND	5.2	ND	16.0	ND
2B-1	4.0-5.0'	0.72	1.1	74	0.57	6.4	3.6	4,500	0.08	4.1	ND	3.3	ND	38.0	ND
2B-2	9.0-10.0'	0.66	3.7	580	0.43	4.1	5.0	2,500	0.21	3.3	ND	1.3	ND	36.0	ND
2C-1	4.0-5.0'	ND	4.0	79	0.27	7.9	5.8	8,000	0.10	8.4	ND	6.4	ND	68.0	ND
2C-2	9.0-10.0'	1.2	1.5	320	ND	5.8	2.4	4,500	0.017	3.6	ND	3.7	ND	61.0	ND
2D-1	4.0-5.0'	0.58	1.5	100	0.34	8.3	6.3	7,800	0.035	7.7	ND	7.0	ND	61.0	ND
2D-2	9.0-10.0'	0.57	11.0	89	ND	3.5	0.79	2,100	0.083	1.7	ND	1.9	ND	19.0	ND
2E-1	4.0-5.0'	0.38	0.74	110	0.40	7.8	7.5	8,700	0.068	5.8	ND	10.0	ND	57.0	ND
2E-2	9.0-10.0'	0.55	0.81	66	0.48	7.4	5.7	6,900	0.13	7.7	ND	7.5	ND	190.0	ND
2E-3	52.5-53.5'	0.35	ND	45	0.39	3.1	0.81	2,100	0.065	0.96	ND	0.90	ND	5.2	ND
2C-1a[1]	4.0-5.0'	ND	5.0	57	ND	4.7	4.5	5,000	0.09	8.5	ND	2.6	ND	16.0	ND

[1]Duplicate analysis of 2C-1

ND = Not detected

Data collected by Radian Corporation, IRP Phase II, 1986.

Source: Final Remedial Investigation Report for 18 Solid Waste Management Units (Woodward-Clyde 1992)

TABLE 3-1
COMPARISON OF 95% UCL CONCENTRATION WITH PROPOSED CORRECTIVE ACTION LEVELS FOR ORGANIC CHEMICALS OF CONCERN
LANDFILL NO. 2
SWMU NO. 82/IRP NO.LF-02
Cannon Air Force Base, New Mexico

Chemical	Toxicity Values		RCRA Action Level (mg/kg)	95% UCL Concentration* (mg/kg)
	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Chronic Oral RfD (mg/kg-day)		
Aroclor	7.7E+0		0.91	0.027
Benzo(a)anthracene	8.4E-01		0.83	0.23
Benzo(a)pyrene	5.8E+0		0.12	0.21
Benzo(b)fluoranthene	8.1E-01		0.86	0.23
Benzo(k)fluoranthene	3.8E-01		1.84	0.20
Chrysene	3.0E-02		23.33	0.22
Indeno-(1,2,3-c,d)pyrene	1.4E+0		0.50	0.20
Acenaphthene		6.0E-02	4800	0.19
Anthracene		3.0E-01	24000	0.21
Fluoranthene		4.0E-02	3200	0.33
Fluorene		4.0E-02	3200	0.20
Naphthalene		4.0E-03	320	0.19
Pyrene		3.0E-02	2400	0.29
Toluene		2.0E-01	16000	0.014**

* All 95% UCL Concentration values were calculated using guidance contained in the EPA Proposed Corrective Action Rule for Solid Waste Management Units ("RCRA Subpart S, 1990"), 55 FR 30798; July 27, 1990, except where otherwise noted.

** This value is a proposed Action Level contained in the EPA Proposed Corrective Action Rule for Solid Waste Management Units ("RCRA Subpart S, 1990"), 55 FR 30798; July 27, 1990.

Source: RCRA Facility Investigation Report for Landfill No.1 (SWMU No. 74/IRP No. LF-1) and Landfill No.2 (SWMU No. 82/IRP No. LF-2) (Woodward-Clyde 1993)

TABLE 3-2
COMPARISON OF MAXIMUM CONCENTRATIONS OF METALS IN SUBSURFACE SOIL SAMPLES TO RCRA ACTION LEVELS
LANDFILL NO. 2
SWMU NO. 82/IRP NO. LF-02
Cannon Air Force Base, New Mexico

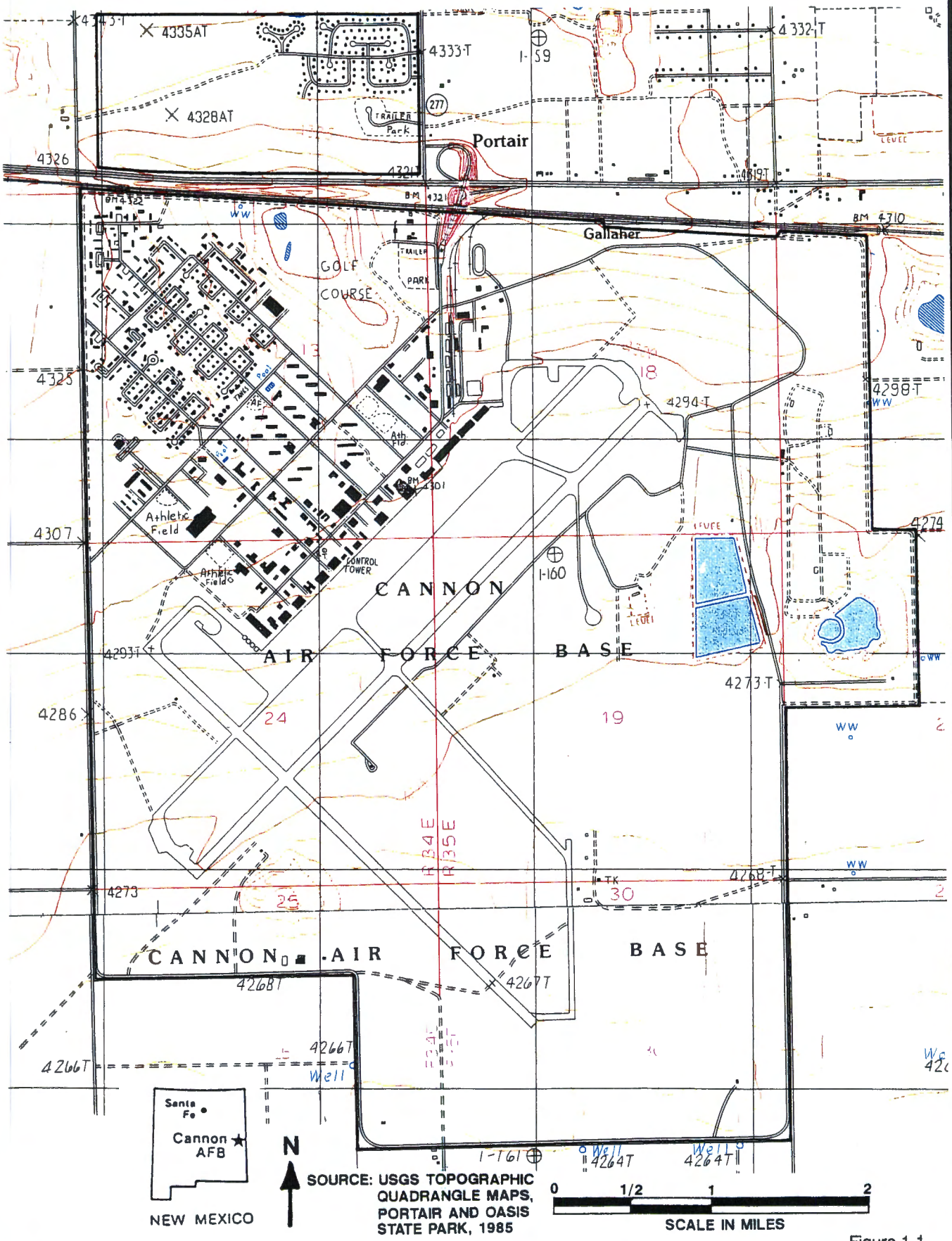
Metal	Maximum Concentration (mg/kg)	95% UCL Concentration (mg/kg)	RCRA Action Level (mg/kg)
Barium	5600	323	4000
Cadmium	1.4		40
Chromium	117		400*
Lead	20.2		500-1000**
Nickel	330		2000
Silver	2.6		200
Zinc	87.3		16000

* This Action Level is for chromium VI. The sample concentration reported is for total chromium.

** This concentration range is the EPA intrim soil cleanup level for total lead for chronic residential exposure (OSWER Directive 9355.4-02).

Source: RCRA Facility Investigation Report for Landfill No.1 (SWMU No. 74/IRP No. LF-1) and Landfill No.2 (SWMU No. 82/IRP No. LF-2) (Woodward-Clyde 1993)

FIGURES



SOURCE: Woodward-Clyde, February1996

Figure 1-1

GENERAL VICINITY MAP

LANDFILL No. 2
SWMU No. 82 / IRP No. LF-02
Cannon Air Force Base, New Mexico

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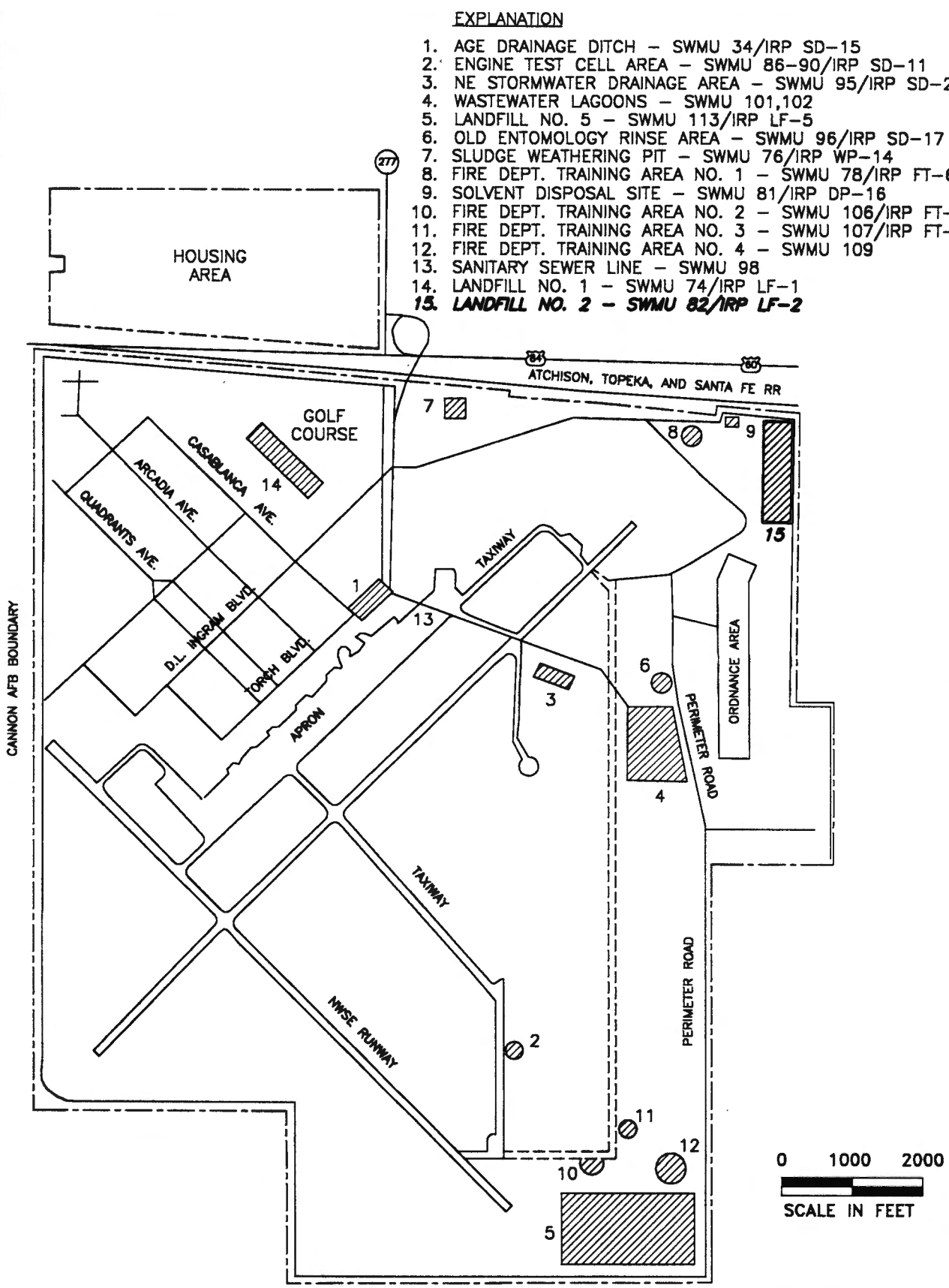

Figure 1-2

IRP/SWMU SITE LOCATION MAP

LANDFILL No. 2
SWMU No. 82 / IRP No. LF-02
Cannon Air Force Base, New Mexico

SOURCE: Woodward-Clyde, February1996

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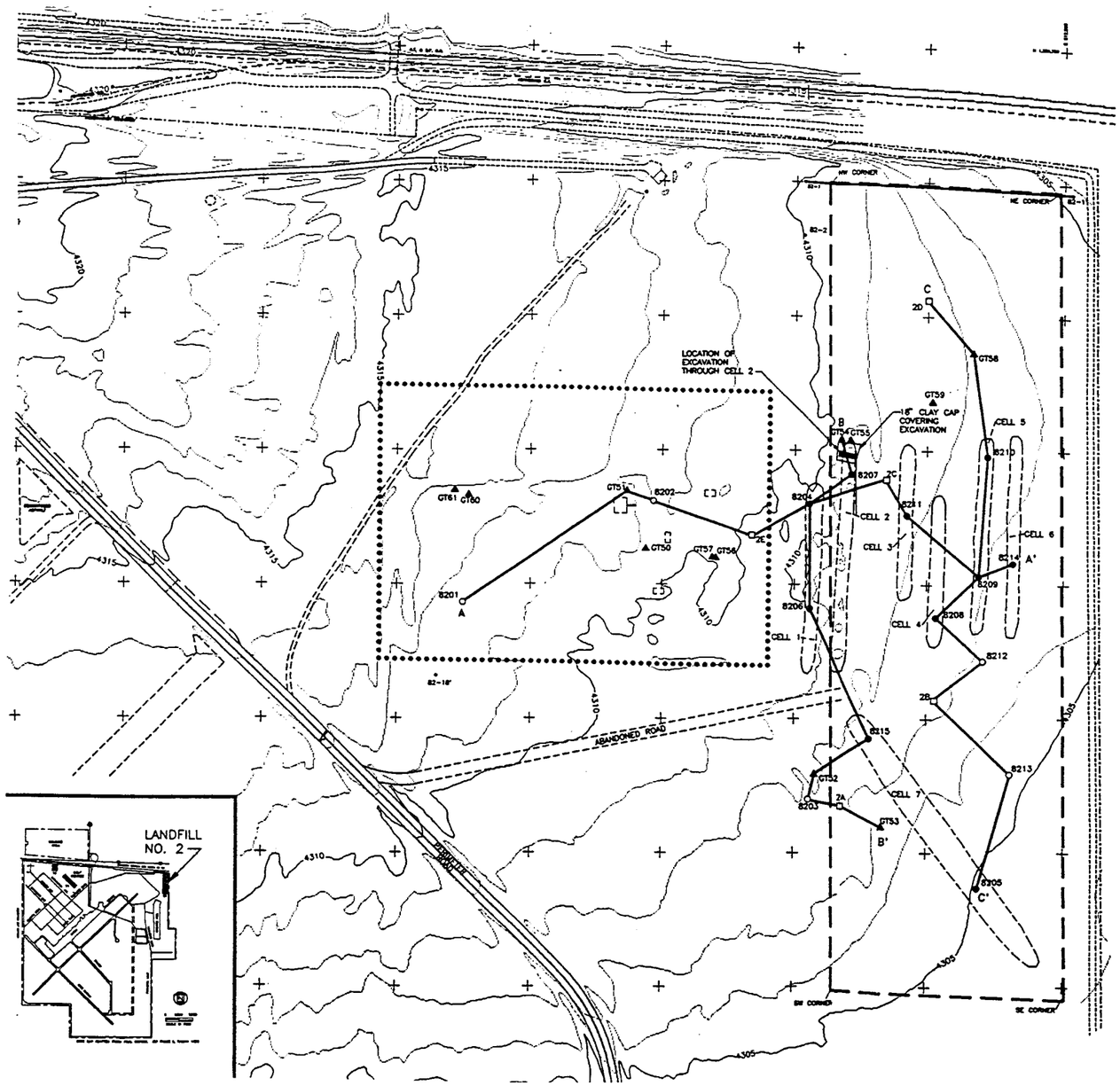

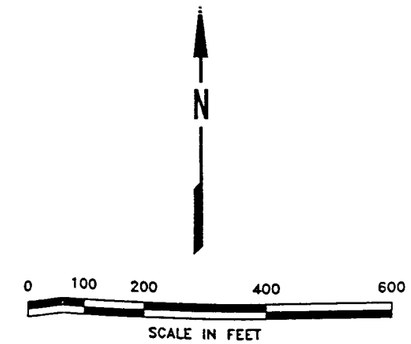

LEGEND:

- 4 WIRE B/W CANNON AFB BOUNDARY FENCE
- PAVED ROAD
- UNPAVED ROAD
- RAILROAD
- BUILDING
- CONCRETE FOUNDATIONS
- TOPOGRAPIC CONTOUR IN FEET MEAN SEA LEVEL CONTOUR INTERVAL = 1 FOOT
- DEPRESSION
- RAISED
- 8204 — W-C 1992 ANALYTICAL SOIL BORING LOCATION WHICH ENCOUNTERED LANDFILL MATERIAL
- 8201 — W-C 1992 ANALYTICAL SOIL BORING LOCATION WHICH DID NOT ENCOUNTER LANDFILL MATERIAL
- GT51 — W-C 1992 GEOTECHNICAL SOIL BORING LOCATION WHICH DID NOT ENCOUNTER LANDFILL MATERIAL
- 3A — RADIAN CORP. 1985 SOIL BORING LOCATION
- ESTIMATED EXTENT OF LANDFILL NO. 2 BASED ON WCC's REVIEW OF AERIAL PHOTOGRAPHS
- ESTIMATED EXTENT OF LANDFILL CELLS BASED ON AERIAL PHOTOGRAPHS, GEOPHYSICAL RESULTS, AND FIELD OBSERVATIONS
- A — A' GEOLOGICAL CROSS-SECTION LOCATION
- AREA SHOWING EVIDENCE OF SURFACE DISTURBANCE FROM AERIAL PHOTOGRAPHS

NOTE:

1. THE LOCATIONS OF THE SOIL BORINGS DRILLED BY W-C IN MARCH AND APRIL 1992. ARE BASED ON SURVEY DATA COLLECTED ON APRIL 28 AND 30, 1992. THE LOCATIONS OF THE SOIL BORINGS DRILLED BY RADIAN IN JANUARY 1985 ARE APPROXIMATIONS BASED ON FIGURE 4-3 FROM RADIAN'S 1986 IRP PHASE II REPORT.

SOURCE: Woodward-Clyde, February 1996

HARZA Consulting Engineers and Scientists

Figure 1-3

LOCATION OF SOIL BORINGS AND LANDFILL CELLS

LANDFILL No. 2
SWMU No. 82 / IRP No. LF-02
Cannon Air Force Base, New Mexico

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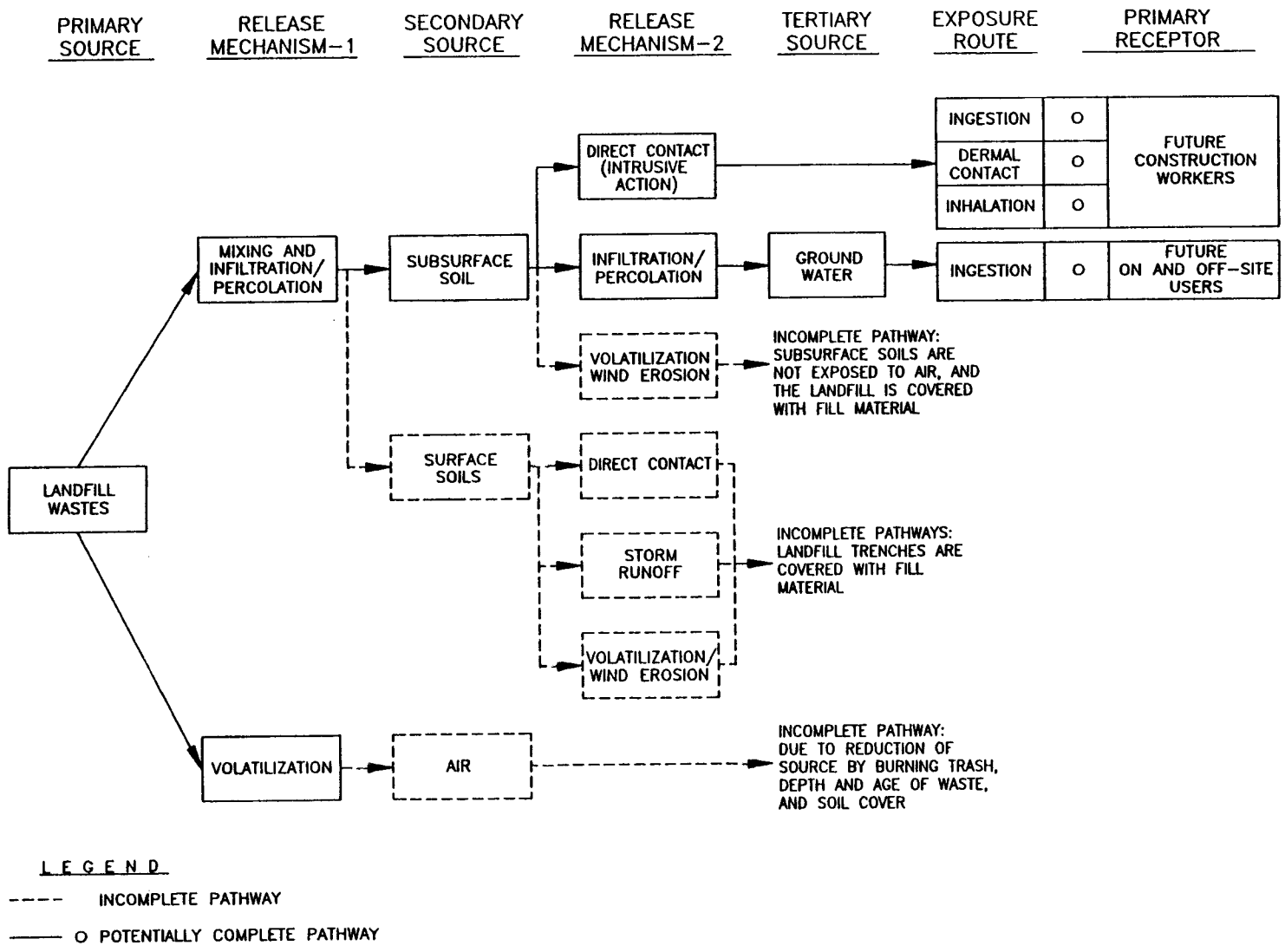

SOURCE: Woodward-Clyde, January 1993

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Figure 2-1

CONCEPTUAL SITE MODEL

LANDFILL No. 2
SWMU No. 82 / IRP No. LF-02
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the RCRA Facility Investigation (RFI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Landfill No. 2 (SWMU No. 78) in March and April, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

- RCRA Facility Investigation Report for Landfill No.1 (SWMU No. 74/IRP No. LF-1) and Landfill No.2 (SWMU No. 82/IRP No. LF-2), Cannon Air force Base, Clovis, New Mexico. W-C. 1993.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Northeast Stormwater Drainage Area
SWMU No. 95 / IRP No. SD-20

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

NE Stormwater Drainage Area
SWMU No. 95/IRP No. SD-20
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

NE Stormwater Drainage Area
SWMU No. 95/IRP No. SD-20

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for NE Stormwater Drainage Area (SWMU No. 95/IRP No. SD-20) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the NE Stormwater Drainage Area (SWMU No. 95/IRP No. SD-20) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at NE Stormwater Drainage Area (SWMU No. 95/IRP No. SD-20) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendices

Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyls
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
TAL	Target Analytical List
TCL	Target Compound List

LIST OF ACRONYMS

TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

NE Stormwater Drainage Area, designated as Solid Waste Management Unit (SWMU) No. 95 and Installation Restoration Program (IRP) No. SD-20, is an open drain which receives water from several oil/water separators and runoff water from runways and storm water drains in the east-central portion of the base. The NE Stormwater Drainage Area is unlined.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. NE Stormwater Drainage Area (SWMU No. 95) begins near the end of the northeast Runway 4/22 and extends southeast toward the wastewater lagoons. The northwest end of the ditch is marked by a concrete culvert and is surrounded by heavy vegetation. The site is shown as Area 3 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. NE Stormwater Drainage Area occupies an area nearly 3/4 of an acre and is less elevated than the land immediately surrounding it. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico and western Texas, and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. NE Stormwater Drainage Area is the only facility in use at this location. No buildings or other structures exist in this area. The primary facility near this site is the active northeast-southwest runway located northwest of the unit. The site is

characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. NE Stormwater Drainage Area is located in a remote section of the base. It is not frequented by base personnel. The vegetation is not mowed as other portions of the base are mowed. Three or four vehicles per day use a northeast-southwest road that crosses the southeastern end of the ditch. The site lies approximately 2/3 mile from the nearest on base housing.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

NE Stormwater Drainage Area is an open drain, about 40 feet wide and 800 feet long. It extends under a road and into a field. The northwest end of the ditch is marked by a concrete culvert and is surrounded by heavy vegetation.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The NE Stormwater Drainage Area is a natural depression extending approximately 40 feet from the northeast end of Runway 4/22 to an open field. The area receives runoff water from runways and stormwater drains in the east area of the base and formerly received water from several oil/water separators along the flightline. Water entering this SWMU may contain oil and grease, fuels, solvents, and alkaline-based aircraft cleaning compounds. The area is covered with prairie grass and grasses associated with wetlands. The vegetation is thick and remains green throughout the summer due to the volume of water received from runoff.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the USEPA at Cannon AFB by A.T. Kearney, Inc. (A.T. Kearney 1987). The purpose of the investigation was to identify and evaluate Solid Waste Management Units to assess the potential for hazardous waste or constituent releases to the environment. Results of this investigation identified NE Stormwater Drainage Area as a potential Solid Waste Management Unit.

- In late 1987 through early 1988, Walk, Haydel & Associates (WH&A) conducted the RI of four sites at Cannon AFB, including the NE Stormwater Drainage Area, to characterize the underground fuel tank and runoff areas. During this investigation eleven soil borings were drilled at the locations shown in **Figure 1-3**, and analytical samples were collected for volatile organic compounds (VOCs), base/neutral organics, and total metals.

- In September 1991, Woodward-Clyde (W-C) investigated this site as part of the RI conducted for 18 IRP/SWMU sites at Cannon AFB. Two soil borings (Borings 0951 and 0952) were drilled and surface and subsurface samples collected for chemical and geotechnical analyses. Results of the W-C investigation are summarized in Section 2.2.

1.2.2 Period of Operation

The NE Stormwater Drainage Area (SWMU No. 95) started receiving runoff from the runways in 1953. The oil/water separators presumably began discharging to the area after they were installed in 1969 (USAF 1990). Reportedly, the majority of flow in the ditch occurs as storm runoff only during precipitation events. During the 1991 RI by W-C, no flow was observed in the ditch.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that the NE Stormwater Drainage Area was used exclusively as a drainage ditch throughout its period of operation (1953 to present).

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

During its period of operation (1953 to present), NE Stormwater Drainage Area received runoff from the runways. In 1969, oil/water separators were installed and presumably began discharging to the drainage area.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI of this SWMU at Cannon AFB was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of the NE Stormwater Drainage Area indicate that remediation is not required under RCRA or the USAF IRP; however, monitoring would be conducted under 40 CFR parts 122, 123, and 124 (i.e., Stormwater regulations). Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

NE Stormwater Drainage Area (SWMU No. 95/IRP No. SD-20) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface stratigraphy at the NE Stormwater Drainage Area consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation. The fluvial deposits consist primarily of well sorted sand. The total thickness of these Ogallala deposits beneath the SWMU is not presently known. Based on regional information, they may be as thick as 390 feet.

From the lithologic descriptions obtained during this RI, two fairly distinct sand units are present beneath the IRP/SWMU site to a depth of 61 feet BGL. The lower fluvial deposits consist of fine-grained, well sorted, light to medium orange sands. These sands are comprised predominantly of subrounded to subangular quartz grains with varying amounts of calcareous nodules. This unit was only encountered in a previously drilled Boring B-1 at approximately 44 feet BGL (WH&A 1990). The thickness of this unit is unknown at present due to the fact that the unit was not fully penetrated.

The upper fluvial deposits consist of very fine- to fine-grained, well sorted, silty, calcareous light to pale brown sands. These sands are comprised predominantly of subangular quartz grains with slight to moderate amounts of silt and calcium carbonate. This unit is comprised of approximately 51 percent sand, 15 percent silt, and 34 percent calcium carbonate and/or clay-sized material. The thickness of this unit probably ranges from 40 to 41 feet thick. Approximately 4 to 5 feet of native topsoil exist above this unit. No groundwater was encountered during the drilling of the borings during the 1991 RI.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The soils underlying the NE Stormwater Drainage Area consist of sandy loam and loamy sand of the Amarillo Soil Group with a total thickness of approximately 4 to 5 feet (W-C 1992). The soils consist primarily of fine-to fine-grained, well sorted, silty, clayey, light brown sands. The sands are generally wet to very moist at depth, due to the constant drainage, pooling and infiltration of the two drainages. One gradation analysis was performed on a sample collected from this unit at 0.5 feet BGL in Boring 0951. The results indicate that this soil sample was comprised of approximately 48 percent sand, 23 percent silt, and 29 percent clay. The upper 2 to 3 feet of this soil unit is stained black to dark gray.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS 1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations have been conducted at Cannon AFB including the NE Stormwater Drainage Area. Results from the Preliminary Review/Visual Site Inspection, RCRA Facility Assessment performed in 1987 by A.T. Kearney, Inc. identified the NE Stormwater Drainage Area as a potential SWMU. The RCRA Facility Assessment also indicated that the potential for releases to the soil is high due to the unlined nature of the IRP/SWMU site.

In January 1988, eleven soil borings (Borings B1 through B11), shown in **Figure 1-3**, were drilled by WH&A to depths ranging from 5 to 60 feet. Analytical results contained in **Table 2-1** indicated the presence of detectable levels of long-chain organics within the upper 3 feet of sediment and oil at the mouth of the drainage ditch (Lee Wan and Associates 1990a). Barium and selenium were present at concentrations above background (**Table 2-2**). However, these metals are naturally occurring in soils and sediments and are known to accumulate in soils in arid climates. Lee Wan and Associates (1990a) attributed barium and selenium to natural sources. Review of other IRP data, as well as data from other sources, suggests that the concentrations of these metals in soils may be highly variable within a small area (WH&A 1990b).

W-C conducted further sampling at the NE Stormwater Drainage Area in 1991 to further evaluate the nature and extent of potential hazardous contaminants. Two soil borings (Borings 0951 and 0952) were drilled and surface and subsurface samples collected for chemical and geotechnical analyses (**Figure 1-3**). Surface samples were collected from 0 to 0.5 feet BGL at locations near each of the soil borings. Subsurface soil samples were collected at depths ranging from 2 to 8 feet BGL. All soil samples were analyzed for Target Compound List (TCL) VOCs, semi-VOCs, total petroleum hydrocarbons (TPH), and Target Analytical List (TAL) metals. Due to laboratory missed holding times for TCL VOCs, semi-VOCs, and TPH analyses on several of the original samples, resampling was performed near each original boring location as required to complete the investigation sampling program.

The results of the sampling and analysis of soils at this IRP/SWMU site, shown in **Table 2-3**, indicate no volatile or semivolatile organic compounds of concern were present. However, hydrocarbon contamination was detected at the upstream end of the ditch, at Boring 0951. The concentration of hydrocarbon contamination diminished to the southwest in the direction of flow in the drainage ditch. TPH contamination is supported by detections at Borings 0951 and 0952 and the occurrence of long-chain saturated hydrocarbon concentrations ranging from 49 to 73 mg/kg for Boring B1 of the previous Phase IV IRP Investigation in 1989. The data suggest that hydrocarbon contamination may extend laterally throughout the drainage ditch, with the higher concentrations being found near the mouth. The TPH contamination appears to be surficial (i.e., less than 2 feet BGL).

A variety of metals were detected in surface soil samples above background levels (**Table 2-4**). The metals which were detected above background concentrations at the upstream surface soil sample location (Boring 0951) were arsenic (3.9 mg/kg), cadmium (1.8

mg/kg), chromium (115 mg/kg), cobalt (12.6 mg/kg), copper (59 mg/kg), iron (41,200 mg/kg), lead (147 mg/kg) nickel (49.1 mg/kg), and zinc (467 mg/kg). At the downstream surface soil sample location (Boring 0952), arsenic (2.2 mg/kg), chromium (26.8 mg/kg), lead (31.6 mg/kg) and zinc (62.6 mg/kg) were detected in the surface soil sample. At both the upstream and downstream sample locations, metals concentrations in the subsurface soil samples were below or near background levels.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined aquifer, with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990b).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990b). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water

well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater because the depth to groundwater is approximately 270 ft BGL and the presence of caliche layers tends to inhibit downward migration of hazardous constituents. Therefore, no hydrogeologic investigation was planned or conducted at this site during W-C's remedial investigation and

no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to the NE Stormwater Drainage Area. Concentrations in surface soil at the site are expected to be higher than those in any transported soils; therefore, evaluation of surface soils at the site would be protective of the runoff pathway without the separate evaluation of surface waters. Therefore, no surface water information was collected as part of the RI by W-C in 1991.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with NE Stormwater Drainage Area. No air sampling was performed as part of this RI, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination. However, air modeling was performed in support of the baseline risk assessment.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. NE Stormwater Drainage Area is within RAA3, which also includes the Old Entomology Rinse Area and the Wastewater Lagoons.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

Current Exposure Scenario:

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB. The construction of residential homes is particularly unlikely in the Northeast Drainage Ditch since it is a natural drainage ditch. It would require a major earthworking endeavor to divert the natural runoff pattern in order to allow construction of residential homes.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of the NE Stormwater Drainage Area is greater than ½ acre and, therefore, future construction or intrusive action were considered plausible. Future construction workers and residents were assumed in these areas.

2.6.2 Pathways

The primary chemical sources in RAA3 include oily waste, alkaline aircraft cleaning compounds, pesticides and herbicides. Release of chemicals from soil include leaching of chemicals into groundwater, stormwater runoff to surface water, and direct contact with soils, fugitive VOC and dusts emissions.

Secondary release mechanisms from soil include leaching of chemicals to groundwater, stormwater runoff to surface water, direct contact with subsurface soils, fugitive VOC and dust emissions, and intrusive actions such as site excavation and construction. As a result of intrusive actions, ingestion or dermal absorption via direct contact with chemicals in surface and subsurface soils may occur. Disturbance of soil may result in the generation of fugitive dust, and release of VOC emissions into the air, providing a complete pathway by inhalation. Potential pathways are discussed below.

Soils. Direct contact with soils containing chemicals may result in potentially significant exposure via ingestion or dermal absorption. Such pathways may be particularly important in children. A high frequency of contact with soils by children is not expected under current conditions due to the location of these SWMUs and access limitations. Workers in the vicinity of these SWMUs are the most likely to come into contact with soils from these areas.

Air. Chemicals can be released into the air via volatilization or via fugitive dust emissions, resulting in potential exposures via inhalation.

Stormwater runoff. Storm water runoff may result in migration of chemicals from soil to surface water and from surface water to groundwater. Potential exposure routes for surface water include ingestion, direct contact (dermal contact), and ingestion of fugitive VOC emissions from surface water. These pathways are not expected to be complete due to the intermittent nature of on-site surface water runoff.

Groundwater. Potential exposure to groundwater may occur via ingestion, inhalation, or dermal absorption from showering, bathing, o other domestic uses of groundwater. The groundwater gradient in this area is to the southeast. The groundwater pathway is expected to be incomplete due to the great depth to the groundwater (over 260 feet) and the site geology (presence of clay and caliche).

Crop Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils.

Atmospheric Deposition of Airborne Particulates on Edible Crops. Atmospheric deposition of airborne particulates on edible crops located off-site (or within the RAA under the future exposure scenario) is possible due to land use in the area. This exposure pathway is not expected to be significant based on the concentrations of chemicals detected in soils from this RAA. Fugitive dust inhalation by workers is expected to result in greater levels of chemical intake. If the results of

risk characterization from the inhalation routes for workers and future residents in this RAA are acceptable, it is likely that indirect exposure via ingestion of edible crops is also insignificant.

Based on the above, potential receptors for this site are current and future Maintenance Workers, future Construction Workers, and future Adult and Child Residents. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in potential ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA3 is provided in **Figure 2-1**.

3.0
DATA ANALYSIS/RISK ASSESSMENT

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed in 1991 by W-C under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989a), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA3 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA3 were metals, volatile organic chemicals, and pesticides. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors. Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA3. Future intrusive action or residential scenarios were judged to be plausible for RAA3 because it is larger than ½ acre in area. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA3: toluene, heptachlor epoxide, chlordane, DDD, DDE, DDT, PCBs, BEHP, cadmium, cobalt, mercury, barium, chromium, lead, selenium, silver, nickel and zinc. RAA3 includes the NE Stormwater Drainage Area (SWMU No. 95), the Old Entomology Rinse Area (SWMU No. 95), and the Wastewater Lagoons (SWMU No. 101 and 102). Of the COCs listed above, only toluene, heptachlor epoxide, chlordane, DDE, DDT, cadmium, cobalt, mercury, barium, chromium, lead, nickel and zinc were found to be present at NE Stormwater Drainage Area (SWMU No. 95).

Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA3 were well below the current EPA interim guidance (EPA 1994) for residential soil lead cleanup levels (400 mg/kg).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure and potential risks and hazards associated with groundwater use were not evaluated in the BRA.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 for current and future Maintenance (general duty) Workers, future Construction Workers and for future Adult and Child Residents.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA3 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for each receptor.

Current and future maintenance workers were assumed to be routinely exposed to site chemicals for 9 to 25 years. The total hazard index calculated for noncarcinogenic health effects due to cumulative exposures to soil via ingestion, dermal contact, and

inhalation of VOCs and particulates is 3.4E-02 and 1.6E-01 in the average and RME conditions respectively. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

Future construction workers were assumed to be exposed to chemicals 8 hours per day, 20 days per year and 40 days per year for the average and RME exposure scenarios, respectively. The total hazard index is 3.6E-03 and 3.0E-02 in the average and RME conditions, respectively, for noncarcinogenic health effects due to cumulative exposures to soil via ingestion, dermal contact, and inhalation of VOCs and particulates.

Hypothetical future adult and child residents were assumed to be routinely exposed to site chemicals for 9 to 30 years. For the future adult resident, the total hazard index calculated for noncarcinogenic health effects due to cumulative exposures to soil via ingestion, dermal contact, and inhalation of VOCs and particulates is 1.8E-01 and 5.6E-01 in the average and RME conditions, respectively. Average and RME hazard indexes calculated for the future child resident were 7.2E-01 and 8.8E-01, respectively. Hazard indexes for these two hypothetical future residents are below the EPA level of concern (1.0).

Carcinogenic Risks. Carcinogenic risks are also indicated in **Table 3-3**. The total carcinogenic risk (i.e., risks for all pathways combined), for the average and the RME exposures for current and future maintenance workers were 1.2E-10 and 2.6E-8 respectively. These risks are below the EPA's target risk range (1.0E-04 and 1.0E-06) for Superfund sites (EPA 1989b). The primary exposure pathway contributing the majority of the cancer risk was inhalation of particulates.

The lifetime excess cancer risk to future construction workers under the assumed exposure conditions is 2.3E-10 and 1.1E-9 in the average and RME cases, respectively. Soil ingestion is the chief contributor to the risk estimates. These levels are at or below the target risk range of 1 E-06 to 1 E-04 for exposure to chemicals released from RAA3.

The lifetime excess cancer risk to hypothetical future adult and child residents under the assumed exposure conditions is 8.6E-09 and 2.2E-7 for the hypothetical adult resident and 4.5E-08 and 5.1E-07 for the hypothetical child resident in the average and

RME cases, respectively. For the average exposure scenario, inhalation of particulates is the chief contributor to the risk estimates, while the RME scenario has soil ingestion as the primary contributor to the risk estimates. These levels are at or below the target risk range of 1 E-06 to 1 E-04 for exposure to chemicals released from RAA3.

Lead as a Potential Risk/Hazard. The maximum level of lead detected in soils at RAA3 was 147 mg/kg in surficial soil, well below the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994).

Air modeling was performed to determine the lead concentrations in ambient air. For the average and RME exposures, the estimated ambient concentrations of lead were well below the EPA's background value of 0.200 $\mu g/m^3$ (EPA 1991).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) were detected in soils at levels which were considered to be above background. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA3. The total noncarcinogenic HIs for all receptors were below the EPA's level of concern (1.0) at RAA3 for both individual exposure pathways and combined exposure pathways. The total carcinogenic risks for the average and RME exposures for workers and potential residents were below the EPA's target risk range of 1.0E-04 to 1.0E-06 for a Superfund site.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA3, which includes the NE Stormwater Drainage Ditch.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for NE Stormwater Drainage Area, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

A review of Applicable or Relevant and Appropriate Requirements (ARARs) indicated that the NE Stormwater Drainage Area will likely be required to comply with the new stormwater discharge regulations contained in 40 CFR parts 122, 123, and 124. Cannon AFB is currently in the permit application process to comply with the new regulations.

In the permit Cannon proposes to monitor effluent in the NE Stormwater Drainage Ditch annually during a storm event. The effluent sample will be analyzed for the following parameters:

- Volatile organic compounds
- Semi-volatile organic compounds
- Pesticides/PCBs
- Metals (antimony, barium, beryllium, cadmium, chromium, copper, lead, silver, thallium, zinc)

Other ARARS were reviewed during the RI, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

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TABLES

TABLE 2-1
ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES[1]
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

Sample Depth (Ft-BGL)	Compound	Boring Number	
		B1	B8
0-1	2,5,9-Trimethyl-decane	73,000	340
	7-Methyl-tridecane	56,000	
	2,7,10-Trimethyl-dodecane	60,000	
	2,6-Dimethyl-heptadecane	49,000	
	2,6,7-Trimethyl-decane	73,000	
	Ethylbenzene		37
	Total Xylene		70
2-3	4-Propyl-heptane	52,000	
	2,5,9-Trimethyl-decane	70,000	
	7-methyl-tridecane	74,000	
	2,7,10-Trimethyl-dodecane	37,000	
	2,6-Dimethyl-heptadecane	70,000	

Ft-BGL = Feet below ground level

[1]All concentrations are in micrograms per kilogram (μg/kg)

Source: Final Report, IRP Phase IV (Walk, Haydel and Associates Inc. 1990)

TABLE 2-2
SELENIUM AND BARIUM CONCENTRATIONS IN SOIL SAMPLES[1]
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

Sample Depth (Ft-BGL)	Boring Number										
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
0-1			149.1	61.8		NS	NS	NS	NS	NS	NS
0-1.5	NS	NS	NS	NS	NS	80.2		54.2	105	153.9	68.2
2-3	174.1	150.6	131.3 (1,499)			NS	NS	NS	NS	NS	NS
2.5-4	NS	NS	NS	NS	NS	162.3		94.9 (4,294.6)	175.2	149.4	94.6
4-5	185.9	149.7	273	71.4	68.9	NS	NS	NS	NS	NS	NS
5-6.5	NS	NS	NS	NS	NS	120.6	53.3		75.3	174.4	76.6
7.5-9	NS	NS	NS	NS	NS		81.2	78.6	129.5	140.8	57.1
10-11.5	NS	NS	NS	NS	NS	124.7			132.4		
15-16.5	NS	NS	NS	NS	NS	142.1		75.8		74.1	
20-21.5	NS	NS	NS	NS	NS	138.6			130.5	106.8	NS

TABLE 2-2 (continued)
SELENIUM AND BARIUM CONCENTRATIONS IN SOIL SAMPLES[1]
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

Sample Depth (Ft-BGL)	Boring Number										
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
25-26.5	NS	NS	NS	NS	NS	100.6	111.2		106.2	83.3	NS
30-31.5	NS	NS	NS	NS	NS		101.2		106.3		
45-46.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
60-61.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	

Ft-BGL = Feet Below ground level
NS = Sample not collected in accordance with Scope of Services/Sampling Plan
( ) = The values in parentheses are for barium, all other values are for selenium

[1]All concentrations are in milligrams per kilogram (mg/kg)

Source: Final Report, IRP Phase IV (Walk, Haydel and Associates, Inc. 1990)

TABLE 2-3
TOTAL PETROLEUM HYDROCARBON, VOLATILE, AND SEMI-VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

Boring Number (Redrill Boring Number)	Sample Depth (Ft-BGL)	TPH (mg/kg)	Volatile Organics[1]				Semi-Volatile Organics[1]		
			Acetone (μg/kg)	2-Butanone (μg/kg)	Methylene Chloride (μg/kg)	Toluene (μg/kg)	2-Methyl naphthalene (μg/kg)	bis(2-Ethylhexyl) phthalate (μg/kg)	Butyl benzyl phthalate (μg/kg)
0951 (0953)	0 to 0.5	1,260	(140J)	(23J)	(57UJ)	(57U)	1,300J	1,700J	7500U
	2 - 4	(48.5U)	(22)	(12U)	(2J)	(12U)	390U	350J	390U
	4 - 6	(46.4U)	11J	11U	11U	11U	380U	380U	380U
	8 - 10	(46.5U)	17	11U	11U	11U	(380U)	(45J)	(240J)
0952 (0954)	0 - 0.5	285	12U	12UJ	12U	3J	8,200U	8,200U	8200U
	2 - 4	(49U)	(21)	(12J)	(3J)	(12U)	(400U)	(400U)	(120J)
	4 - 6	(49.9U)	37U	12U	12U	12U	410U	410U	410U
	8 - 10	48.5U	(12UJ)	(12UJ)	(2UJ)	(12UJ)	400U	190J	400U

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
μg/kg = Micrograms per kilogram
CRQL = Contract Required Quantitation Limit
( ) = The values in parentheses are results from samples collected from the redrill borings due to laboratory missed holding times.

U = Not detected at the concentration given
J = Estimated concentration
UJ = Estimated as non-detect at the CRQL

[1]Only the volatile and semi-volatile organic compounds listed were detected (or estimated) in soil samples. All values are in μg/kg (micrograms per kilogram). All other volatile and semi-volatile organic compounds were not detected.

Source: Final Remedial Investigation Report for 18 solid waste management units (Woodward-Clyde 1992)

TABLE 2-4
METAL CONCENTRATIONS IN SOIL SAMPLES[1]
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

Element	Boring 0951 Sample Depth (Ft-BGL)				Boring 0952 Sample Depth (Ft-BGL)				Background[2] $\bar{x} + 2\sigma$
	0-0.5	2-4	4-6	8-10	0-0.5	2-4	4-6	8-10	
Aluminum	2,180	4,560	9,840	7,840	6,320	4,160	4,760	5,240	2,571-10,447
Antimony	5.1UJ	5.4UJ	5.2UJ	5.2UJ	5.8UJ	5.6UJ	5.6UJ	5.5UJ	4.81-5.44
Arsenic	3.9	1.5J	2.3	1.3J	2.2J	1.9J	1.8J	1.9J	0.43-1.95
Barium	3820	255	188	50.9	184	74.3	82.7	239	0-903
Beryllium	0.44U	0.47U	0.54J	0.54J	0.51U	0.48U	0.49U	0.48U	0.32-0.68
Cadmium	1.8	0.94U	0.91U	0.9U	1U	0.97U	0.97U	0.97U	0.81-1.01
Calcium	144,000	223,000	88,900	109,000	137,000	146,000	127,000	160,000	0-193,062
Chromium	115J	4.2	7.6	6.6	26.8J	4.4J	4.3J	4.4J	2.67-9.31
Cobalt	12.6	2.7J	4.3J	3J	3.5J	1.5J	2.4J	3.1J	1.38-4.06
Copper	59	4.3U	6.1U	4.5U	14U	4.7U	4U	4.3U	0.00-15.44
Iron	41,200	2,660	6,530	4,730	6,310	3,810	3,880	3,800	2,239-8,683
Lead	147	1.6	4.8	3.1	31.6	3.6	3.3	2.9	1.76-8.64
Magnesium	2,740	3,910	4,500	4,340	2,610	2,360	2,290	3,450	0-11,903
Manganese	443	115	103	57.2	165	106	99.9	113	10.89-167
Mercury	0.38	0.12U	0.11U	0.11U	0.13U	0.12U	0.12U	0.12U	-- - --

TABLE 2-4 (continued)
METAL CONCENTRATIONS IN SOIL SAMPLES[1]
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

Element	Boring 0951 Sample Depth (Ft-BGL)				Boring 0952 Sample Depth (Ft-BGL)				Background[2] $\bar{x} + 2\sigma$
	0-0.5	2-4	4-6	8-10	0-0.5	2-4	4-6	8-10	
Nickel	49.1	5.6J	9.6	6.8J	8.1J	4.7J	4.6J	4.9J	3.57-8.49
Potassium	448J	814J	2030	1680	1130J	982J	1110J	1110J	632-2613
Selenium	0.22UJ	2.3UJ	2.3UJ	2.2UJ	2.5UJ	2.4UJ	2.4UJ	2.4UJ	0.00-1.35
Silver	0.88U	1J	0.91U	0.9U	1U	0.97U	0.97U	0.97U	0.86-0.94
Sodium	6410	5570	3140	1170	1850	1410	1800	1420	154-540
Thallium	0.22UJ	2.3UJ	2.3UJ	0.22UJ	0.25UJ	0.24U	0.24U	0.24UJ	0.20-0.24
Vanadium	15.5	9.4J	20.7	14.3	13.8	12.5	11.5J	11.6J	9.26-26.74
Zinc	467J	7.6	17.4	11.3	62.6J	9	8.8	9.3J	4.58-21.82

Ft-BGL = Feet below ground level
UJ = Estimated as non detect at the instrument detection limit
J = Estimated value
U = Not detected
-- - -- = No range could be calculated

[1] All concentrations are in milligrams per kilogram (mg/kg)
[2] Background range calculated from concentrations in Table 2-7 on the RI Report (W-C 1992)

Source: Final Remedial Investigation Report for 18 Solid Waste Management Units (Woodward-Clyde 1992)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1(continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level

(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2(continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL

(1) = MCL for total trihalomethanes (2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA3
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index
Current Worker - Maintenance						
-- Soil Ingestion	1.11E-10	1.21E-04	1.30E-04	1.02E-08	7.46E-03	7.86E-03
-- Dermal Contact - Soil	4.32E-11	5.27E-06	2.42E-06	3.55E-09	1.56E-05	7.18E-05
-- Inhalation - VOCs	4.76E-11	2.75E-07	2.75E-07	3.48E-10	1.20E-06	1.20E-06
-- Inhalation - Particulates	9.49E-10	3.40E-03	3.40E-02	1.17E-08	1.50E-02	1.50E-01
Total	1.15E-09	3.52E-03	3.41E-02	2.57E-08	2.25E-02	1.58E-01
Future Worker - Maintenance						
-- Soil Ingestion	1.11E-10	1.21E-04	1.30E-04	1.02E-08	7.46E-03	7.86E-03
-- Dermal Contact - Soil	4.32E-11	5.27E-06	2.42E-06	3.55E-09	1.56E-05	7.18E-05
-- Inhalation - VOCs	4.76E-11	2.75E-07	2.75E-07	3.48E-10	1.20E-06	1.20E-06
-- Inhalation - Particulates	9.49E-10	3.40E-03	3.40E-02	1.17E-08	1.50E-02	1.50E-01
Total	1.15E-09	3.52E-03	3.41E-02	2.57E-08	2.25E-02	1.58E-01

TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA3
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

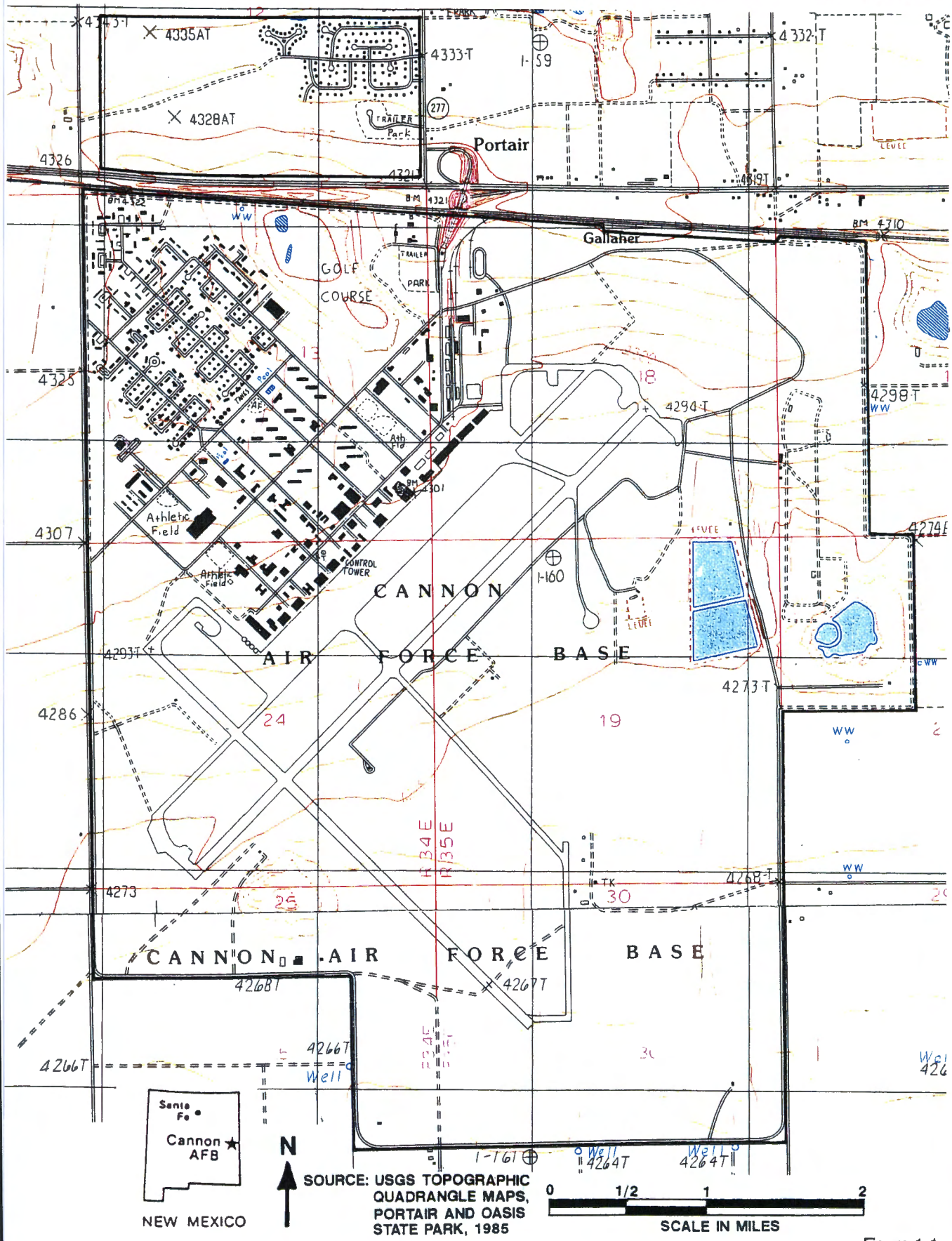
	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index
Future Worker - Intrusive						
-- Soil Ingestion	1.30E-10	4.06E-04	8.84E-04	5.21E-10	4.21E-03	4.57E-03
-- Dermal Contact - Soil	1.01E-11	1.11E-06	5.11E-06	9.09E-11	1.00E-05	4.60E-05
-- Inhalation - VOCs	0.00E+00	1.90E-07	1.90E-07	0.00E+00	9.48E-07	9.48E-07
-- Inhalation - Particulates	8.51E-11	3.13E-04	3.12E-03	4.51E-10	2.14E-03	2.14E-02
Total	2.25E-10	7.20E-04	3.61E-03	1.06E-09	6.36E-03	2.96E-02
Future Resident - Adult						
-- Soil Ingestion	8.02E-10	2.78E-04	3.31E-04	1.37E-07	3.68E-02	4.00E-02
-- Dermal Contact - Soil	3.11E-10	3.81E-06	1.75E-05	2.39E-08	8.76E-05	4.02E-04
-- Inhalation - VOCs	0.00E+00	4.82E-06	4.82E-06	0.00E+00	1.02E-05	1.02E-05
-- Inhalation - Particulates	7.46E-09	1.83E-02	1.83E-01	5.57E-08	5.20E-02	5.20E-01
Total	8.58E-09	1.86E-02	1.84E-01	2.16E-07	8.90E-02	5.61E-01

TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA3
NE STORMWATER DRAINAGE AREA
SWMU NO. 95/IRP NO. SD-20
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index
Future Resident - Child						
-- Soil Ingestion	1.56E-08	5.41E-03	6.44E-03	3.99E-07	1.07E-01	1.17E-01
-- Dermal Contact - Soil	3.43E-10	4.20E-06	1.93E-05	2.60E-08	9.55E-05	4.38E-04
-- Inhalation - VOCs	0.00E+00	1.87E-06	1.87E-06	0.00E+00	1.49E+05	1.49E-05
-- Inhalation - Particulates	2.90E-08	7.13E-02	7.12E-01	8.12E-08	7.59E-02	7.58E-01
Total	4.50E-08	7.67E-02	7.19E-01	5.06E-07	1.83E-01	8.76E-01

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

Figure 1-1

GENERAL VICINITY MAP

NORTHEAST STORMWATER DRAINAGE AREA
SWMU No. 95 / IRP No. SD-20
Cannon Air Force Base, New Mexico

HARZA *Consulting Engineers and Scientists*

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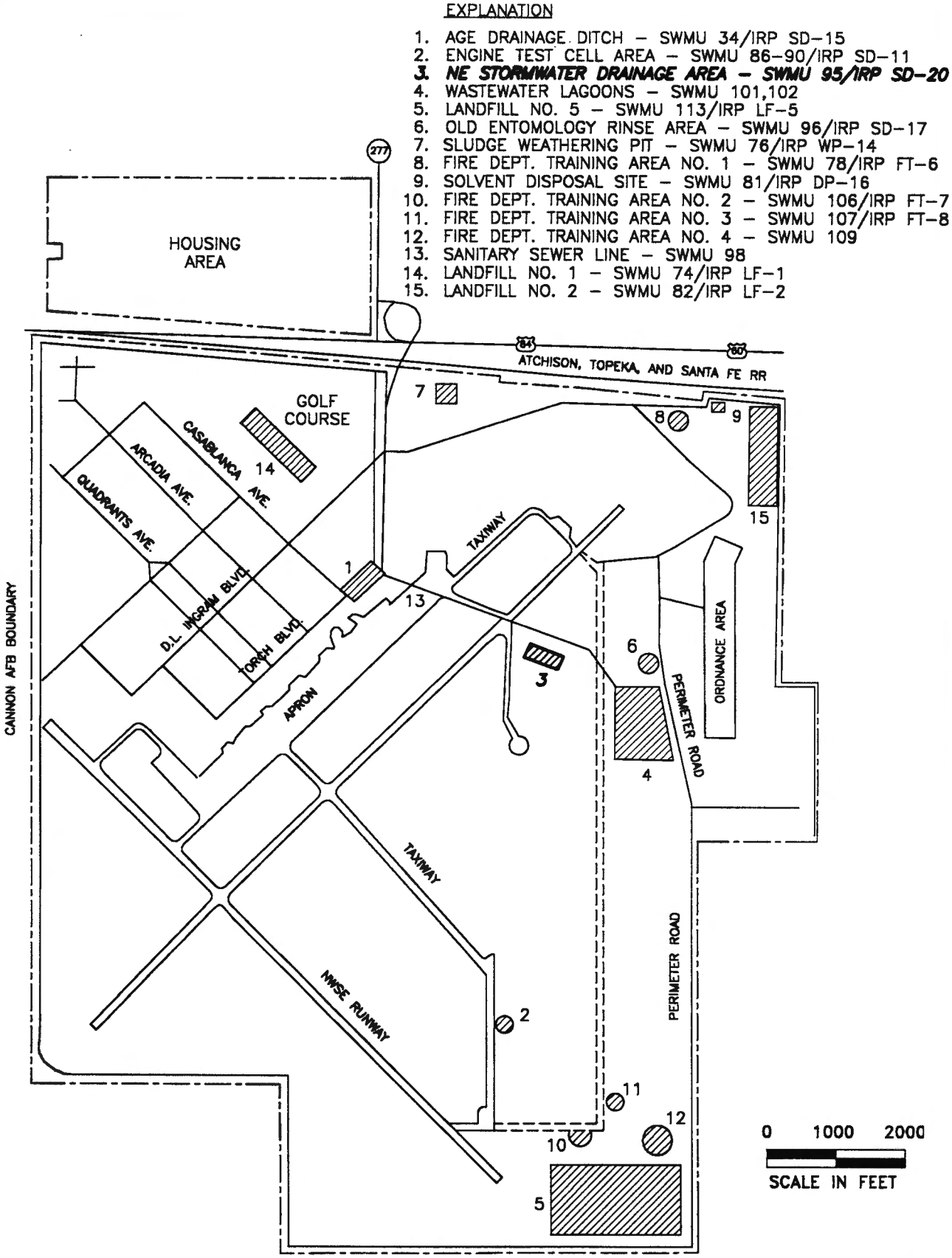

SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-2

IRP/SWMU SITE LOCATION MAP

NORTHEAST STORMWATER DRAINAGE AREA
SWMU No. 95 / IRP No. SD-20
Cannon Air Force Base, New Mexico

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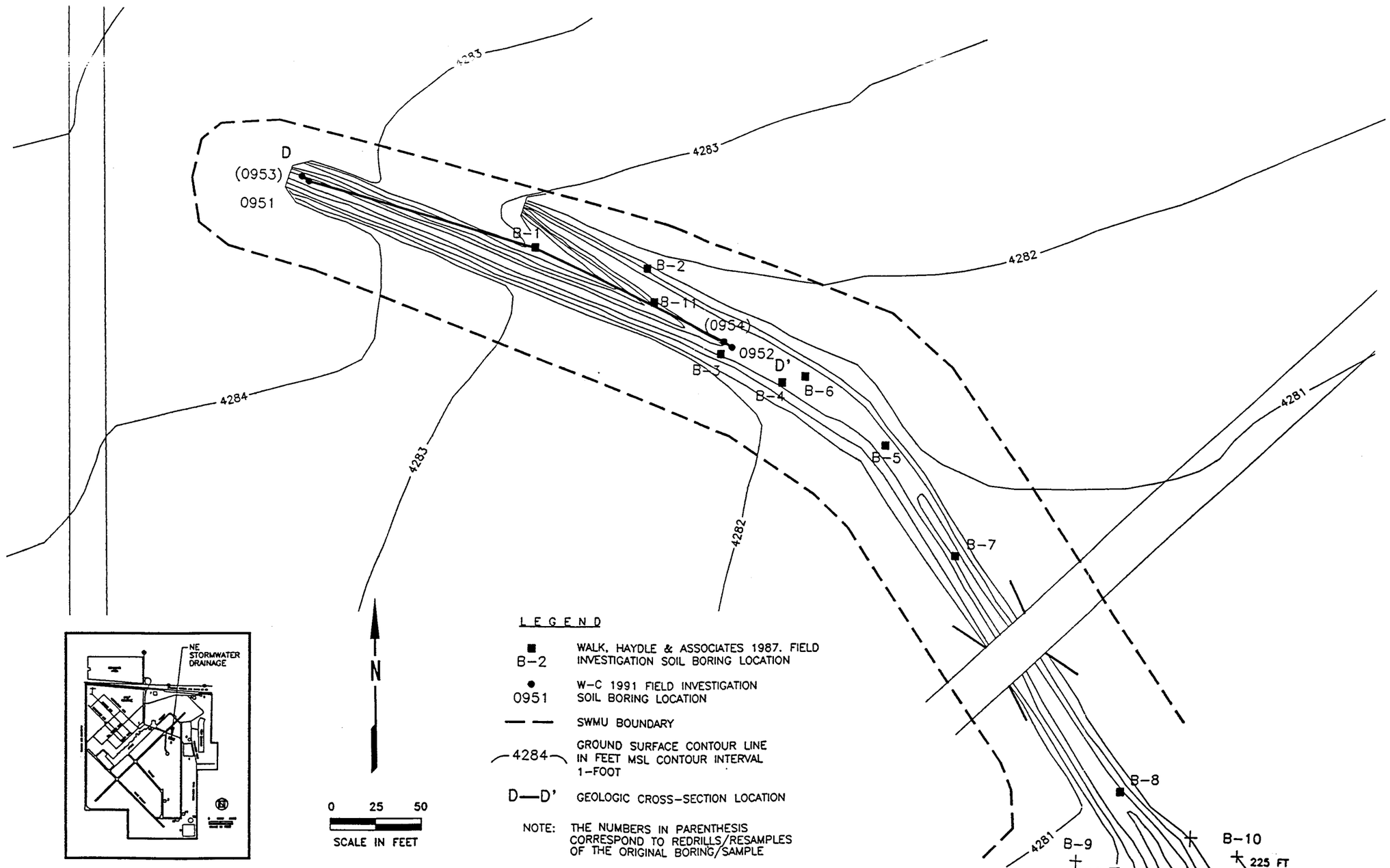

SOURCE: Woodward-Clyde, February 1996

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Figure 1-3

LOCATION OF SOIL BORINGS

NORTHEAST STORMWATER DRAINAGE AREA
SWMU No. 95 / IRP No. SD-20
Cannon Air Force Base, New Mexico

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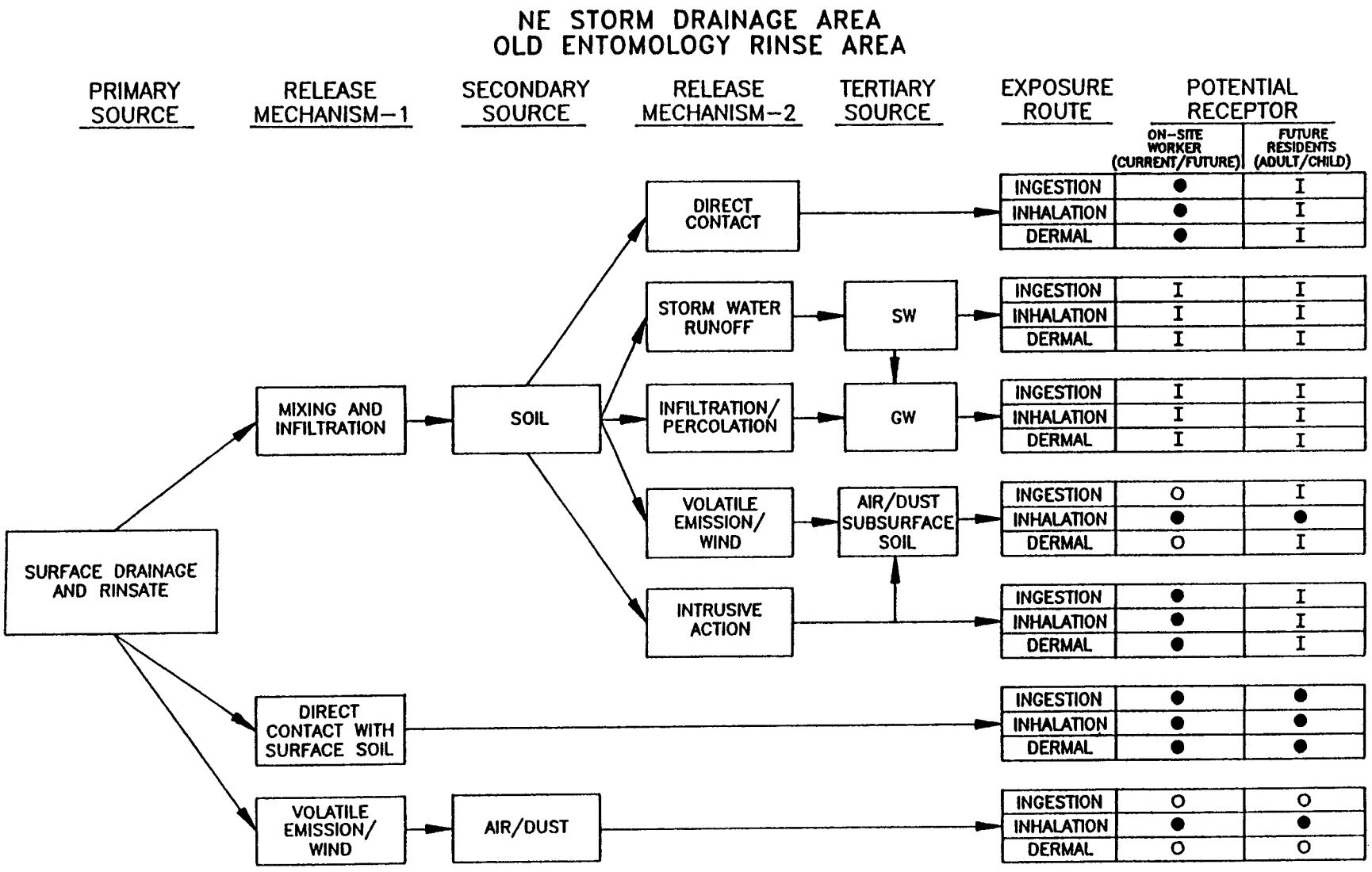

LEGEND

I INCOMPLETE EXPOSURE PATHWAYS
● SIGNIFICANT EXPOSURE PATHWAY
O RELATIVELY INSIGNIFICANT EXPOSURE PATHWAY

SOURCE: Woodward-Clyde, October 1992

HARZA Consulting Engineers and Scientists

Figure 2-1
CONCEPTUAL SITE MODEL
NORTHEAST STORMWATER DRAINAGE AREA
SWMU No. 95 / IRP No. SD-20
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for NE Stormwater Drainage (SWMU No. 95) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Installation Restoration Program Remedial Investigation, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. January, 1990.

  This report is a RI of four IRP sites at Cannon AFB including SD-11, SD-12, SD-20, and FT-9.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

  This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Solvent Disposal Site
SWMU No. 81 / IRP No. DP-16

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Solvent Disposal Site
SWMU No. 81/IRP No. DP-16
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Solvent Disposal Site
SWMU No. 81/IRP No. DP-16

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the Solvent Disposal Site (SWMU No. 81/IRP No. DP-16) of the Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the Solvent Disposal Site (SWMU No. 81/IRP No. DP-16) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the Solvent Disposal Site (SWMU No. 81/IRP No. DP-16) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CRQL	Contract Required Quantitation Limit
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
TCL	Target Compound List

LIST OF ACRONYMS

UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.1 SITE LOCATION AND DESCRIPTION

The Solvent Disposal Site, designated as Solid Waste Management Unit (SWMU) No. 81 and Installation Restoration Program (IRP) No. DP-16, was first identified in the 1983 IRP Phase 1 Records Search. The site consisted of two empty drums labeled "trichloroethylene" laying on the ground and positioned to drain into a shallow pit.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. The Solvent Disposal Site (SWMU No. 81) is located in the northeast corner of the base, 300 ft east of Fire Training Area No. 1 and 100 ft south of the north installation fence. The site is shown as Area 9 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. The Solvent Disposal Site occupies an area approximately 50 ft in diameter and is essentially flat. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The Solvent Disposal Site is within an area characterized by the Cannon AFB Base Comprehensive Plan as an Open Area. Open Areas are defined as conservation areas and required buffer space. The site is also characterized as Open

Space according to the U.S. Air Force's Rational National Standards Initiative. To the west of the Solvent Disposal Site is an Aircraft Operations and Maintenance Facilities area and to the south is an Industrial Area (W-C 1995). To the north and east of the site is the base property boundary. The Solvent Disposal Site is located in a open field covered with prairie grass. Ground contractors now mow the area once per month for approximately 5 to 10 minutes, for 6 months of the year.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The Solvent Disposal Site is located approximately 2 to 3 miles from on-base family housing areas. These housing areas include on-base facilities at the northwest corner of the base and the Chaves Manor Housing Area, north of U.S. Highway 60/84.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The Solvent Disposal Site occupies an approximately circular area of 50 feet in diameter. The facility now appears as an open field covered with prairie grass.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The Solvent Disposal Site was first identified in the 1983 IRP Phase 1 Records Search as consisting of two empty drums labeled "trichloroethylene" laying on the ground. The drums were positioned to drain into a shallow pit. Each drum had rust holes, suggesting that they had been there for several years (CH_2M Hill 1983).

Although the Solvent Disposal Site was first identified in 1983, it was not permanently marked. The site could not be located during the Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)

conducted by A.T. Kearney in 1987. The site was subsequently located by USAF personnel for the W-C RI effort, although no visual indications for the site were observed.

In September 1991, W-C investigated this site as part of a Remedial Investigation (RI) for 18 IRP/SWMU sites at Cannon AFB by drilling 10 soil borings (**Figure 1-3**). Summary results of that investigation are contained in Section 2.2 of this document.

1.2.2 Period of Operation

The period of operation of the Solvent Disposal Site (SWMU No. 81) is not known; however, it is likely that its use was discontinued prior to 1983. The drums found on the site had rust holes in the top suggesting they had been there for several years (CH_2M Hill 1983).

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

The site has been used as solvent disposal site for an unknown period of time.

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;

- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

There is no known record of releases at the Solvent Disposal Site. In the 1983 IRP Phase 1 Records Search, two empty drums labeled "trichloroethylene" were found laying on the ground. The drums were positioned to drain into a shallow pit.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI at the Solvent Disposal Site was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the

1991 RI of the Solvent Disposal site indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

The Solvent Disposal Area (SWMU No. 81/IRP No. DP-16) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface stratigraphy at the Solvent Disposal Site consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation. Stratigraphic correlations of the various fluvial deposits between borings is based primarily on the split spoon lithologic samples collected during drilling. The total thickness of the Ogallala deposits beneath the IRP/SWMU is not presently known, but based on regional information, may be as thick as 390 feet.

Based on the information obtained from the 1991 RI performed by W-C, this IRP/SWMU site is underlain by Ogallala fluvial deposits consisting primarily of well sorted sand. The fluvial deposits consist of fine- to very fine-grained, well sorted, silty, calcareous medium to light orange and brown sands. These sands are comprised predominantly of subangular to subrounded quartz grains with varying amounts of silt, calcium carbonate, and very minor amounts of clay. Scattered throughout this unit is tan to tan-orange caliche pockets or nodules. This unit is comprised of approximately 30 to 45 percent sand, 17 to 19 percent silt, and 38 to 51 percent calcium carbonate and/or clay-sized material. The thickness of this unit is unknown at present due to the fact that the unit was not fully penetrated. Approximately 2 to 5 feet of native topsoil exists above this unit (see Section 2.2.1). No groundwater was encountered during the drilling of these borings.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

Soils underlying the Solvent Disposal Site area consist of sandy loam and loamy sand of the Amarillo Soil Group with a total thickness of 2-5 feet (W-C 1992). The soils consist primarily of fine-grained, well sorted, silty, clayey, unconsolidated orange to brown-orange to brown

sands. The sands are generally slightly moist with trace amounts of clay. Six gradation analyses were performed on samples collected within this unit at 0.5 feet BGL in Borings 8101 and 8106, and at 2 feet BGL in Borings 8102, 8104, 8107, and 8109 (see **Figure 1-3**). The results indicate that the soil samples collected at 0.5 feet BGL were comprised was comprised of approximately 57 to 58 percent sand, 25 percent silt, and 17 to 18 percent clay. The total thickness of the soil is 2 to 5 feet.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations conducted at Cannon AFB have encompassed the Solvent Disposal Area, as previously discussed. The site was first identified during the 1983 Phase I IRP Records Search as containing two drums labeled "Trichloroethylene" on the ground, opened, and positioned to drain to shallow surrounding pit (CH_2M Hill 1983). During the RFA in 1987, there was apparently no evidence of the site; however, it was recommended that the site be located and samples collected to determine if residual contamination exists (A.T. Kearney 1987). No intrusive investigations had been conducted at this IRP/SWMU site prior to the 1991 RI performed by W-C.

W-C conducted sampling at the Solvent Disposal Area in 1991 to evaluate the nature and extent of potential hazardous contaminants. Ten original soil borings (Borings 8101 through 8110) were drilled and surface and subsurface samples collected for chemical and geotechnical analyses (**Figure 1-3**). Surface samples were collected from 0 to 0.5 feet BGL at locations

near each of the soil borings. Subsurface soil samples were collected at 4 feet BGL in all borings.

Based on elevated OVA readings of the subsurface soil samples collected in Borings 8102 and 8107, two additional soil borings, Boring 8111 (a deeper redrill of Boring 8102), located approximately 1 foot southeast of the original soil boring, and Boring 8112 (a deeper redrill of Boring 8107), located approximately 1 foot northeast of the original boring, were drilled to a depth of 9.5 and 9.4 feet, respectively, and sampled continuously. Three additional subsurface soil samples were collected at 5 and 9 feet BGL in Boring 8111, and at 5 feet BGL in Boring 8112, to evaluate the vertical extent of potential contamination below the depth of the original borings. All soil samples were analyzed for Target Compound List volatile organic compounds (TCL VOCs).

The results of the W-C analyses, shown in **Table 2-1**, indicated that only acetone and toluene were detected at concentrations above the laboratory contract required quantitation limit (CRQL). The low concentrations reported for toluene, less than 17 μg/kg, suggest that toluene is not a chemical of concern at this site. However, even though acetone is a common laboratory contaminant at low concentrations, the elevated levels reported at Borings 8101, 8102, 8104, 8107, and 8108 in the western portion of the SWMU (400 μg/kg, 160 μg/kg, 910 μg/kg, 5200 μg/kg, and 1300 μg/kg, respectively) may indicate possible contamination from solvent disposal practices. However, based on the results from the two deeper redrill borings completed in that area, it appears that acetone is restricted to the 4- to 6-foot interval. Acetone concentrations in Borings 8111 (redrill of Boring 8102) and Boring 8112 (redrill of Boring 8107) at the 9 to 9.5 foot and 5 to 7 foot intervals were very low or non-detect at 22 μg/kg and 15 μg/kg, respectively. Therefore, the vertical extent of acetone in the soil in the western portion of the SWMU appears to lie between 4 to 6 feet and does not extend below 9 feet BGL.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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

redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during W-C's remedial investigation and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit

was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to the Solvent Disposal Area; therefore, no surface water information was collected as part of the RI performed by W-C.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with the Solvent Disposal Site. No air sampling was performed as part of this RI, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination. However, air modeling was performed in support of the baseline risk assessment.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. The Solvent Disposal Site is within RAA4, which also includes the Fire Department Training Area No. 1.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

<u>Current Exposure Scenario:</u>

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of RAA4 is less than ½ acre and, therefore, future construction or intrusive action was not assumed nor was future residents. Maintenance Workers were the only present and future potential human receptors.

2.6.2 Pathways

The primary chemical sources in RAA4 include waste oils, recovered fuels, and spent solvents such as trichloroethylene. Release mechanisms from soil include leaching of chemicals to

groundwater, storm water runoff to surface water, and direct contact with subsurface soils. Chemicals can also be released into the air via volatilization or via fugitive dust emissions resulting in potential inhalation exposures. A ground maintenance or general duty worker in the area may be exposed to surficial soil via ingestion and dermal contact. This person may also be exposed to fugitive dust or particulates from wind erosion of surface soil, or volatilized chemicals emitted from surface and subsurface soils. Potential pathways are discussed below.

Soils. Direct contact with soils containing chemicals may result in potentially significant exposure via ingestion or dermal absorption. Such pathways may be particularly important in children. A high frequency of contact with soils by children is not expected under current conditions due to the location of these SWMUs and access limitations. Workers in the vicinity of these SWMUs are the most likely to come into contact with soils from these areas.

Air. Chemicals can be released into the air via volatilization or via fugitive dust emissions, resulting in potential exposures via inhalation.

Storm water runoff. Storm water runoff may result in migration of chemicals from soil to surface water and from surface water to groundwater. Potential exposure routes for surface water include ingestion, direct contact (dermal contact), and ingestion of fugitive VOC emissions from surface water. These pathways are not expected to be complete due to the intermittent nature of on-site surface water runoff.

Groundwater. Potential exposure to groundwater may occur via ingestion, inhalation, or dermal absorption from showering, bathing, or other domestic uses of groundwater. The groundwater gradient in this area is to the southeast. The groundwater pathway is expected to be incomplete due to the great depth to the groundwater (over 270 feet) and the site geology (presence of clay and caliche).

Crop Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils.

Atmospheric Deposition of Airborne Particulates on Edible Crops. Atmospheric deposition of airborne particulates on edible crops located off-site (or within the RAA under the future exposure scenario) is possible due to land use in the area. This exposure pathway is not expected to be significant based on the concentrations of chemicals detected in soils from this RAA. Fugitive dust inhalation by workers is expected to result in greater levels of chemical intake. If the results of risk characterization from the inhalation routes for workers and future residents in this RAA are acceptable, it is likely that indirect exposure via ingestion of edible crops is also insignificant.

Based on the above, current and future potential receptors for this site are Maintenance Workers. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA4 is provided in **Figure 2-1**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed in 1991 by W-C under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989a), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA4 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA4 were metals, volatile organic chemicals, and pesticides. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors (potential receptors are discussed in Section 2.6). Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA4. Future intrusive action or residential scenarios were not judged to be plausible for RAA4, because it is smaller than ½ acre in area. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA4: acetone, ethylbenzene, perchloroethylene (PCE), 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), toluene, xylene, DDD, DDE, DDT, cadmium, lead, and zinc. RAA4 includes both Fire Department Training Area No. 1 and the Solvent Disposal Area. Of the COCs listed above, only acetone and toluene were found at the Solvent Disposal Area.

Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA4 was slightly above the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 for both current and future Maintenance (general duty) Workers.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA4 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for each receptor. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

The exposure pathway contributing the most to the total HI for both the average and RME exposure scenarios is incidental ingestion of soil, making up almost all (>80%) of the total noncarcinogenic hazard. Cadmium was the primary COC for this exposure pathway.

Carcinogenic Risks. Carcinogenic risks are also presented in **Table 3-3**. The total carcinogenic risk (i.e., risks for all pathways combined), for the average and the RME exposures for workers were 1.7E-11 and 8.9E-10 respectively. These risks are below the EPA's target risk range (1.0E-04 and 1.0E-06) for Superfund sites (EPA 1989b).

The primary exposure pathway contributing the majority of the cancer risk was inhalation of particulates. 4,4-DDD contributed significantly (>75%) to this carcinogenic risk.

Lead as a Potential Risk/Hazard. The maximum level of lead detected in soils at RAA4 was 529 mg/kg in surficial soil. The EPA Uptake Biokinetic (UBK) model is not applicable to this RAA since residential exposure is not likely to occur. The 95% UCL concentration for lead in surficial soil at RAA4 was 411 mg/kg, which exceeds the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994). However, the guidance is not applicable to this RAA, since residential exposure is not likely to occur. Allowable lead concentrations in soil for commercial and industrial exposure scenarios are significantly higher than 400 mg/kg.

Air modeling was performed to determine the lead concentrations in ambient air. For the average and RME exposures, the estimated ambient concentrations of lead were 0.015 ug/m^3 and 0.048 ug/m^3, respectively. Both of these concentrations were well below the EPA's background value of 0.200 ug/m^3 (EPA 1991).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) were detected in soils at levels which were considered to be above background. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA4. The total noncarcinogenic HIs for all receptors were below the EPA's

level of concern (1.0) at RAA4 for both the average exposure and RME scenarios. The total carcinogenic risks for the average and RME exposures for workers were below the EPA's target risk range of 1.0E-04 to 1.0E-06 for a Superfund site.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA4, which includes Solvent Disposal Area.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for the Solvent Disposal Area, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the NFRAP alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for the Solvent Disposal Area, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

Boring Number	Sample Depth (Ft-BGL)	Acetone (μg/kg)	Toluene (μg/kg)	111 TCA (μg/kg)	Ethyl Benzene (μg/kg)	TCE (μg/kg)	Xylenes (μg/kg)	2 Butanone (μg/kg)
8101	0-0.5	10U	10J	2J	1J	2J	3J	10U
	4-6	400	21U	2J	21U	21U	21U	1J
8102/8111	0-0.5	30J	17	2J	2J	2J	6J	1J
	4-6	160	54U	54U	54U	54U	54U	54U
	9-11	22	11U	11U	11U	11U	11U	11U
8103	0-0.5	2J	8J	11U	11U	1J	3J	11U
	4-6	90	10U	10U	10U	10U	10U	10U
8104	0-0.5	2J	13	2J	10U	2J	3J	10U
	4-6	910	53U	53U	53U	53U	53U	53U
8105	0-0.5	11U	14	2J	2J	2J	5J	11U
	4-6	190	11U	11U	11U	11U	11U	11U
8106/8114	0-0.5	4J	11U	11U	11U	11U	11U	11U
	4-6	130	10U	10U	10U	10U	10U	10U
8107	0-0.5	11U	9J	1J	1J	2J	4J	11U
	4-6	5,200	1,400U	1,400U	1,400U	1,400U	1,400U	1,400U

TABLE 2-1 (continued)
VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

Boring Number	Sample Depth (Ft-BGL)	Acetone (µg/kg)	Toluene (µg/kg)	111 TCA (µg/kg)	Ethyl Benzene (µg/kg)	TCE (µg/kg)	Xylenes (µg/kg)	2 Butanone (µg/kg)
8108	0-0.5	1,300	1J	11U	11U	11U	11U	11U
	4-6	57	11U	11U	11U	11U	11U	11U
8109	0-0.5	11U	3J	11U	11U	11U	11U	11U
	4-6	140	10U	10U	10U	10U	10U	10U
8110	0-0.5	11UJ	13	2J	1J	2J	4J	11UJ
	4-6	150	11U	11U	11U	11U	11U	11U
8112	0-0.5	16U	11U	11U	11U	11U	11U	11U
	5-7	15U	11U	11U	11U	11U	11U	3J
8113	4-6	210	11U	11U	11U	11U	11U	11U

Ft-BGL = Feet below ground level
µg/kg = Micrograms per kilogram
CRQL = Contract Required Quantitation Limit

J = Estimated concentration
U = Not detected at concentration given
UJ = Estimated as non-detect at the CRQL

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1(continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level

(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL
(1) = MCL for total trihalomethanes (2) = Effective July 30, 1992

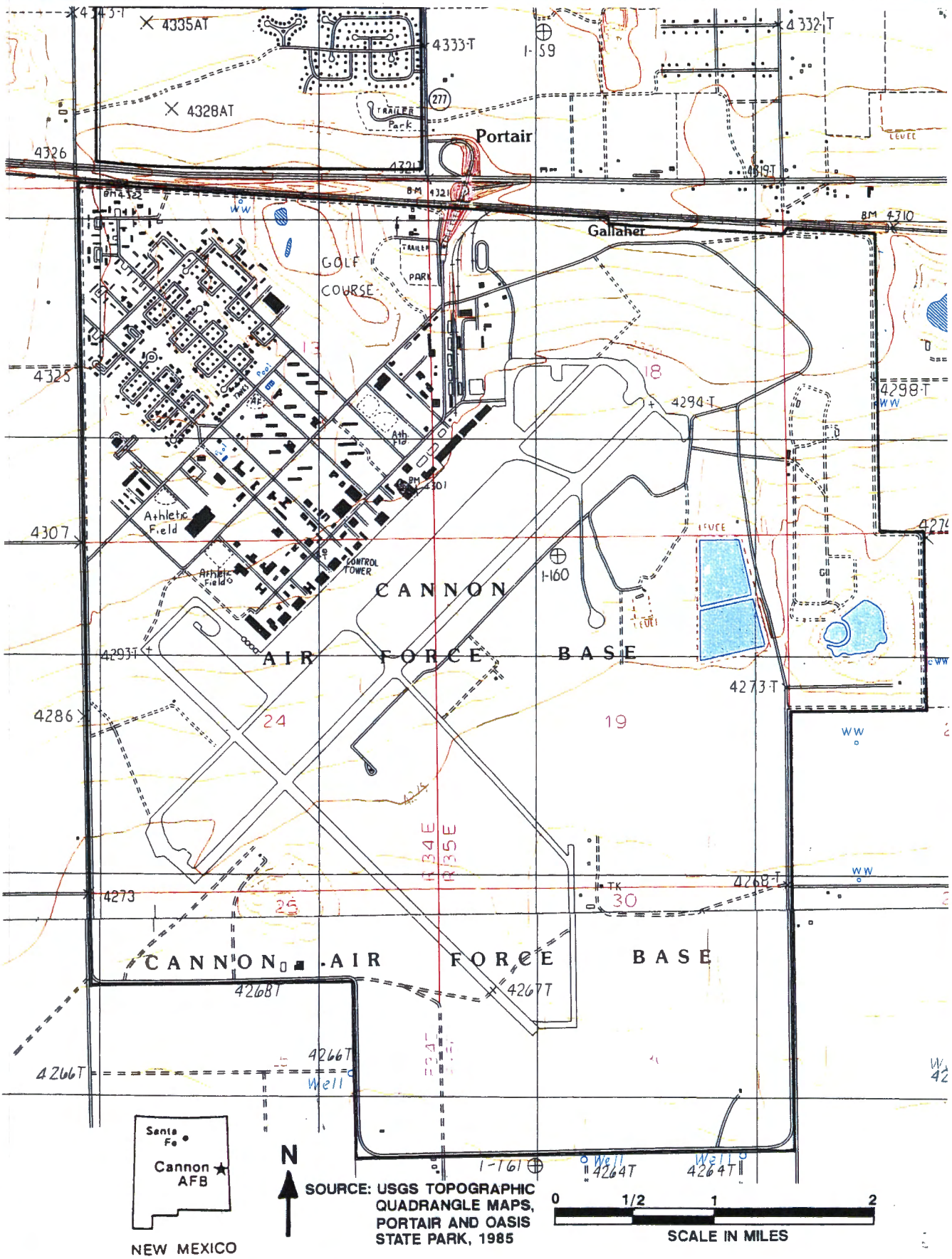
Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA4
SOLVENT DISPOSAL SITE
SWMU NO. 81/IRP NO. DP-16
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Current Worker - Maintenance						
-- Soil Ingestion	1.19E-12	1.01E-07	5.68E-07	2.89E-10	7.34E-06	4.07E-05
-- Dermal Contact - Soil	4.64E-13	3.90E-08	2.20E-07	1.01E-10	2.56E-06	1.42E-05
-- Inhalation - VOCs	7.28E-12	5.24E-08	1.63E-07	1.82E-10	4.70E-07	1.47E-06
-- Inhalation - Particulates	7.59E-12	0.00E+00	0.00E+00	3.17E-10	0.00E+00	0.00E+00
Total	1.65E-11	1.92E-07	9.51E-07	8.89E-10	1.04E-05	5.64E-05
Future Worker - Maintenance						
-- Soil Ingestion	1.19E-12	1.10E-07	5.68E-07	2.89E-10	7.34E-06	4.07E-05
-- Dermal Contact - Soil	4.64E-13	3.90E-08	2.20E-07	1.01E-10	2.56E-06	1.42E-05
-- Inhalation - VOCs	7.28E-12	5.24E-08	1.63E-07	1.82E-10	4.70E-07	1.47E-06
-- Inhalation - Particulates	7.59E-12	0.00E+00	0.00E+00	3.17E-10	0.00E+00	0.00E+00
Total	1.65E-11	1.92E-07	9.51E-07	8.89E-10	1.04E-05	5.64E-05

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

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Figure 1-1

GENERAL VICINITY MAP

SOLVENT DISPOSAL SITE
SWMU No. 81 / IRP No. DP-16
Cannon Air Force Base, New Mexico

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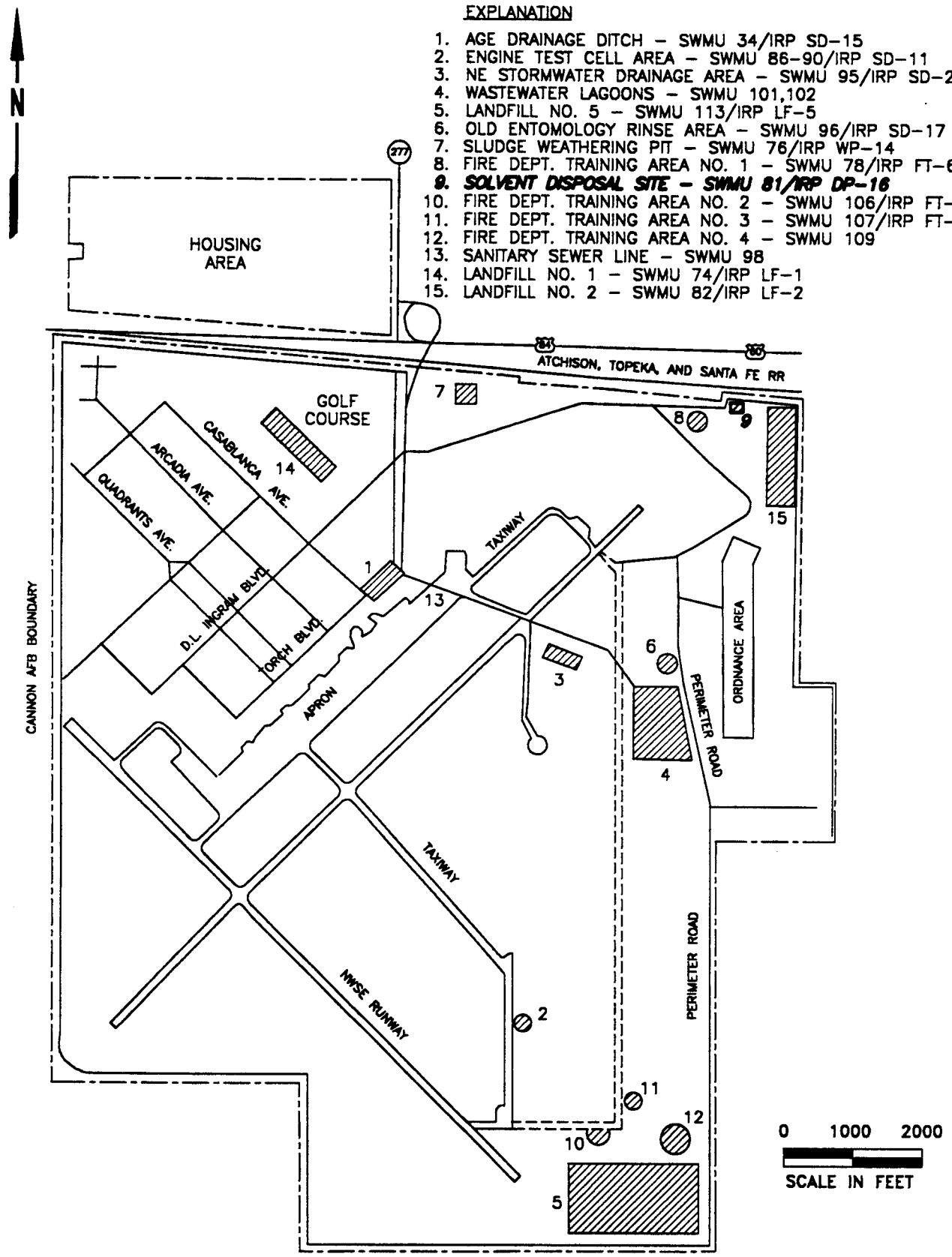

Figure 1-2

IRP/SWMU SITE LOCATION MAP

SOLVENT DISPOSAL SITE
SWMU No. 81 / IRP No. DP-16
Cannon Air Force Base, New Mexico

SOURCE: Woodward-Clyde, February1996

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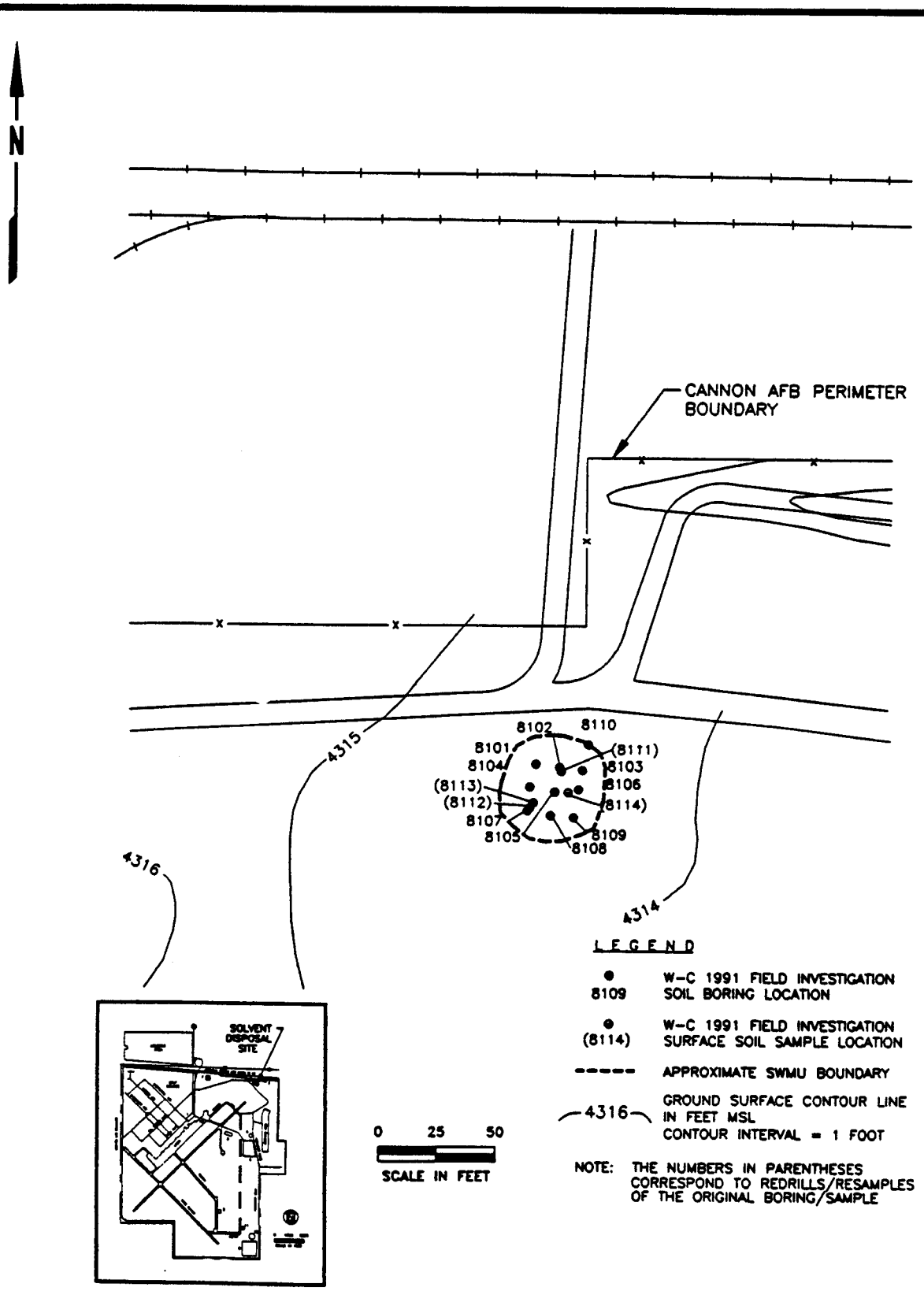

SOURCE: Woodward-Clyde, February1996

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Figure 1-3

LOCATION OF SOIL BORINGS AND SURFACE SOIL SAMPLES

SOLVENT DISPOSAL SITE
SWMU No. 81 / IRP No. DP-16
Cannon Air Force Base, New Mexico

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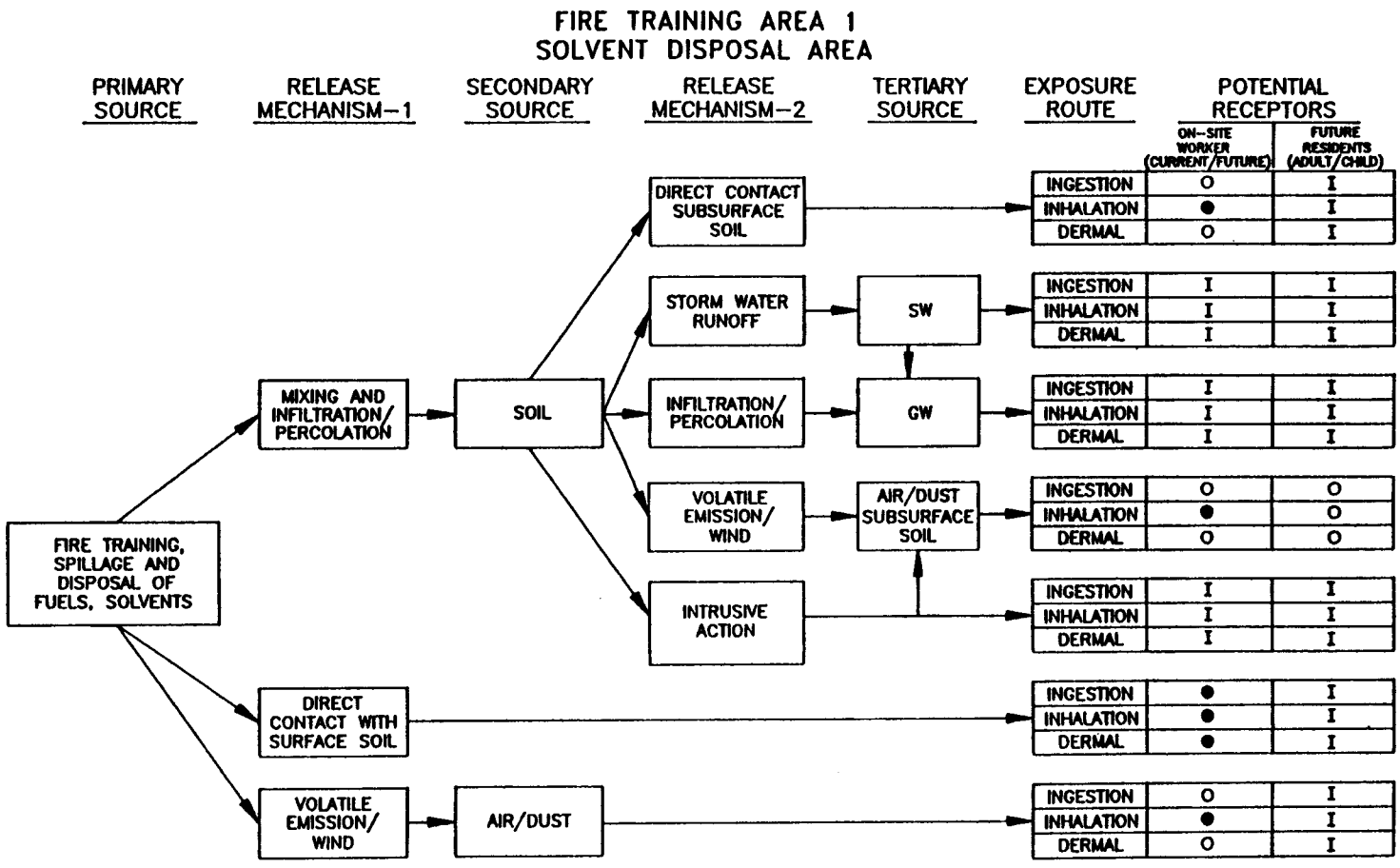

LEGEND

- I INCOMPLETE EXPOSURE PATHWAYS
- ● SIGNIFICANT EXPOSURE PATHWAY
- O RELATIVELY INSIGNIFICANT EXPOSURE PATHWAY

SOURCE: Woodward-Clyde, 1995

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Figure 2-1

CONCEPTUAL SITE MODEL

SOLVENT DISPOSAL SITE
SWMU No. 81 / IRP No. DP-16
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Solvent Disposal Site (SWMU No. 81) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

  This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Fire Department Training Area No. 3
SWMU No. 107 / IRP No. FT-08

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Fire Department Training Area No. 3
SWMU No. 107/IRP No. FT-8
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Fire Department Training Area No. 3
SWMU No. 107/IRP No. FT-8

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Fire Department Training Area No. 3 (SWMU No. 107/IRP No. FT-8) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the Fire Department Training Area No. 3 (SWMU No. 107/IRP No. FT-8) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Fire Department Training Area No. 3 (SWMU No. 107/IRP No. FT-8) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Hydrocarbons
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command

LIST OF ACRONYMS

TAL	Target Analytical List
TCE	Trichloroethylene
TIC	Tentatively Identified Compounds
TCL	Target Compound List
TPH	Total Petroleum Hydrocarbons
UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

Fire Department Training Area No. 3, designated as Solid Waste Management Unit (SWMU) No. 107 and Installation Restoration Program (IRP) No. FT-8, is a former base fire department training area operated from 1968 to 1974. The site consists of an unlined half-circle shaped surface approximately 100 feet in length, surrounded by a low berm. During the period of operation, each fire training exercise consisted of pouring approximately 300 gallons of unused JP-4 fuel onto water-saturated soil to create fires for personnel training purposes.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. Fire Department Training Area No. 3 is located in the southeastern part of the base, immediately adjacent to an abandoned north-south runway. The site is shown as Area 11 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Fire Department Training Area No.3 is half-circle shaped, approximately 100 ft in length, and is surrounded by a low berm. The site occupies an area less than 1/8 acre and is essentially flat. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. Although fire training activities are no longer conducted at Fire Training Area No. 3, the area continues to have activities associated with the adjacent

explosive ordinance site. The explosive ordinance site, which is approximately 1,800 feet in diameter, has been used for ammunition disposal and training operations. Currently this ammunition facility is used for practice only, with no detonations taking place. Approximately 5 people use this area for one to two hours per month. The site is characterized as Open Space according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The Fire Department Training Area No. 3 is located approximately 2 to 3 miles from on-base family housing areas. These housing areas include on-base facilities at the northwest corner of the base and the Chaves Manor Housing Area, north of U.S. Highway 60/84.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Fire Training Area No. 3 consists of a half-circle shaped surface approximately 100 ft in length, surrounded by a low berm. The area has little vegetation on it. The southwest corner has a small wooden storage unit, open on one side, containing various empty pails. The ground in this corner of the site is partially covered with gravel, and is littered with empty plastic containers, pails, and a large empty aircraft fuel tank.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former Range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

Fire Department Training Area No. 3 is a half-circular area with a radius of approximately 100 feet in the southeast area of the base. The unit was active from 1968 to 1974. During each training exercise, approximately 300 gallons of JP-4 fuel were poured on the ground to create fires between eight and twelve times per year.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at Fire Department Training Area No. 3 was evaluated by reviewing existing information and conducting an analysis of installation records.

- During 1984 and 1985, a Phase II (Stage 1) investigation was conducted by Radian Corporation (Radian) to determine if environmental contamination had resulted from fire training exercises at Fire Department Training Area No. 3 (Radian 1986). During this investigation, one deep soil boring (Boring No. 8) was drilled and samples for chemical analyses collected to evaluate the impact of past and ongoing activities and to define site-specific hydrogeologic conditions. Boring locations are shown on **Figure 1-3.** Soil samples collected during this investigation were analyzed for oil and grease, lead, and purgeable halocarbons and aromatics.

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the U.S. EPA at Cannon AFB by A.T. Kearney, Inc. (A.T. Kearney 1987). The purpose was to identify and evaluate SWMUs to assess the potential for releases of hazardous wastes or constituents to the environment. Results identified Fire Department Training Area No. 3 as a potential SWMU.

- In September 1991, Woodward-Clyde (W-C) investigated Fire Department Training Area No. 3 as part of a Remedial Investigation (RI) conducted for 18 IRP/SWMU sites at Cannon AFB. Four soil borings (Borings 1071 through 1074) were drilled and subsurface samples collected for chemical and geotechnical analyses. Two soil borings were located in low lying areas or areas of visible staining or residue within the SWMU boundary (**Figure 1-3**). Surface samples also were collected from near each soil boring. Results of the W-C investigation are summarized in Section 2.2.

1.2.2 Period of Operation

The Fire Department Training Area No. 3 (SWMU No. 107) was used to conduct fire department training exercises from 1968 to 1974.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U.S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that Fire Department Training Area No. 3 was used exclusively for fire training exercises throughout its period of operation (1968 to 1974).

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

During its period of operation (1968 to 1974), Fire Department Training Area No. 3 was used for training exercises approximately eight to twelve times per year. For each usage, approximately 300 gallons of unused JP-4 fuels were poured on the ground within the site and ignited to create training fires (USAF 1990). In some instances, the ground may have been presaturated with water prior to pouring the waste products onto the ground.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA by A.T Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI at Fire Department Training Area No. 3 was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of Fire Department Training Area No.3 site indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for NFA (No Further Action), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Fire Department Training Area No. 3 (SWMU No. 107/IRP No. FT-08) has been categorized as requiring No Further Action.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface stratigraphy at Fire Department Training Area No. 3 consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation. The Ogallala fluvial deposits consist primarily of well to moderately sorted sand, with scattered thin (1 to 12 feet thick) layers of caliche. The total thickness of these Ogallala deposits beneath the SWMU is not presently known, but based on regional information, may be as thick as 390 feet.

From the lithologic descriptions, it appears that three fairly distinct sand, sand/caliche units are present beneath the SWMU to a depth of 67 feet. The lowermost fluvial deposits consist of fine- to medium-grained, well sorted, unconsolidated orange sands. These sands are comprised predominantly of subrounded quartz grains with very minor amounts (1 to 2 percent) of black grains. These consist of little or no silt/clay sized particles. These sands are non-calcareous. This unit was encountered in Boring 1074 at 55 feet BGL. The thickness of this unit is unknown at present due to the fact that the unit was not fully penetrated, but is at least 12 feet thick at this IRP/SWMU site.

The middle fluvial deposits consist of fine-grained, well sorted, silty, orange to pale orange sands. These sands are comprised predominantly of subangular to subrounded quartz grains with very minor amounts (1-3 percent) of black and dark colored grains. These sands are silty and slightly clayey with varying amounts of calcium carbonate. Occasionally, these sands have scattered small pockets or nodules of tan-orange to pale orange caliche and calcium carbonate cemented sands. This unit was comprised of approximately 70 percent sand, 11 percent silt, and 19 percent calcium carbonate and/or clay-sized material. This unit was encountered at approximately 30 feet BGL in Borings 8 and 1074. The thickness of this unit ranges from approximately 25 feet in Boring 1074 to 27 feet in Boring 8. This unit may be contaminated with petroleum residue in Boring 1074, based on OVA readings and odor observations. The lithologies from Radian's Boring 8 appear to show more silt than sand. Since thick silt deposits were not encountered in any of the W-C borings, nor were silts

identified in any of the gradation analyses performed, it may be assumed that these silt deposits are probably very fine-grained, silty sand deposits.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 land forms are relict sand dunes located along the northern side of the Portales Valley south of the base. Relict dunes are not found at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures Range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July.

The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985 (Hale 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

Soils at Fire Department Training Area No. 3 area consist of sandy loam and loamy sand of the Amarillo Soil Group with a total thickness of approximately 4 feet (W-C 1992). The soils consist primarily of fine-grained, well sorted, silty, clayey, unconsolidated light brown and gray-brown to red-brown and brown-orange sands. The sands are generally dry to slightly moist at depth. One gradation analysis was performed on a sample collected within this unit at 2 feet BGL in Boring 1072. The results indicate that this soil sample was comprised of approximately 56 percent sand, 14 percent silt, and 30 percent clay. The upper one foot in Borings 1071, 1072, and 1073 are calcareous with pockets or nodules of caliche, which suggest that this may not be native material.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations conducted at Cannon AFB encompassed soils at Fire Department Training Area No. 3. The Phase II (Stage 1) investigation was conducted by Radian Corporation in 1984 and 1985, during which soil Boring No. 8 (**Figure 1-3**) was drilled and samples for chemical analyses collected (Radian 1986). Results indicated the presence of oil and grease, and lead at the site (**Table 2-1**), but no further actions were recommended.

The PA/VSI, RFA performed in 1987 by A.T. Kearney, Inc. identified Fire Department Training Area No. 3 as a potential SWMU. The RFA also indicated that the potential for releases to the soil was high due to past disposal of hazardous wastes and because the SWMU was unlined. 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 additional soil sampling to determine if soil contamination still exists.

W-C conducted further sampling at Fire Department Training Area No. 3 in 1991 to further evaluate the nature and extent of potential hazardous contaminants. Four soil borings (Borings 1071 through 1074) were drilled and samples collected for chemical and geotechnical analyses (**Figure 1-3**). The soil borings were located low lying area or areas of visible staining or residue within the SWMU boundary (**Figure 1-3**). Surface samples were collected from the upper 0.5 feet of soil at locations near each soil boring. Subsurface soil samples were collected at depths ranging from 4 to 60 feet BGL. All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), and the metals lead and chromium. Due to laboratory missed holding times for TCL VOCs on several of the original samples, resampling was performed 5 feet northwest of Boring 0782 as required to complete the investigation sampling program.

Results of the W-C analyses are summarized in **Tables 2-2** and **2-3** and indicate the presence of ethyl benzene and xylenes in subsurface soils. Acetone was also detected in subsurface soil samples collected at two boring locations; however, acetone was not detected at two or more depths in the same borings, suggesting that acetone is probably related to laboratory contamination. Xylenes were detected at Boring 1074 between 4 and 32 feet BGL at concentrations of 94 and 4.9 mg/kg, respectively; however, xylenes were not detected above the quantification limit at the next sample interval. These results are supported by VOC analysis of tentatively identified compounds (TICs) which indicate the possible presence of a

variety of xylene derivatives. Ethyl benzene was detected in samples from Boring 1074 at 4, 10, and 20 feet BGL at an estimated concentration of 13 and 15, and a concentration of 5.8 mg/kg, respectively. Ethyl benzene may also be present at the 30 to 32 foot interval since the detection limit was raised to 14 mg/kg. The detection of xylenes and ethyl benzene at Boring 1074 is consistent with residual fuel constituents from previous fire training exercises.

Total petroleum hydrocarbons were detected in surface samples collected at the four boring locations at concentrations ranging from 963 mg/kg to 6,080 mg/kg, with the highest concentration at Boring 1073 (**Table 2-2**). Elevated petroleum hydrocarbon concentrations were also detected in subsurface soils at 5 feet BGL in Boring 1071, and from 4 to 32 feet BGL in Boring 1074 (**Table 2-2** and **Figure 2-2**). The VOC analysis of soil samples from Boring 1074 also reported a variety of medium molecular weight saturated and unsaturated hydrocarbon TICs to a depth of 30 feet BGL (**Figure 2-3**). A summary of sample results is contained in **Table 2-2**.

Lead was detected in surface soil samples at boring locations 1071 and 1074 at concentrations of 151 mg/kg and 322 mg/kg, respectively. The analytical results indicate that lead contamination does not extend into deeper soils. Chromium was detected infrequently and in concentration comparable to site background levels. A summary of lead concentration sample results is contained in **Table 2-3**.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1,600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc.

1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities Range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed

in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during W-C's remedial investigation and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost

from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to Fire Department Training Area No. 3; therefore, no surface water information was collected as part of the RI performed by W-C.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with Fire Department Training Area No. 3. No air sampling was performed as part of this RI, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination. However, air modeling was performed in support of the baseline risk assessment.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. Fire Department Training Area No. 3 is within RAA1, which also includes Landfill No. 5, and Fire Department Training Areas No. 2 and No. 4.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

<u>Current Exposure Scenario:</u>

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of RAA1 is greater than ½ acre and, therefore, future construction or intrusive action was assumed.

2.6.2 Pathways

The primary chemical sources in RAA 1 include fuel spills to the soil during fire training (from fire training areas) and chemicals potentially released to the soil (from the landfill). As mentioned above, the RAA which Fire Department Training Area No. 3 is part of is larger

than ½ acres and therefore the potential for soil excavation and residential home construction in the future is plausible.

Secondary release mechanisms from soil include leaching of chemicals to groundwater, storm water runoff to surface water, direct contact with subsurface soils, fugitive VOC and dust emissions, and intrusive actions such as site excavation and construction. As a result of intrusive actions, ingestion or dermal absorption via direct contact with chemicals in surface and subsurface soils may occur. Disturbance of soil may result in the generation of fugitive dust, and release of VOC emissions into the air, providing a complete pathway by inhalation. Potential pathways are discussed below.

Soils. Direct contact with soils containing chemicals may result in potentially significant exposure via ingestion or dermal absorption. Such pathways may be particularly important in children. A high frequency of contact with soils by children is not expected under current conditions due to the location of these SWMUs and access limitations. Workers in the vicinity of these SWMUs are the most likely to come into contact with soils from these areas.

Air. Chemicals can be released into the air via volatilization or via fugitive dust emissions, resulting in potential exposures via inhalation.

Stormwater runoff. Storm water runoff may result in migration of chemicals from soil to surface water and from surface water to groundwater. Potential exposure routes for surface water include ingestion, direct contact (dermal contact), and ingestion of fugitive VOC emissions from surface water. These pathways are not expected to be complete due to the intermittent nature of on-site surface water runoff.

Groundwater. Potential exposure to groundwater may occur via ingestion, inhalation, or dermal absorption from showering, bathing, o other domestic uses of groundwater. The groundwater gradient in this area is to the southeast. The groundwater pathway is expected to be incomplete due to the great depth to the groundwater (over 270 feet) and the site geology (presence of clay and caliche).

Crop Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals

were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils.

Atmospheric Deposition of Airborne Particulates on Edible Crops. Atmospheric deposition of airborne particulates on edible crops located off-site (or within the RAA under the future exposure scenario) is possible due to land use in the area. This exposure pathway is not expected to be significant based on the concentrations of chemicals detected in soils from this RAA. Fugitive dust inhalation by workers is expected to result in greater levels of chemical intake. If the results of risk characterization from the inhalation routes for workers and future residents in this RAA are acceptable, it is likely that indirect exposure via ingestion of edible crops is also insignificant.

Based on the above, potential receptors for this site are current and Future Maintenance Workers, Future Construction Workers, and Future Residents. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA1 is provided in **Figure 2-4**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed by W-C in 1992 under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989a), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA1 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA1 were benzene, toluene, xylenes, trichloroethylene (TCE), ethylbenzene, chromium, and lead. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors. Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA1, future construction workers, and future residents. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA1: benzene, toluene, xylenes, trichloroethylene (TCE), ethylbenzene, chromium, and lead. RAA1 includes Fire Department Training Area No. 2 as well as Landfill No. 5 and Fire Department Training Areas No. 3 and No. 4. Of the COCs listed above, only ethyl benzene, xylenes, total petroleum hydrocarbons, and lead were found to be present at Fire Department Training Area No. 3.

Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA1 were well below the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure and potential risks and hazards associated with groundwater use were not evaluated in the BRA.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 to 1.00E-04 for all exposure scenarios except future child residents (1.10E-4). However, given the fact that risk is only slightly above the allowed risk of 1.00E-04, and given high detection limits in chemical analyses and conservative assumptions used in the risk calculations (chemicals contributing to the estimated risks were detected at extremely low frequencies, and the VOC model used to estimate airborne VOC concentrations did not take into account biodegradation of benzene or TCE). The results may, therefore, represent an overestimation of the calculated risks.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA1 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for

each receptor. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

The exposure pathway contributing the most to the total HI for both the average and RME exposure scenarios is inhalation of VOCs, making up nearly all of the non-carcinogenic hazard for each receptor evaluated. Total xylenes presented the majority of these non-carcinogenic hazards for this exposure pathway.

Carcinogenic Risks. Carcinogenic risks are also presented in **Table 3-3**. The total carcinogenic risk (i.e., risks for all pathways combined), for the average and the RME exposures for each of the receptors evaluated was below the EPA's target risk Range (1.00E-04 and 1.00E-06) for Superfund sites (EPA 1989b), with the exception of total RME cancer risk for the future hypothetical child resident (1.10E-04). The primary exposure pathway contributing the majority of the cancer risk was inhalation of VOCs. In this case, benzene contributed at least 80% of this risk, regardless of the exposure scenario (i.e. average or RME). However, the chemicals contributing to the estimated risks were detected at extremely low frequencies (1/29 for TCE and 1/37 for benzene). The highest values for these chemicals were based on non-detects and the detection limits ranged from 30 to 60 mg/kg. Thus, the corresponding risk estimates are probably artifacts based on matrix effects associated with the soil analyses. In addition, the VOC model used to estimate airborne VOC concentrations did not take into account biodegradation of benzene or TCE, which would tend to decrease VOC concentrations over time. Thus, the estimated ambient VOC concentration would probably not be sustained over the entire exposure duration.

Lead as a Potential Risk/Hazard. Lead in RAA1 was measured in soil and in groundwater and modeling was performed to estimate ambient air concentration of lead in fugitive dust. The surface soil and groundwater lead 95% UCL concentrations for RAA1 were 100.4 mg/kg and 0.011 mg/L, respectively. The groundwater lead is below the current action level (0.015 mg/L) and MCL (0.050 mg/L) for lead in drinking water. Surface soil lead concentrations were well below current EPA guidance, which has established soil lead cleanup levels of 400 mg/kg at Superfund sites (EPA 1994).

Air modeling was performed to determine the lead concentrations in ambient air under the baseline, intrusive action, and future residential exposure conditions. The baseline

average and RME air concentrations of lead were 0.008 $\mu g/m^3$ and 0.017 $\mu g/m^3$, respectively. The predicted average and RME air concentrations of lead were for the intrusive action and future use (residential) scenarios were 0.006, 0.011, 0.0056, and 0.0099 $\mu g/m^3$, respectively. The estimated concentrations for the above three exposure conditions were below the EPA Uptake Biokinetic (UBK) model's default value of 0.200 $\mu g/m^3$, which is considered by the EPA to be the average (1988) background urban air concentration for lead in the U.S. (EPA 1991).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) and one semi-volatile organic compound (benzo-a-pyrene) were detected in soils at levels which were considered to be above background. Benzo-a-pyrene, because of its relatively low concentration at near background levels, is not considered to be a chemical of concern. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA1. The total noncarcinogenic HIs for all receptors were below the EPA's level of concern (1.0) at RAA1 for both the average exposure and RME scenarios. The total carcinogenic risks for the average and RME exposures for workers were below the EPA's target risk Range of 1.00E-04 to 1.00E-06 for a Superfund site, except for the RME cancer risk for the hypothetical future child resident, which was 1.10E-04. Although this level exceeds the EPA target risk Range, the COCs were detected infrequently and had high detection limit values. The results may, therefore, represent an overestimation of the calculated risks.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA1, which includes Fire Department Training Area No. 3.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for Fire Department Training Area No. 3, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the NFRAP alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for Fire Department Training Area No. 3, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
OIL AND GREASE, TOTAL LEAD, AND PURGEABLE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/IRP NO. FT-8
Cannon Air Force Base, New Mexico

Sample Number	Sample Depth (Ft-BGL)	Oil and Grease	Total Lead (mg/kg)	Purgeable Organic Compounds (EPA 8010/8020) (μg/kg)
8-1	1.5-2.0	1,700	3.7	ND
8-2	7.5-9.5	3,800	2.9	ND
8-3	59.8-61.5	2,600	1.7	ND

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
μg/kg = Micrograms per kilogram
ND = Not detected
( ) = Detection Limit

[1]duplicate analysis of 15B-1

Source: Final Report, IRP Phase II (Radian 1986)

TABLE 2-2
TOTAL PETROLEUM HYDROCARBON, ETHYL BENZENE, XYLENES, BENZENE, AND TOLUENE CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/1RP NO. FT-8
Cannon Air Force Base, New Mexico

Boring Number (Redrill Boring Number)	Sample Depth (Ft-BGL)	TPH (mg/kg)	Ethyl Benzene (ug/kg)	Xylene (ug/kg)	Benzene (ug/kg)	Toluene (ug/kg)
1071	0-0.5	2,870	52U	52U	1100U	1100U
	5-7	74.2	11U	11U	11U	11U
	10-12	43.8U	11U	11U	11U	11U
	20-22	44.6U	11U	11U	11U	11U
	30-32	43.5U	11U	11U	11U	11U
1072	0-0.5	963	54U	54U	54U	54UJ
	4-6	46.4U	11U	11U	11U	11U
	10-12	44.1U	11U	11U	11U	11U
	20-22	43.5U	54U	54U	54U	54U
	30-32	43U	27U	27U	27U	27U
1073 (1076)	0-0.5	6,080	53U	53U	53U	73J
	4-6	46.3U	(11U)	(11U)	(11U)	(11U)
	10-12	43.7U	11U	11U	11U	11U
	20-22	44.6U	11U	11U	11U	11U
	30-32	43.9U	(27U)	(27U)	(27U)	(27U)
1074 (1075)	0-0.5	3,610	55U	55U	55U	55UJ
	4-6	18,300	13,000J	94,000	29,000U	6,900J
	10-12	9,220	(15,000J)	(87,000)	(36,000U)	(36,000U)
	20-22	11,500	5,800	28,000	2,700U	2,700J
	30-32	4,710	14,000U	4,900J	14,000U	14,000U
	45-47	41.9	11U	11U	11U	11U
	50-52	43U	(11U)	(11U)	(11U)	(11U)
	60-62	41.9U	11U	11U	11U	4J

Ft-BGL = Feet below ground level
U = Not detected at concentration given
J = Estimated concentration
UJ = Estimate as non-detect at the CRQL
( ) = The values in parentheses are results from samples collected from the redrill borings due to laboratory missed holding times.
CRQL = Contract Required Quantitation Limit
mg/kg = Milligrams per kilogram
ug/kg = Micrograms per kilogram

Source: Final Remedial Investigation Report for 18 Solid Waste Management Units (Woodward-clyde 1992)

TABLE 2-3
CHROMIUM AND LEAD CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/IRP NO. FT-8
Cannon Air Force Base, New Mexico

Boring Number	Sample Depth (Ft-BGL)	Chromium[1] (mg/kg)	Lead[2] (mg/kg)
1071	0 - 0.5	5.1	151
	5	5.7	3.3
	10	7.7	4.8
	20	5.6	2.1
	30	6.4	3.8
1072	0 - 0.5	3.5	6.4 J
	4	3.3	2.1
	10	5.0	5.3
	20	4.9	2.7
	30	10.3	1.6
1073	0 - 0.5	3.2	8.7
	4	6.1	2.9
	10	8.2	4.8
	20	7.3	4.1
	30	4.8	1.9
1074	0 - 0.5	11.1	322
	4	5.7	10.4
	10	5.2	5.8
	20	7.3	3.7
	30	8.3	3.6
	45	4.4	1.8
	50	5.2	1.5
	60	2.7	0.73

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
J = Estimated concentration

[1]Background range for chromium is 2.67 to 9.31 mg/kg (see Table 2-7) of RI report (W-C 1992).
[2]Background range for lead is 1.76 to 8.64 mg/kg (see Table 2-7) of RI report (W-C 1992).

Source: Final Remedial Investigation Report for 18 Solid Waste Management Units (Woodward-Clyde 1992)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/IRP NO. FT-8
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1(continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/IRP NO. FT-8
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level
(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/IRP NO. FT-8
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 3
SWMU NO. 107/IRP NO. FT-8
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL
(1) = MCL for total trihalomethanes
(2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA1
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Current Worker - Maintenance						
-- Soil Ingestion	5.04E-13	1.07E-09	1.06E-08	1.35E-10	5.52E-08	5.50E-07
-- Dermal Contact - Soil	1.95E-13	2.30E-11	2.12E-10	4.72E-11	1.46E-09	1.38E-08
-- Inhalation - VOCs	1.75E-07	3.63E-04	3.63E-04	2.83E-06	2.38E-03	2.38E-03
-- Inhalation - Particulates[1]	0.00E+00	1.08E-04	1.08E-03	0.00E+00	4.43E-04	4.43E-03
Total	1.75E-07	4.71E-04	1.44E-03	2.83E-06	2.83E-03	6.81E-03
Future Worker - Maintenance						
-- Soil Ingestion	5.04E-13	1.07E-09	1.06E-08	1.35E-10	5.52E-08	5.50E-07
-- Dermal Contact - Soil	1.95E-13	2.30E-11	2.12E-10	4.72E-11	1.46E-09	1.38E-08
-- Inhalation - VOCs	1.75E-07	3.63E-04	3.63E-04	2.83E-06	2.38E-03	2.38E-03
-- Inhalation - Particulates[1]	0.00E+00	1.08E-04	1.08E-03	0.00E+00	4.43E-04	4.43E-03
Total	1.75E-07	4.71E-04	1.44E-03	2.83E-06	2.83E-03	6.81E-03

TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA1
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Future Worker - Intrusive						
-- Soil Ingestion	5.01E-11	2.59E-07	1.57E-06	3.63E-10	1.92E-06	1.08E-05
-- Dermal Contact - Soil	3.89E-12	1.79E-08	9.98E-08	6.33E-11	3.14E-07	1.67E-06
-- Inhalation - VOCs	3.97E-08	7.59E-04	7.59E-04	2.15E-07	4.55E-03	4.55E-03
-- Inhalation - Particulates	0.00E+00	5.02E-04	5.02E-03	0.00E+00	1.72E-03	1.72E-02
Total	3.97E-08	1.26E-03	5.78E-03	2.16E-07	6.27E-03	2.17E-02
Future Resident - Adult						
-- Soil Ingestion	3.09E-10	1.77E-07	1.08E-06	9.52E-08	1.68E-05	9.46E-05
-- Dermal Contact - Soil	1.20E-10	6.13E-08	3.42E-07	1.66E-08	2.74E-06	1.46E-05
-- Inhalation - VOCs	9.69E-06	2.02E-02	2.02E-02	7.52E-05	5.27E-02	5.27E-02
-- Inhalation - Particulates[1]	0.00E+00	8.41E-03	8.41E-02	0.00E+00	1.20E-02	1.20E-01
Total	9.69E-06	2.86E-02	1.04E-01	7.53E-05	6.48E-02	1.73E-01

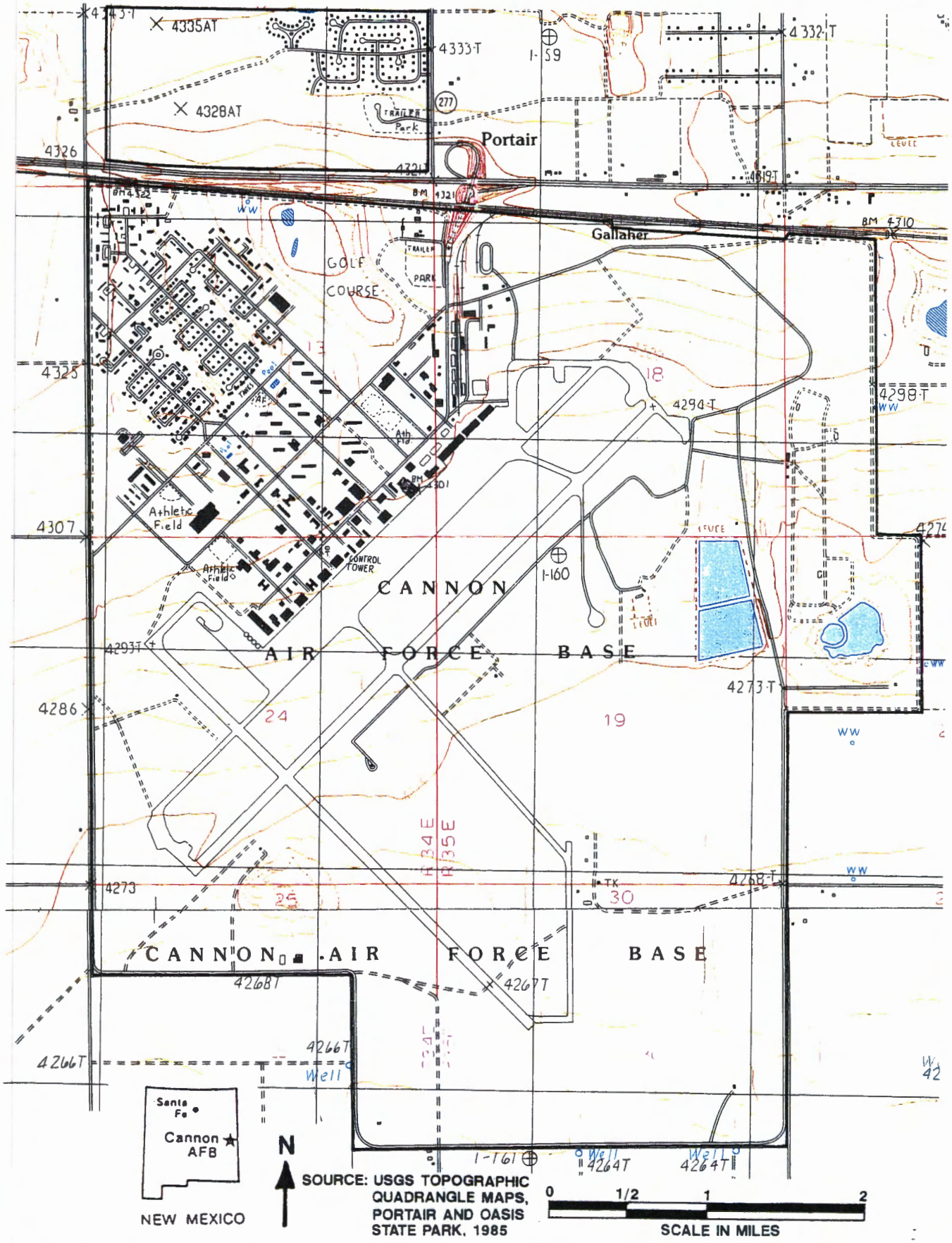
TABLE 3-3 (continued)
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA1
FIRE DEPARTMENT TRAINING AREA NO. 2
SWMU NO. 106/IRP NO. FT-7
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Future Resident - Child						
-- Soil Ingestion	6.01E-09	3.45E-06	2.09E-05	2.78E-07	4.91E-05	2.76E-04
-- Dermal Contact - Soil	1.32E-10	6.76E-08	3.77E-07	1.81E-08	2.99E-06	1.59E-05
-- Inhalation - VOCs	3.77E-05	7.84E-02	7.84E-02	1.10E-04	7.69E-02	7.69E-02
-- Inhalation - Particulates[1]	0.00E+00	3.27E-02	3.27E-01	0.00E+00	1.76E-02	1.76E-01
Total	3.77E-05	1.11E-01	4.05E-01	1.10E-04	9.45E-02	2.53E-01

[1]No carcinogenic chemicals with EPA-verified toxicity factors were identified for inhalation of chemicals of concern in particulates.

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

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Figure 1-1

GENERAL VICINITY MAP

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

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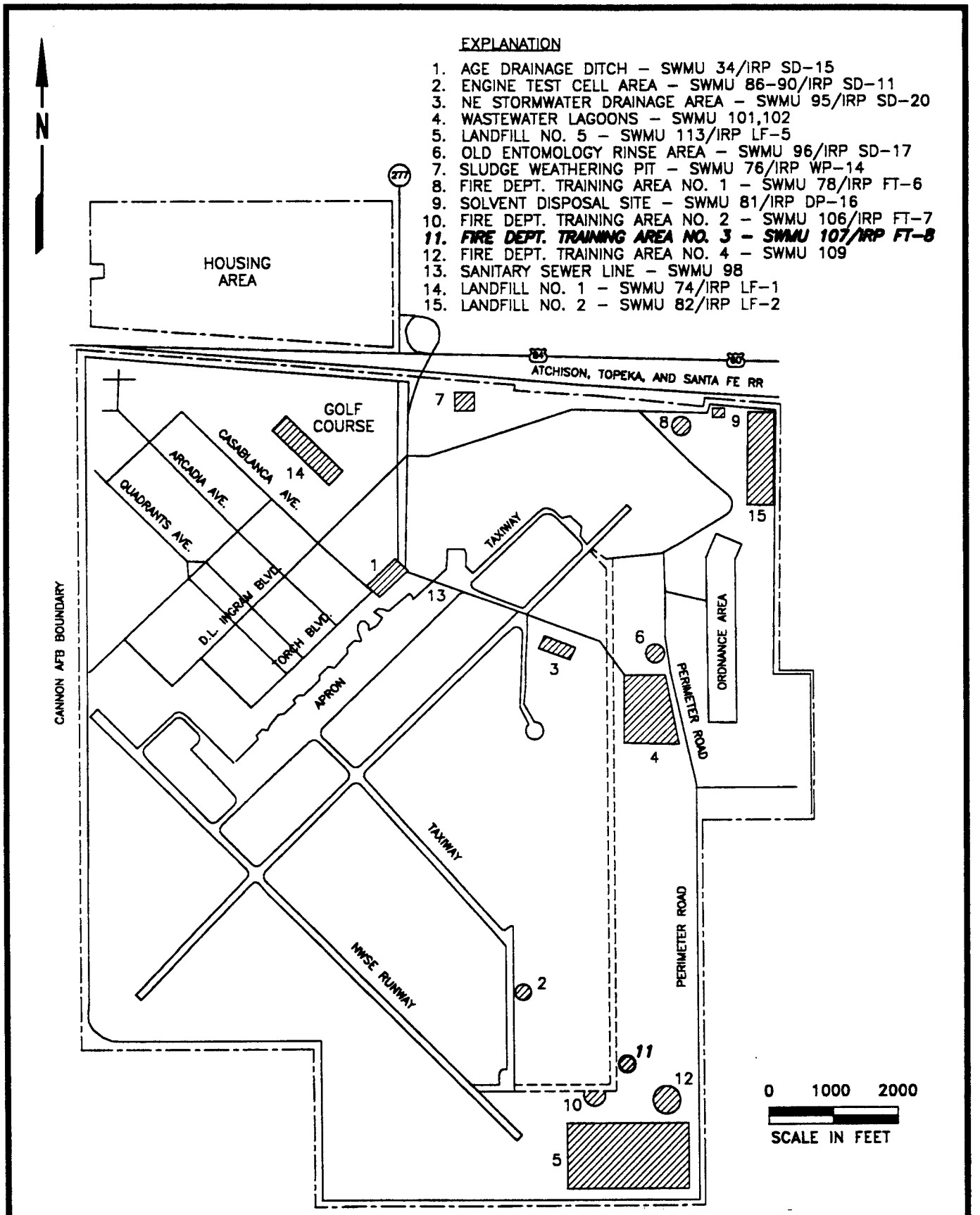

SOURCE: Woodward-Clyde, February1996

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Figure 1-2

IRP/SWMU SITE LOCATION MAP

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

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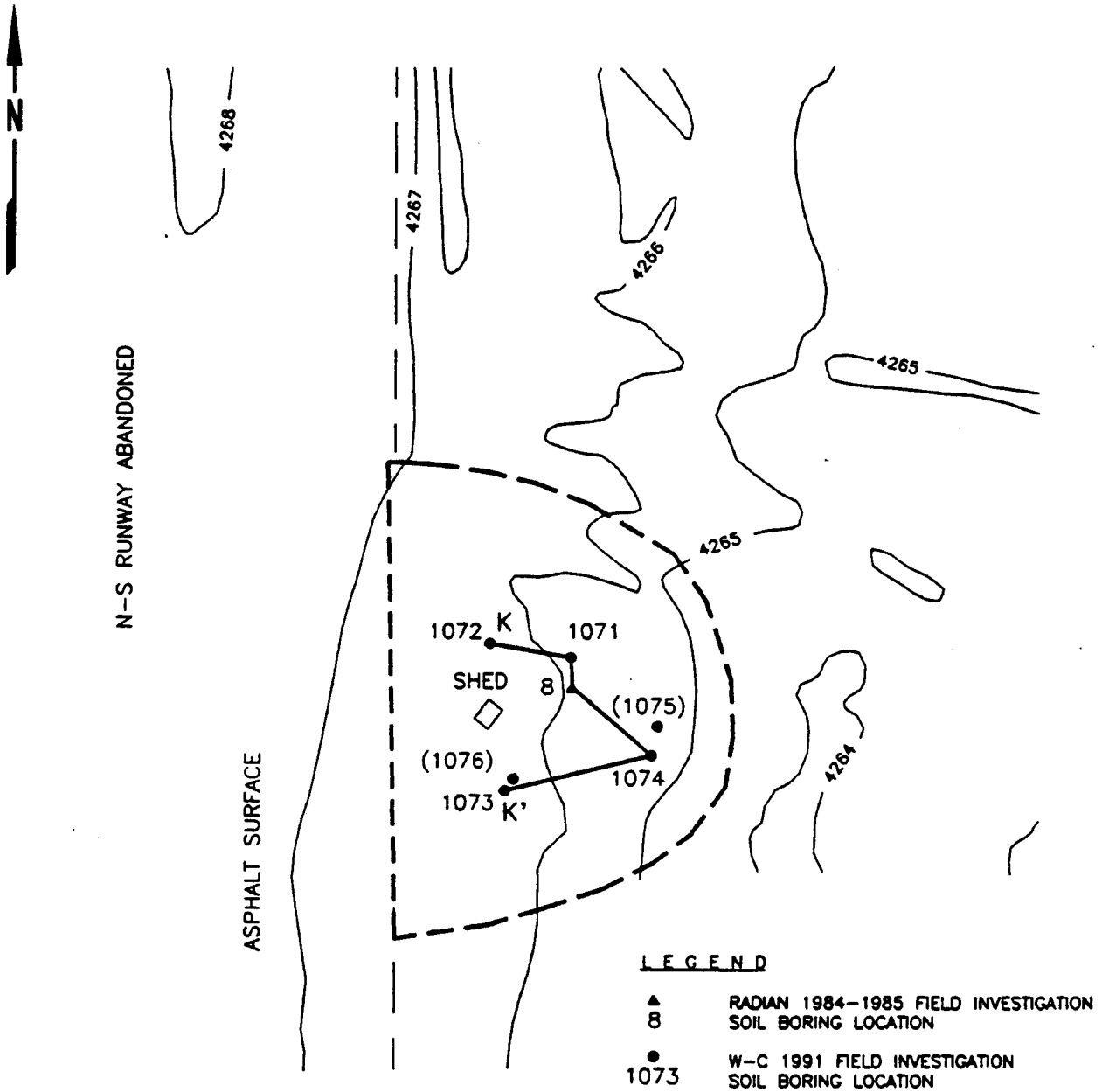

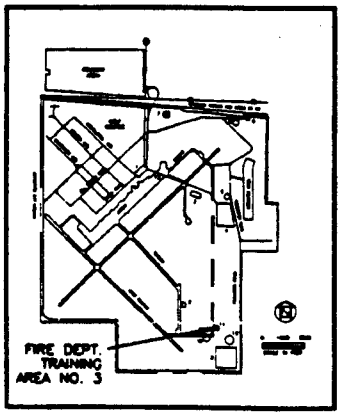

SOURCE: Woodward-Clyde, February1996

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Figure 1-3

LOCATION OF SOIL BORINGS AND SURFACE SOIL SAMPLES

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

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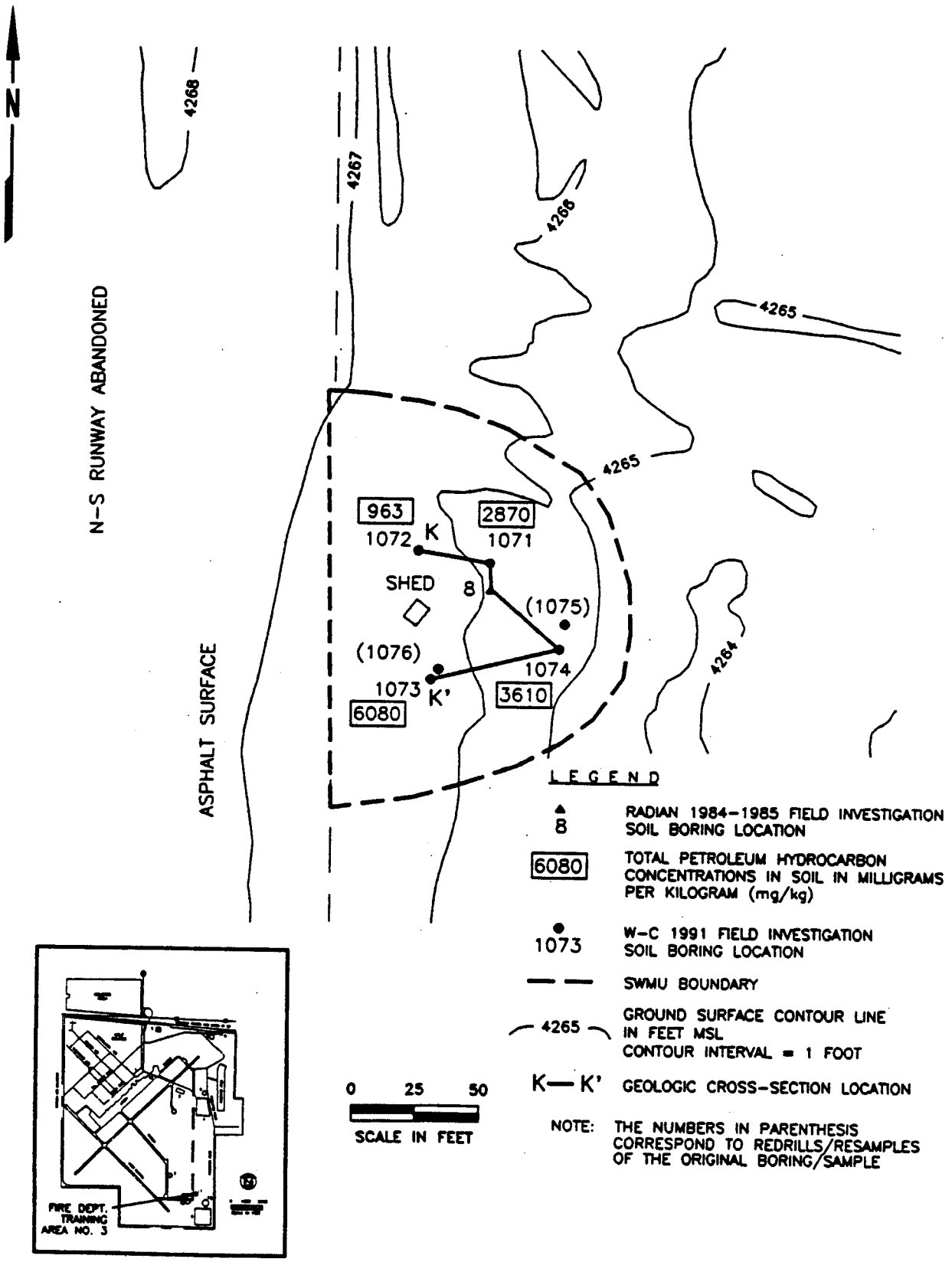

SOURCE: Woodward-Clyde, February1996

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Figure 2-1

TPH CONCENTRATIONS IN SURFACE SOIL

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

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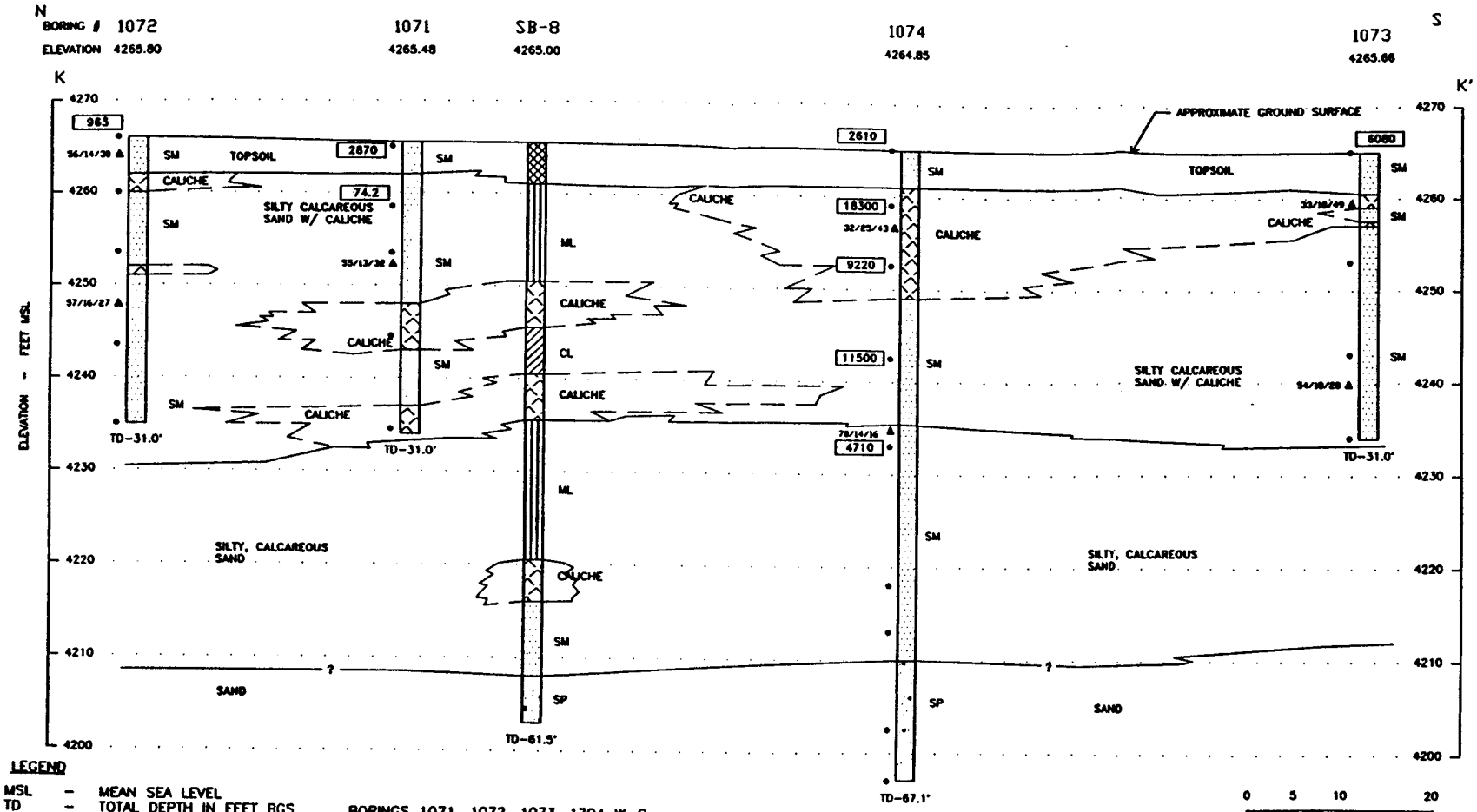

LEGEND

MSL – MEAN SEA LEVEL
TD – TOTAL DEPTH IN FEET BGS
SM,SP,GW UNIFIED SOIL CLASSIFICATION
ML,GP SYSTEM ABBREVIATIONS
BGS – BELOW GROUND SURFACE

[2870]• – THE BOXED VALUES ARE THE TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM (mg/kg)

BORINGS 1071, 1072, 1073, 1704 W-C (OCT 91) (BORINGS APPROXIMATELY LOCATED) (BORING APPROXIMATELY LOCATED)

NOTE: THE LOCATION OF THIS CROSS-SECTION IS SHOWN ON FIG. 2-1

• – CHEMICAL ANALYSIS SAMPLE INTERVAL

▲ – GRADATION ANALYSIS SAMPLE INTERVAL. THE THREE NUMBERS REPRESENT THE APPROXIMATE PERCENTAGES OF SAND-, SILT- AND CLAY- SIZED MATERIAL RESPECTIVELY

0 5 10 20

HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 1X

SOURCE: Woodward-Clyde, 1996

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Figure 2-2

VERTICAL EXTENT OF TPH IN SOIL

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

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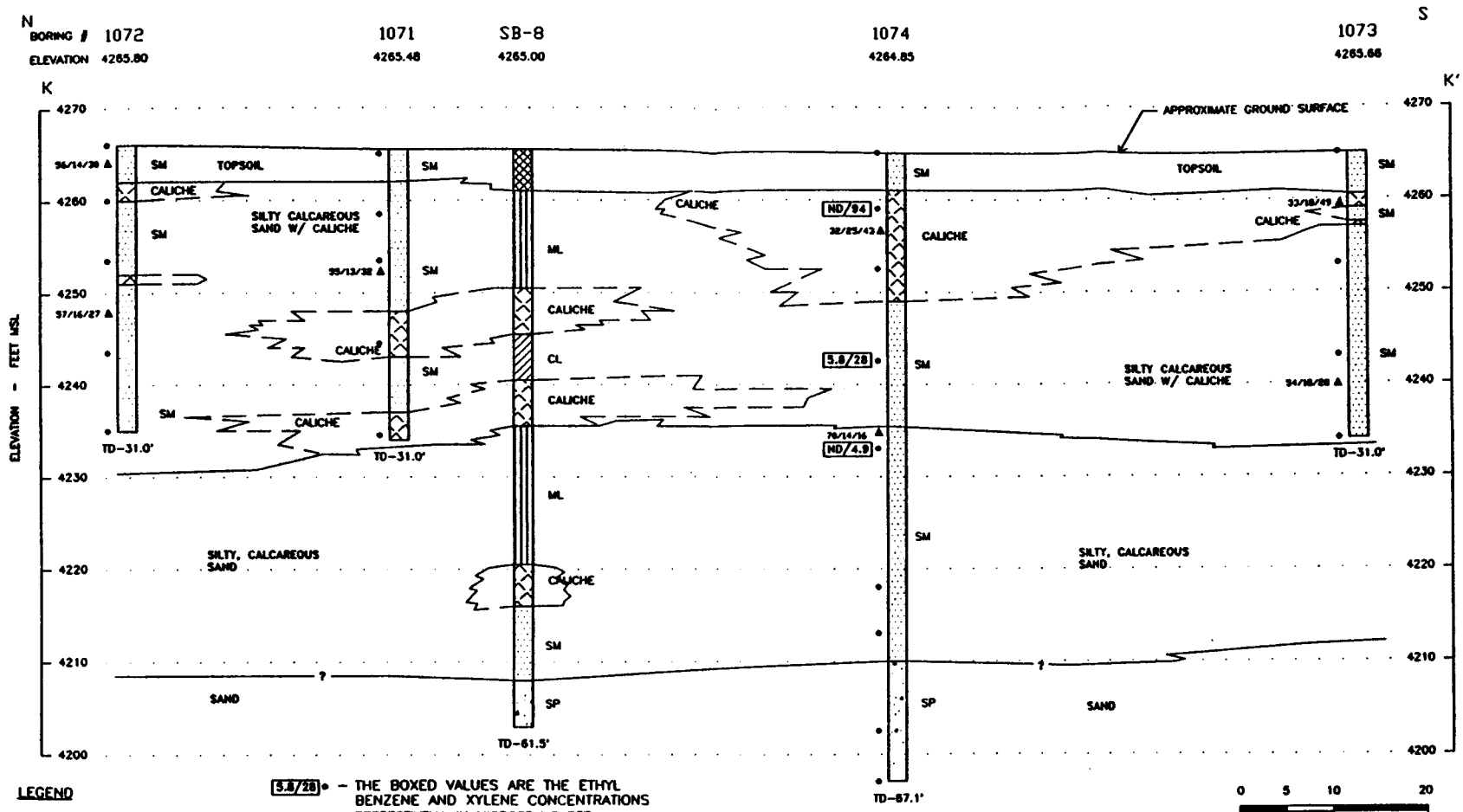


LEGEND

MSL	–	MEAN SEA LEVEL
TD	–	TOTAL DEPTH IN FEET BGS
SM,SP,GW ML,GP		UNIFIED SOIL CLASSIFICATION SYSTEM ABBREVIATIONS
BGS	–	BELOW GROUND SURFACE
ND	–	NOT DETECTED

5.8/28 • – THE BOXED VALUES ARE THE ETHYL BENZENE AND XYLENE CONCENTRATIONS RESPECTIVELY, IN MICROGRAMS PER KILOGRAM (ug/kg)

BORINGS 1071, 1072, 1073, 1704 W-C (OCT 91) (BORINGS APPROXIMATELY LOCATED) (BORING APPROXIMATELY LOCATED)

NOTE: THE LOCATION OF THIS CROSS-SECTION IS SHOWN ON FIG. 2-1

• – CHEMICAL ANALYSIS SAMPLE INTERVAL

76/14/16 ▲ – GRADATION ANALYSIS SAMPLE INTERVAL. THE THREE NUMBERS REPRESENT THE APPROXIMATE PERCENTAGES OF SAND-, SILT- AND CLAY- SIZED MATERIAL RESPECTIVELY

0 5 10 20

HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 1X

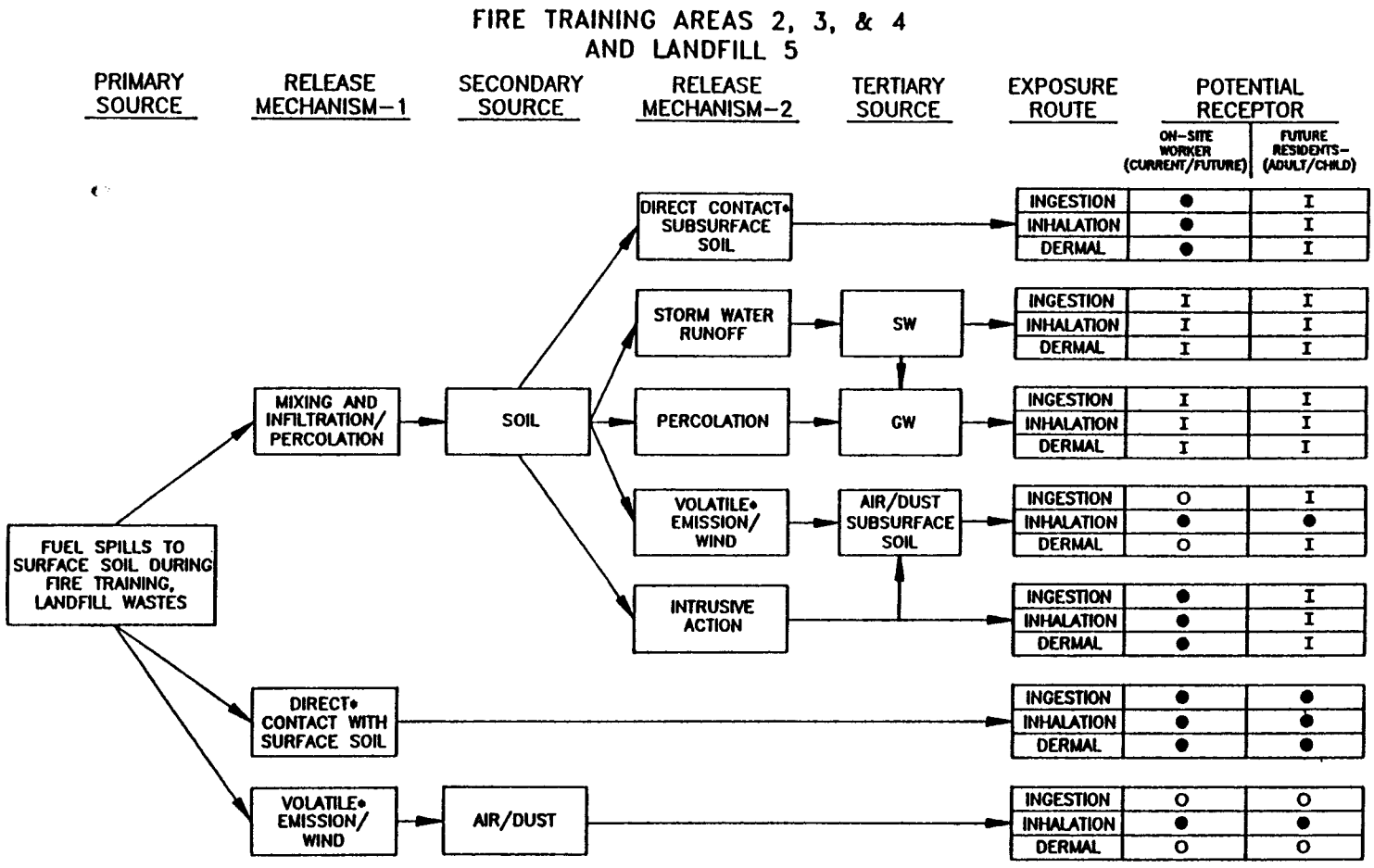
Figure 2-3

ETHYL BENZENE AND XYLENE CONCENTRATIONS IN SOIL

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

SOURCE: Woodward-Clyde, 1996

HARZA Consulting Engineers and Scientists



SOURCE: Woodward-Clyde, 1995

HARZA Consulting Engineers and Scientists

Figure 2-4

CONCEPTUAL SITE MODEL

FIRE DEPARTMENT TRAINING AREA No. 3
SWMU No. 107 / IRP No. FT-08
Cannon Air Force Base, New Mexico

c:\pm5\misc\newmex2.pm5

APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Fire Department Training Area No. 3 (SWMU No. 107) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

  This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Fire Department Training Area No. 1
SWMU No. 78 / IRP No. FT-06

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Fire Department Training Area No. 1
SWMU No. 78/IRP No. FT-6
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Fire Department Training Area No. 1
SWMU No. 78/IRP No. FT-6

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Fire Department Training Area No. 1 (SWMU No. 78/IRP No. FT-6) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the Fire Department Training Area No. 1 (SWMU No. 78/IRP No. FT-6) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Fire Department Training Area No. 1 (SWMU No. 78/IRP No. FT-6) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendices

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Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
TAL	Target Analytical List

LIST OF ACRONYMS

TCL	Target Compound List
TPH	Total Petroleum Hydrocarbons
UBK	Uptake Biokinetic
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.1 SITE LOCATION AND DESCRIPTION

Fire Department Training Area No. 1, designated as Solid Waste Management Unit (SWMU) No. 78 and Installation Restoration Program (IRP) No. FT-6, is a former base fire department training area operated from 1959 to 1968. The site consists of an unlined surface area approximately 100 ft in diameter. During the period of operation approximately 300 gallons of waste oils, solvents, and fuels were poured onto the soil approximately twice monthly to create fires for personnel training purposes.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. Fire Department Training Area No. 1 (SWMU No. 78) is located in the northeast corner of the base, south of the railroad tracks and northeast of Perimeter Road. The site is shown as Area 8 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Fire Department Training Area No. 1 occupies an area of approximately 1/5 acre and is essentially flat. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. Fire Training Area No. 1 is located within an area characterized by the Cannon AFB Base Comprehensive Plan as an Open Area. Open Areas are defined as conservation areas and required buffer space. The site is also characterized as Open

Space according to the U.S. Air Force's Rational National Standards Initiative. To the immediate east and south is an Aircraft Operations and Maintenance Facilities area, to the west is more land characterized as Open Area, and to the north is the base property boundary (W-C 1995). Fire Training Area No. 1 is within an open field which is currently vacant and not in use. Ground maintenance contractors mow the area once per month for approximately 5 to 10 minutes, for 6 months of the year.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Fire Department Training Area No. 1 is located approximately 2 to 3 miles from on-base family housing areas. These housing areas include on-base facilities at the northwest corner of the base and the Chaves Manor Housing Area, north of U.S. Highway 60/84. Other residences are scattered along the highway in the vicinity of the base and may be closer to Fire Department Training Area No. 1.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Fire Training Area No. 1 occupies an approximately circular area of 100 feet in diameter, surrounded by an earth berm. The facility now appears as an open field covered with prairie grass. The general configuration of the fire training area can be discerned because there is abundant aluminum slag on the ground surface and the vegetative cover is slightly stressed.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

Fire Department No. 1 is an unlined surface approximately 100 feet in diameter in the northeast corner of the base. Approximately 300 gallons of waste oils, solvents, and fuels were poured on the ground surface twice monthly to create fires. The site was in use from 1959 to 1968.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at Fire Department Training Area No. 1 was evaluated by reviewing existing information and conducting an analysis of installation records.

- During 1984 and 1985, a Phase II (Stage 1) investigation was conducted by Radian Corporation (Radian) to determine if environmental contamination had resulted from fire training exercises at Fire Department Training Area No. 1 (Radian 1986). During this investigation, two deep soil borings (Borings 6A and 6B) were drilled at the site and samples for chemical analyses were collected to evaluate the impact of past and ongoing activities and to define site-specific hydrogeologic conditions. Boring locations are shown on **Figure 1-3.** Soil samples collected during this investigation were analyzed for oil and grease, lead, and purgeable halocarbons and aromatics.

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the U.S. EPA at Cannon AFB by A.T. Kearney, Inc. (A.T. Kearney 1987). The purpose was to identify and evaluate SWMUs to assess the potential for releases of hazardous wastes or constituents to the environment. Results identified Fire Department Training Area No. 1 as a potential SWMU.

- In September 1991, Woodward-Clyde (W-C) investigated Fire Department Training Area No. 1 as part of a Remedial Investigation (RI) conducted for 18 IRP/SWMU sites at Cannon AFB. Two soil borings (Borings 0781 and 0782) were drilled and subsurface samples collected for chemical and geotechnical analyses. Surface samples also were collected from near both soil borings and at additional surface locations 0783, 0784, and 0785. Results of the W-C investigation are summarized in Section 2.2.

1.2.2 Period of Operation

Fire Department Training Area No. 1 (SWMU No. 78) was used to conduct fire department training exercises from 1959 to 1968. The site has been inactive and unused since 1968, other than routine mowing.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that Fire Department Training Area No. 1 was used exclusively for fire training exercises throughout its period of operation (1959 to 1968).

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

During its period of operation (1959 to 1968), Fire Department Training Area No. 1 was used for training exercises approximately twice per month. For each usage, approximately 300 gallons of waste oils, recovered fuels, and spent solvents were poured on the ground within the site and ignited to create training fires (USAF 1990). In some instances, the ground may have been presaturated with water prior to pouring the waste products onto the ground.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI at Fire Department Training Area No. 1 was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of Fire Department Training Area No. 1 site indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Fire Department Training Area No. 1 (SWMU No. 78/IRP No. FT-06) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Geologic units immediately underlying Fire Department Training Area No. 1 are Tertiary (Miocene to Pliocene) fluvial deposits of the Ogallala Formation (W-C 1992). These consist predominantly of well-sorted sands with scattered thin (1 to 11 feet thick) caliche layers and, based on regional information, may be up to 390 feet thick in the general area.

Borings completed at Fire Department Training Area No. 1 have penetrated the Ogallala deposits to a maximum depth of 102 feet and suggest three fairly distinct sand and sand/caliche fluvial units. The lowermost deposits consist of fine- to medium-grained, well sorted, unconsolidated, light to medium orange sand deposits, comprised predominantly of subrounded to subangular quartz grains with minor amounts of orange and dark colored grains. These sands are relatively clean (i.e., little or no silt/clay sized particles) and are generally non-calcareous; however, there are occasional thin layers and pockets of calcareous sands. This unit is comprised of approximately 89 to 92 percent sand, 2 to 4 percent silt, and 6 to 7 percent clay and was encountered in both W-C borings at approximately 70 feet BGL. The thickness of this unit is unknown at present because it was not fully penetrated. Based on the borings it is at least 32 feet thick at this SWMU.

The middle deposits consist of fine-grained, well sorted, slightly silty, pale orange to orange sands, comprised predominantly of subangular to subrounded quartz grains with minor amounts of dark colored grains. These sands are non-calcareous and become siltier toward the northeast near Boring 0781. This unit is comprised of approximately 86 percent sand, 7 percent silt, and 7 percent clay. This unit was encountered at depths of 52 feet BGL in Boring 0782 and 56 feet BGL in Boring 0781. The thickness of this unit ranges from approximately 13 feet in 0781 to 18 feet in 0782.

The uppermost deposits consist of fine-grained, well sorted, silty, calcareous, medium to pale orange to tan-orange sands. These sands are comprised predominantly of subangular to subrounded quartz grains with varying amounts of silt and calcium carbonate. Occasionally,

these sands are moderately to well cemented with calcium carbonate. Thin layers (ranging from a few inches to several feet in thickness) and small pockets or nodules of tan-orange, silty, sandy, clayey caliche are scattered throughout this unit. This unit is comprised of approximately 52 to 70 percent sand, 16 to 24 percent silt, and 14 to 24 percent calcium carbonate and/or clay-sized material. The thickness of this unit ranges from 48 feet thick in 0782 to 52 feet thick in 0781. Approximately 4 feet of native topsoil exists above this unit (see Section 2.2.1). No groundwater was encountered during the drilling of these borings.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

Soils at Fire Department Training Area No. 1 area are sandy loam and loamy sand of the Amarillo Soil Group with a total thickness of approximately 4 feet (W-C 1992). The soils consist primarily of fine-grained, well sorted, silty, clayey, unconsolidated orange to brown-orange to brown sands. The sands are generally dry to slightly moist at depth. One gradation analysis was performed on a sample collected from this unit at 0.5 feet BGL in Boring 0781. The results indicate that this soil sample was comprised of approximately 59 percent sand, 22 percent silt, and 19 percent clay.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations conducted at Cannon AFB encompassed soils at Fire Department Training Area No. 1. Results of the Phase I IRP Records Search (CH_2M Hill, 1983) recommended a limited Phase II investigation program to confirm or rule out the presence and/or migration of hazardous contaminants at the site. The Phase II (Stage 1) investigation was conducted by Radian Corporation in 1984 and 1985, during which Borings 6A and 6B (**Figure 1-3**), were drilled and samples for chemical analyses collected (Radian 1986). Results indicated the presence of oil and grease, and lead at the site (**Table 2-1**), but no further actions were recommended.

The PA/VSI, RFA performed in 1987 by A.T. Kearney, Inc. identified Fire Department Training Area No. 1 as a potential SWMU. The RFA also indicated that the potential for releases to the soil was high due to past disposal of hazardous wastes and because the SWMU was unlined. 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 additional soil sampling to determine if soil contamination still exists.

W-C conducted further sampling at Fire Department Training Area No. 1 in 1991 to further evaluate the nature and extent of potential hazardous contaminants. Two soil borings (Borings 0781 and 0782) were drilled and samples collected for chemical and geotechnical analyses (**Figure 1-3**). Surface samples were collected from the upper 0.5 feet of soil at locations near both soil borings and at additional surface locations 0783, 0784, and 0785. Subsurface soil samples were collected at depths ranging from 4 to 100 feet BGL. All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), Target Analytical List (TAL) metals, polychlorinated biphenols (PCBs), and pesticides. Due to laboratory missed holding times for TCL VOCs and/or TPH analyses on several of the original samples, resampling was performed 5 feet northwest of Boring 0782 as required to complete the investigation sampling program.

Results of the W-C analyses are summarized in **Tables 2-2** and **2-3** and indicated the presence of the pesticides 4,4-DDD and 4,4-DDE, and TPH in the surficial soils throughout the site. The results suggest further that the soils below 4 to 6 feet BGL have not been significantly impacted, although a minor concentration (14 μg/kg) of 4,4-DDD was reported at 10 to 12 feet BGL in Boring 0781. However, the high soil/water partition coefficient for pesticides

(EPA 1979) indicated that the compounds are retained on soil particles, thus retarding migration into deeper soils. The heavy metals lead and zinc (**Table 2-4** and **2-5**) also were present in the surficial soils throughout the site, and lead was detected at depths of 4 and 20 feet BGL in Borings 0781 and 0782, respectively.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and

to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during W-C's remedial investigation and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to Fire Department Training Area No. 1; therefore, no surface water information was collected as part of the RI performed by W-C.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with Fire Department Training Area No. 1. No air sampling was performed as part of this RI, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination. However, air modeling was performed in support of the baseline risk assessment.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs) (see Section 3.0). Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. Fire Department Training Area No. 1 is within RAA4, which also includes the Solvent Disposal Area.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

Current Exposure Scenario:

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of RAA4 is less than ½ acre and, therefore, future construction or intrusive action was not assumed, nor were residential receptors. Therefore, Maintenance Workers were the only present and future potential human receptors.

2.6.2 Pathways

The primary chemical sources in RAA4 include waste oils, recovered fuels, and spent solvents such as trichloroethylene. Release mechanisms from soil include leaching of chemicals to groundwater, storm water runoff to surface water, and direct contact with subsurface soils. Chemicals can also be released into the air via volatilization or via fugitive dust emissions resulting in potential inhalation exposures. A ground maintenance or general duty worker in the area may be exposed to surficial soil via ingestion and dermal contact. This person may also be exposed to fugitive dust or particulates from wind erosion of surface soil, or volatilized chemicals emitted from surface and subsurface soils.

Soils. Direct contact with soils containing chemicals may result in potentially significant exposure via ingestion or dermal absorption. Such pathways may be particularly important in children. A high frequency of contact with soils by children is not expected under current conditions due to the location of these SWMUs and access limitations. Workers in the vicinity of these SWMUs are the most likely to come into contact with soils from these areas.

Air. Chemicals can be released into the air via volatilization or via fugitive dust emissions, resulting in potential exposures via inhalation.

Storm water runoff. Storm water runoff may result in migration of chemicals from soil to surface water and from surface water to groundwater. Potential exposure routes for surface water include ingestion, direct contact (dermal contact), and ingestion of fugitive VOC emissions from surface water. These pathways are not expected to be complete due to the intermittent nature of on-site surface water runoff.

Groundwater. Potential exposure to groundwater may occur via ingestion, inhalation, or dermal absorption from showering, bathing, or other domestic uses of groundwater. The groundwater gradient in this area is to the southeast. The groundwater pathway is expected to be incomplete due to the great depth to the groundwater (over 270 feet) and the site geology (presence of clay and caliche).

Crops Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils.

Atmospheric Deposition of Airborne Particulates on Edible Crops. Atmospheric deposition of airborne particulates on edible crops located off-site (or within the RAA under the future exposure scenario) is possible due to land use in the area. This exposure pathway is not expected to be significant based on the concentrations of chemicals detected in soils from this RAA. Fugitive dust inhalation by workers is expected to result in greater levels of chemical intake. If the results of risk characterization from the inhalation routes for workers and future residents in this RAA are acceptable, it is likely that indirect exposure via ingestion of edible crops is also insignificant.

Based on the above, current and future potential receptors for this site are Maintenance Workers. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA4 is provided in **Figure 2-1**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed by W-C in 1991 under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA4 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select COCs for the quantitative characterization of risk. The COCs identified in RAA4 were metals, volatile organic chemicals, and pesticides. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors. Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA4. Future intrusive action or residential scenarios were not judged to be plausible for RAA4, because it is smaller than ½ acre in area. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA4: acetone, ethylbenzene, perchloroethylene (PCE), 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), toluene, xylene, DDD, DDE, DDT, cadmium, lead, and zinc. RAA4 includes both Fire Department Training Area No. 1 and the Solvent Disposal Area. Of the COCs listed above, only DDD, DDE, lead, and zinc were found to be present at Fire Department Training Area No. 1.

Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA4 were slightly above (411 mg/kg) the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 for both current and future Maintenance (general duty) Workers.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA4 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for each receptor. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects.

The exposure pathway contributing the most to the total HI for both the average and RME exposure scenarios is incidental ingestion of soil, making up almost all (>80%) of the total noncarcinogenic hazard. Cadmium was the primary COC for this exposure pathway.

Carcinogenic Risks. Carcinogenic risks are also presented in **Table 3-3**. The total carcinogenic risk (i.e., risks for all pathways combined), for the average and the RME exposures for workers were 1.7E-11 and 8.9E-10, respectively. These risks are below the EPA's target risk range (1.0E-04 and 1.0E-06) for Superfund sites (EPA 1989b).

The primary exposure pathway contributing the majority of the cancer risk was inhalation of particulates. 4,4-DDD contributed significantly (>75%) to this carcinogenic risk.

Lead as a Potential Risk/Hazard. The maximum level of lead detected in soils at RAA4 was 529 mg/kg in surficial soil. The EPA Uptake Biokinetic (UBK) model is not applicable to this RAA since residential exposure is not likely to occur. The 95% UCL concentration for lead in surficial soil at RAA4 was 411 mg/kg, which exceeds the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994). However, the guidance is not applicable to this RAA, since residential exposure is not likely to occur. Allowable lead concentrations in soil for commercial and industrial exposure scenarios are significantly higher than 400 mg/kg.

Air modeling was performed to determine the lead concentrations in ambient air. For the average and RME exposures, the estimated ambient concentrations of lead were 0.015 $\mu g/m^3$ and 0.048 $\mu g/m^3$, respectively. Both of these concentrations were well below the EPA's background value of 0.200 $\mu g/m^3$ (EPA 1991b).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) were detected in soils at levels which were considered to be above background. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA4. The total noncarcinogenic HIs for all receptors were below the EPA's

level of concern (1.0) at RAA4 for both the average exposure and RME scenarios. The total carcinogenic risks for the average and RME exposures for workers were below the EPA's target risk range of 1.0E-04 to 1.0E-06 for a Superfund site. The UCL of lead concentrations in soil slightly exceeds the current EPA guidance for residential sites (400 mg/kg); however, this guidance is not strictly applicable to this site since residential exposure is not likely to occur.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA4, which includes Fire Department Training Area No. 1.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for Fire Department Training Area No. 1, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs were reviewed during the RI for Fire Department Training Area No. 1, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
OIL AND GREASE, TOTAL LEAD, PURGEABLE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. WP-14
Cannon Air Force Base, New Mexico

Sample Number	Sample Depth (Ft-BGL)	Oil and Grease (mg/kg)	Total Lead (mg/kg)	Purgeable Organic Compounds (EPA 8010/8020) µg/kg)
6A-1	3.8-4.8	2,000	4.5	ND
6A-2	9.6-10.6	2,800	3.2	ND
6A-3	47.5-48.6	1,700	28	ND
6B-1	3.5-4.5	520	3.8	ND
6B-2	9.5-10.5	140	23	ND
6B-3	47.5-48.0	310	1.8	ND

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
ND = not detected

Source: Final Report, IRP Phase II (Radian 1986)

TABLE 2-2
PESTICIDE 4,4-DDD AND 4,4-DDE CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Sample Location	Sampling Depth (Ft-BGL)	4,4-DDD	4,4-DDE
0781	0-0.5	150	57J
	4-6	23	3.7U
	10-12	14	3.6U
	20-22	3.7U	3.7U
	All samples below 22 feet	Not detected above CRQL	Not detected above CRQL
0782	0-0.5	91	14U
	4-6	3.5UJ	3.5UJ
	10-12	3.7UJ	3.7UJ
	20-22	3.7UJ	3.7U
	All samples below 22 feet	Not detected above CRQL	Not detected above CRQL
0783	0-0.5	2,000	330U
0784	0-0.5	660	58J
0785	0-0.5	160	110
0786	0-0.5	4.3U	1.1J

All concentrations are reported in microgram per kilogram (μg/kg).

Ft-BGL = Feet below ground level
J = Estimated concentration
U = Not detected at the concentration given
UJ = Estimated as non-detect at the CRQL
CRQL = Contract Required Quantitation Limit

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 2-3
TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Sample Location	Sampling Depth (Ft-BGL)	TPH (mg/kg)
0781	0-0.5 4-6 10-12	2,200 95 ND
	All samples deeper than 12 feet	ND
0782	0-0.5 4-6	1,970 ND
	All samples deeper than 6 feet	ND
0783	0-0.5	4,080
0784	0-0.5	980
0785	0-0.5	12,500J
0786	0-0.5	ND

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
ND = Not detected
J = Estimated concentration

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 2-4
METAL CONCENTRATIONS IN SURFACE SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Metal	Boring 0781	Boring 0782	Boring 0783	Boring 0784	Boring 0785	Boring 0786	Background[1] ($\bar{x} + 2\sigma$)
Aluminum	26,000J	10,700J	10,200J	9,110J	14,200J	13,900J	2,571-10,447
Antimony	-R	-R	-R	-R	-R	6.1R	4.81-5.44
Arsenic	1.9J	2J	1.8J	1.6J	1.7J	2.5J	0.43-1.95
Barium	165J	142J	115J	132J	220J	83.5J	0-903
Beryllium	0.44U	0.49J	0.41U	0.53J	0.42U	0.53U	0.32-0.68
Cadmium	21.6	10.5	3.3	7.7	4.1	1.1U	0.81-1.01
Calcium	2,540	1,950	1,450	1,290	832J	12,200	0-193,062
Chromium	39.6	16.7	14.2	13.4	29.1	12.1	2.67-9.31
Cobalt	2J	4J	3.3J	2.5J	1.9J	4.5J	1.38-4.06
Copper	710	112	52	84.7	385	13U	0.00-15.44
Iron	7,100	9,230	8,950	7,500	6,580	11,400	2,239-8,683
Lead	336	292	194	271	529	25.6	1.76-8.64
Magnesium	1,170	1,410	1,390	1,290	968J	2,020	0-11,903
Manganese	225	171	99.5	74.6	51.1	198	10.89-167

TABLE 2-4 (continued)
METAL CONCENTRATIONS IN SURFACE SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Metal	Boring 0781	Boring 0782	Boring 0783	Boring 0784	Boring 0785	Boring 0786	Background[1] ($\bar{x}$ + 2σ)
Mercury	0.11U	0.11	0.12	0.1U	0.1U	0.13U	-- - --
Nickel	8.8J	7.8J	6.8J	5.6J	5.9J	8.8J	3.57-8.49
Potassium	1,450	1,900J	1,880J	1,710J	1,110J	2570J	632-2,613
Selenium	0.22UJ	0.22UJ	0.2UJ	0.2UJ	0.21UJ	0.27UJ	0.00-1.35
Silver	0.88U	0.87U	0.81U	0.81U	0.83U	1.1U	0.86-0.94
Sodium	289U	288U	268U	269U	275U	352U	154-540
Thallium	0.22UJ	0.22UJ	0.2UJ	0.2UJ	0.21UJ	0.27UJ	0.20-0.24
Vanadium	14.4	18.7	19.2	15.4	14.1	24.3	9.26-26.74
Zinc	829	214	126	154	614	33.3J	4.58-21.82

Note: All values in mg/kg, unless indicated

UJ = Estimated as a non-detect at the instrument detection limit

J = Estimated concentration

U = Non-detect at the concentration given

-R = Rejected

-- - -- = No range could be calculated

[1]Background range calculated from concentrations in Table 2-7 in the RI Report (W-C 1992)

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 2-5
METAL CONCENTRATIONS IN SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Element	Boring 0781 Sample Depth (Ft-BGL)										Boring 0782 Sample Depth (Ft-BGL)										Back ground[2] $\bar{x} + 2\sigma$
	0	4	10	20	30	40	50	60	75	100	0	4	10	20	30	40	50	60	75	100	
Aluminum	26,000J	13,000J	10,500J	6,460J	6,340J	4,860J	4,790J	1,940J	1,660J	1,410J	10,700J	6,240J	6,570J	7,940J	9,530J	3,950J	4,490J	2,190J	1,420J	1,350J	2,571-10,447
Antimony	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	-R	4.81-5.44
Arsenic	1.9J	2.7	2.1J	2J	1J	0.76J	0.79J	0.77J	0.67J	0.69J	2J	1.8J	1.3J	1.9J	1.6J	0.83J	0.73J	0.89J	0.67J	0.85J	0.43-1.95
Barium	165J	111J	392J	60.3J	70J	52.5J	19.1J	6.7J	15.6J	27.5J	142J	158J	101J	498J	61.2J	13.4J	66.4J	12.4J	36.1J	13.3J	0-903
Beryllium	0.44U	0.59J	0.5U	0.44U	0.47U	0.42U	0.43U	0.41U	0.42U	0.41U	0.49U	0.42U	0.44U	0.45U	0.46U	0.42U	0.43U	0.43U	0.42U	0.41U	0.32-0.68
Cadmium	21.6	0.9U	0.9U	0.88U	0.94U	0.85U	0.85U	0.83U	0.84U	0.81U	10.5	0.84U	0.89U	0.9U	0.91U	0.85U	0.85U	0.85U	0.84U	0.83U	0.81-1.01
Calcium	2,540	27,400	73,500	43,800	132,000	38,900	29,600	5,920	8,390	3,350	1,950	96,400	151,000	98,100	109,000	13,700	36,600	6,950	49,500	5,780	0-193,062
Chromium	39.6	11.3	8.1	5.3	9.9	3.7	4.2	1.9J	2.1	1.6J	16.7	5.8	5.6	10.4	8	3.3	4.6	2J	3.5	1.3J	2.67-9.31
Cobalt	2J	5.3J	3.6J	2J	1.6J	1.1J	1.4J	1U	1U	1U	4J	2.2J	2.2J	1.7J	1.7J	1.1J	1.1J	1.1U	1.1U	1U	1.38-4.06
Copper	710	12.6	7	4.3J	5.7U	3J	5.1U	3.1J	2.7J	2.3J	112	8.9	6	5.9	4.6J	2.7J	3.3J	3.7J	2.5J	3.2J	0.00-15.44
Iron	7,100	11,300	7,880	4,750	3,340	3,540	3,650	1,710	1,900	2,000	9,230	5,060	4,660	5,140	4,820	3,120	3,320	1,800	1,470	2,000	2,239-8,683
Lead	336	16.3	6.1	5	2.6	2.5	4.2	2	1.8	1.4	292	6.8	3.8	25	3.1	2.7	3.6	2.2	3	2.8	1.76-8.64
Magnesium	1,170	2,640	4,370	4,220	20,700	5,010	6,430	1,640	1,100	827	1,410	2,490	4,290	4,900	18,800	3,610	5,180	2,510	1,200	823J	0-11,903
Manganese	225	214	153	73.1	42	34.5	52.1	17.2	20.3	29.5	171	66	55.5	59.4	33.6	58.6	43	18.8	22.5	30.5	10.89-167
Mercury	0.11U	0.11U	0.11U	0.11U	0.12U	0.11U	0.11U	0.1U	0.1U	0.1U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.11U	0.1U	----
Nickel	8.8J	11.6	8.8J	6.2J	6.1J	3.5J	4.4J	2.1J	2.2J	1.4U	7.8J	5.8J	7.4J	5.9J	6.1J	3.5J	4J	2.3J	1.5U	1.8J	3.57-8.49
Potassium	1,450	2,070J	1,890	1,650	1,020J	1,020J	996J	366J	313J	277J	1,900J	1,110	1,420J	1,520	1,600	841J	864J	369J	253J	261J	632-2613
Selenium	0.22UJ	0.23UJ	0.22UJ	0.22UJ	0.24UJ	0.21UJ	0.21UJ	0.21UJ	0.21UJ	0.2UJ	0.22UJ	0.21UJ	0.22UJ	0.23UJ	0.23UJ	0.21UJ	0.21UJ	0.21UJ	0.21UJ	0.21UJ	0.00-1.35
Silver	0.88U	0.9U	0.9U	0.88U	0.941U	0.85U	0.85U	0.83U	0.84U	0.81U	0.87U	0.84U	0.89U	0.9U	0.91U	0.85U	0.85U	0.85U	0.84U	0.83U	0.86-0.94

TABLE 2-5 (continued)
METAL CONCENTRATIONS IN SURFACE SOIL SAMPLES
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Element	Boring 0781 Sample Depth (Ft-BGL)										Boring 0782 Sample Depth (Ft-BGL)										Back ground[2] $\bar{x} + 2\sigma$
	0	4	10	20	30	40	50	60	75	100	0	4	10	20	30	40	50	60	75	100	
Sodium	289U	299U	296U	292U	312U	280U	282U	274U	276U	269U	288U	278U	294U	298U	301U	280U	282U	281U	278U	274U	154-540
Thallium	0.22UJ	0.23UJ	0.22UJ	0.22UJ	0.24UJ	0.21UJ	0.21UJ	0.21UJ	0.21UJ	0.2UJ	0.22UJ	0.21UJ	0.22UJ	0.23UJ	.234UJ	0.21UJ	0.21UJ	0.21UJ	0.21UJ	0.21UJ	0.20-0.24
Vanadium	14.4	23.4	25	18.1	19.7	10.1J	15.8	7.5J	5.1J	5.2J	18.7	16.4	15.2	19.7	27.1	9.4J	12.8	9.2J	4.7J	4.9J	9.26-26.74
Zinc	829	33.7	21.4	12.4	9.2	9.7	9.9	4.8	4.7	5	214	18	13.7	13.7	11.3	7.9	9.7	5.8	4.2	5	4.58-21.82

Ft-BGL = Feet below ground level
UJ = Estimated as non detect at the instrument detection limit
J = Estimated value
U = Not detected
-- - -- = No range could be calculated

[1] All concentrations are in milligrams per kilogram (mg/kg)
[2] Background range calculated from concentrations in Table 2-7 on the RI Report (W-C 1992)

Source: Final Remedial Investigation Report for 18 solid waste management units (Woodward-Clyde 1992)

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December 27, 1996, 12:38 pm

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level

(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

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December 26, 1996, 5:04 pm

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL
(1) = MCL for total trihalomethanes (2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

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December 26, 1996, 5:04 pm

TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA4
FIRE DEPARTMENT TRAINING AREA NO. 1
SWMU NO. 78/IRP NO. FT-6
Cannon Air Force Base, New Mexico

Receptor/Pathway	Average Exposure			Reasonable Maximum Exposure		
	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index	Cancer Risk	Subchronic Hazard Index	Chronic Hazard Index
Current Worker - Maintenance						
-- Soil Ingestion	1.19E-12	1.01E-07	5.68E-07	2.89E-10	7.34E-06	4.07E-05
-- Dermal Contact - Soil	4.64E-13	3.90E-08	2.20E-07	1.01E-10	2.56E-06	1.42E-05
-- Inhalation - VOCs	7.28E-12	5.24E-08	1.63E-07	1.82E-10	4.70E-07	1.47E-06
-- Inhalation - Particulates	7.59E-12	0.00E+00	0.00E+00	3.17E-10	0.00E+00	0.00E+00
Total	1.65E-11	1.92E-07	9.51E-07	8.89E-10	1.04E-05	5.64E-05
Future Worker - Maintenance						
-- Soil Ingestion	1.19E-12	1.10E-07	5.68E-07	2.89E-10	7.34E-06	4.07E-05
-- Dermal Contact - Soil	4.64E-13	3.90E-08	2.20E-07	1.01E-10	2.56E-06	1.42E-05
-- Inhalation - VOCs	7.28E-12	5.24E-08	1.63E-07	1.82E-10	4.70E-07	1.47E-06
-- Inhalation - Particulates	7.59E-12	0.00E+00	0.00E+00	3.17E-10	0.00E+00	0.00E+00
Total	1.65E-11	1.92E-07	9.51E-07	8.89E-10	1.04E-05	5.64E-05

Source: Final Report, RI at 18 SWMUs (W-C 1992)

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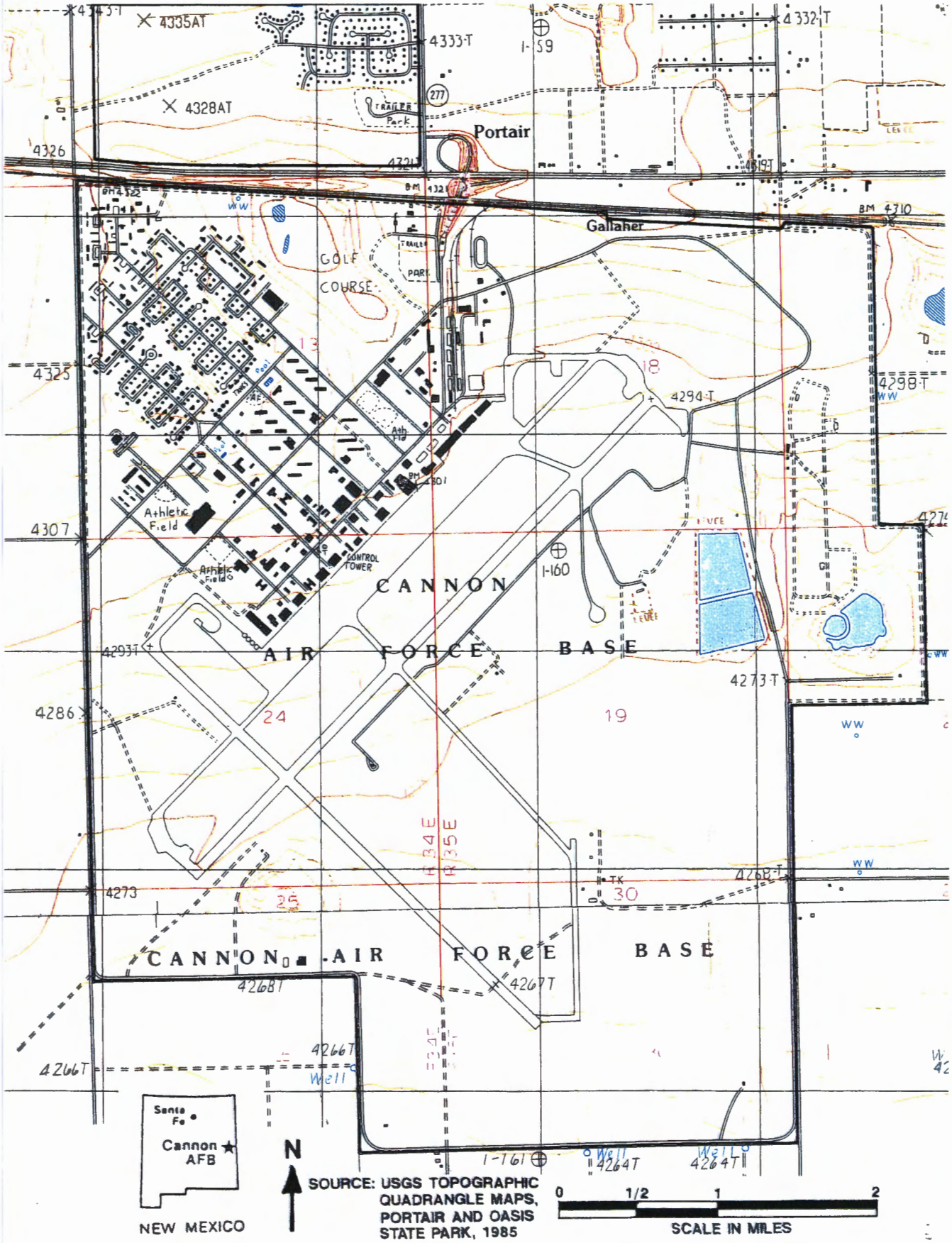
FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA *Consulting Engineers and Scientists*

Figure 1-1

GENERAL VICINITY MAP

FIRE DEPARTMENT TRAINING AREA No. 1
SWMU No. 78 / IRP No. FT-06
Cannon Air Force Base, New Mexico

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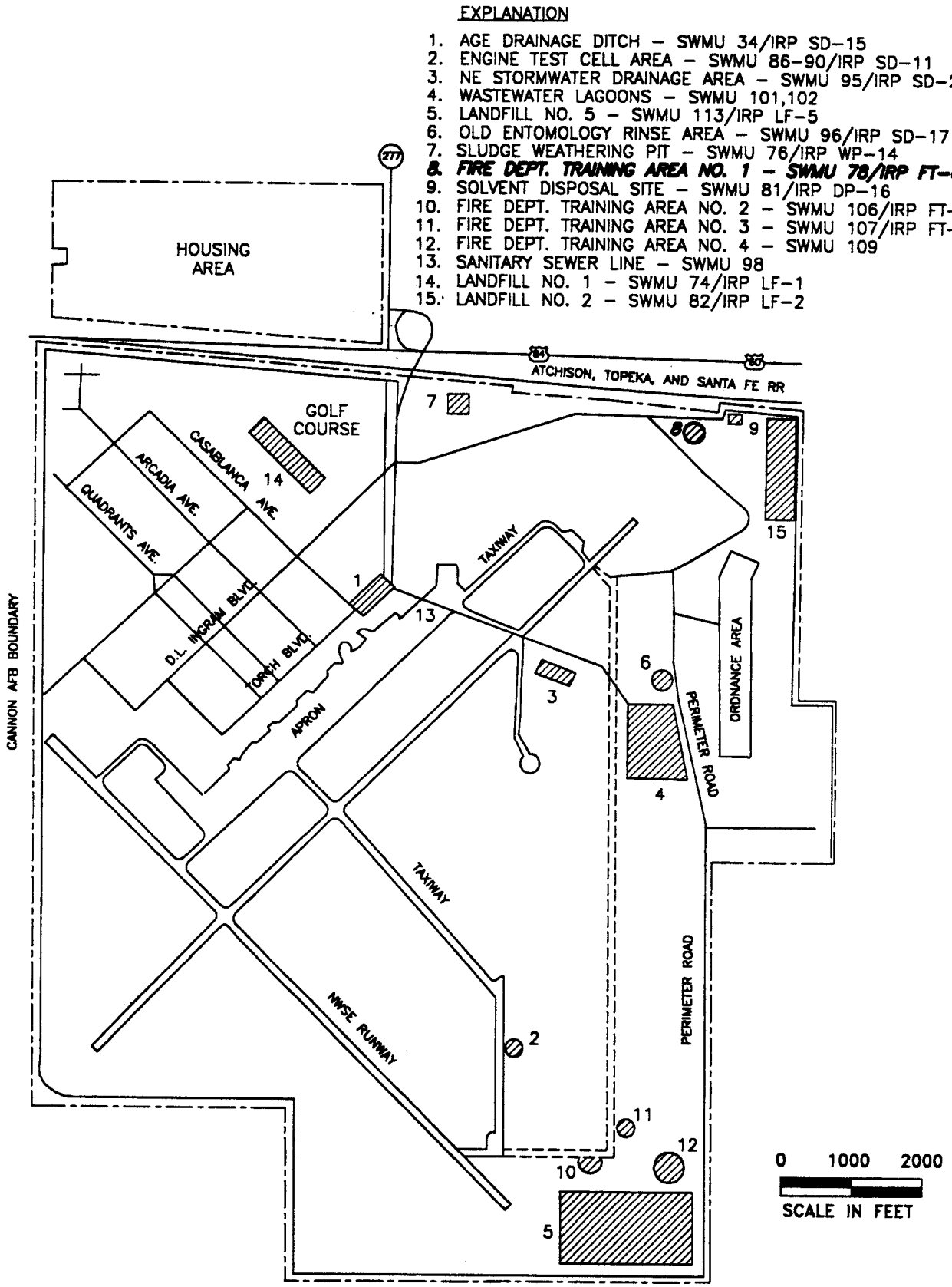

SOURCE: Woodward-Clyde, February1996

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Figure 1-2

IRP/SWMU SITE LOCATION MAP

FIRE DEPARTMENT TRAINING AREA No. 1
SWMU No. 78 / IRP No. FT-06
Cannon Air Force Base, New Mexico

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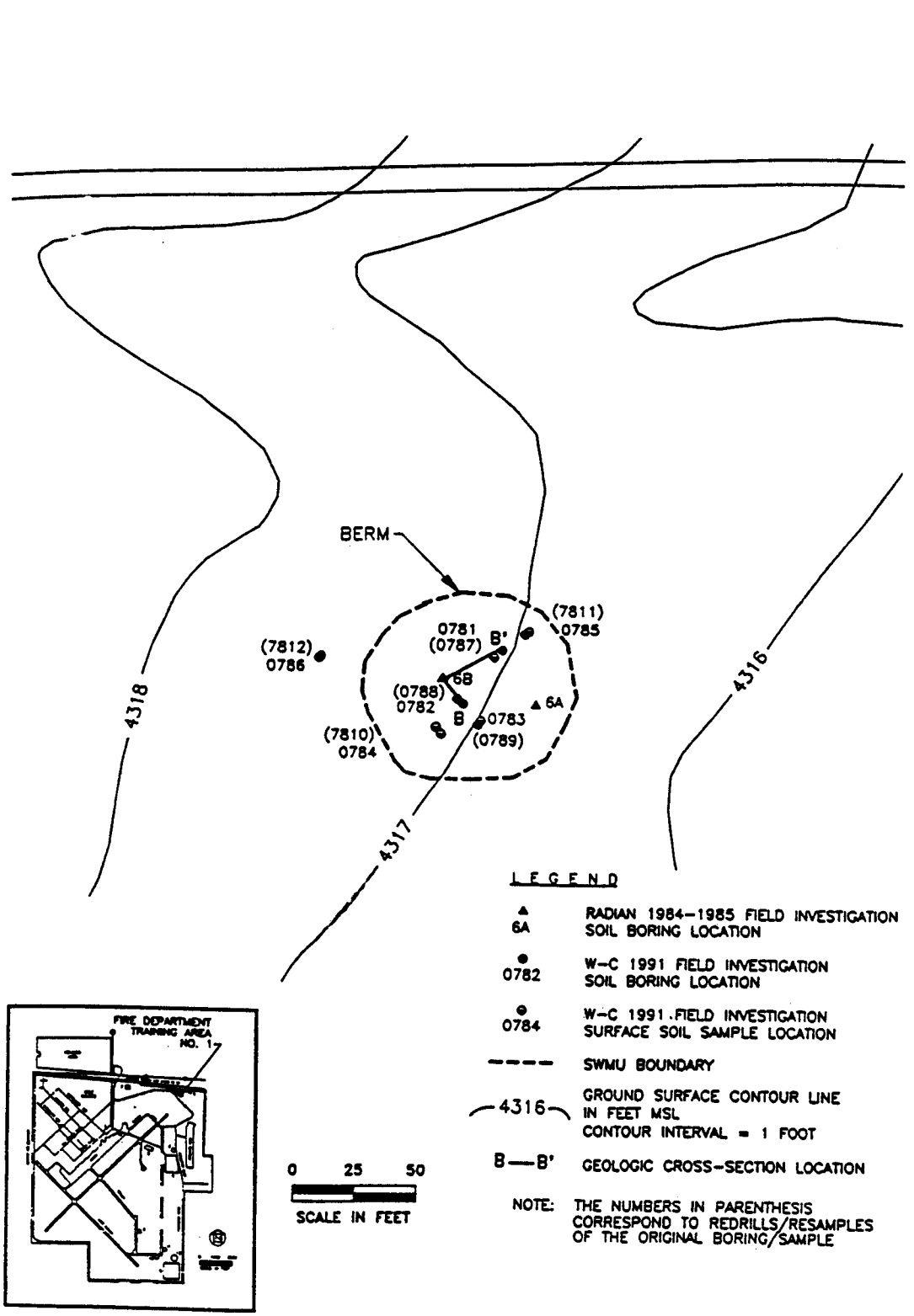

SOURCE: Woodward-Clyde, February1996

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Figure 1-3

LOCATION OF SOIL BORINGS AND SURFACE SOIL SAMPLES

FIRE DEPARTMENT TRAINING AREA No. 1
SWMU No. 78 / IRP No. FT-06
Cannon Air Force Base, New Mexico

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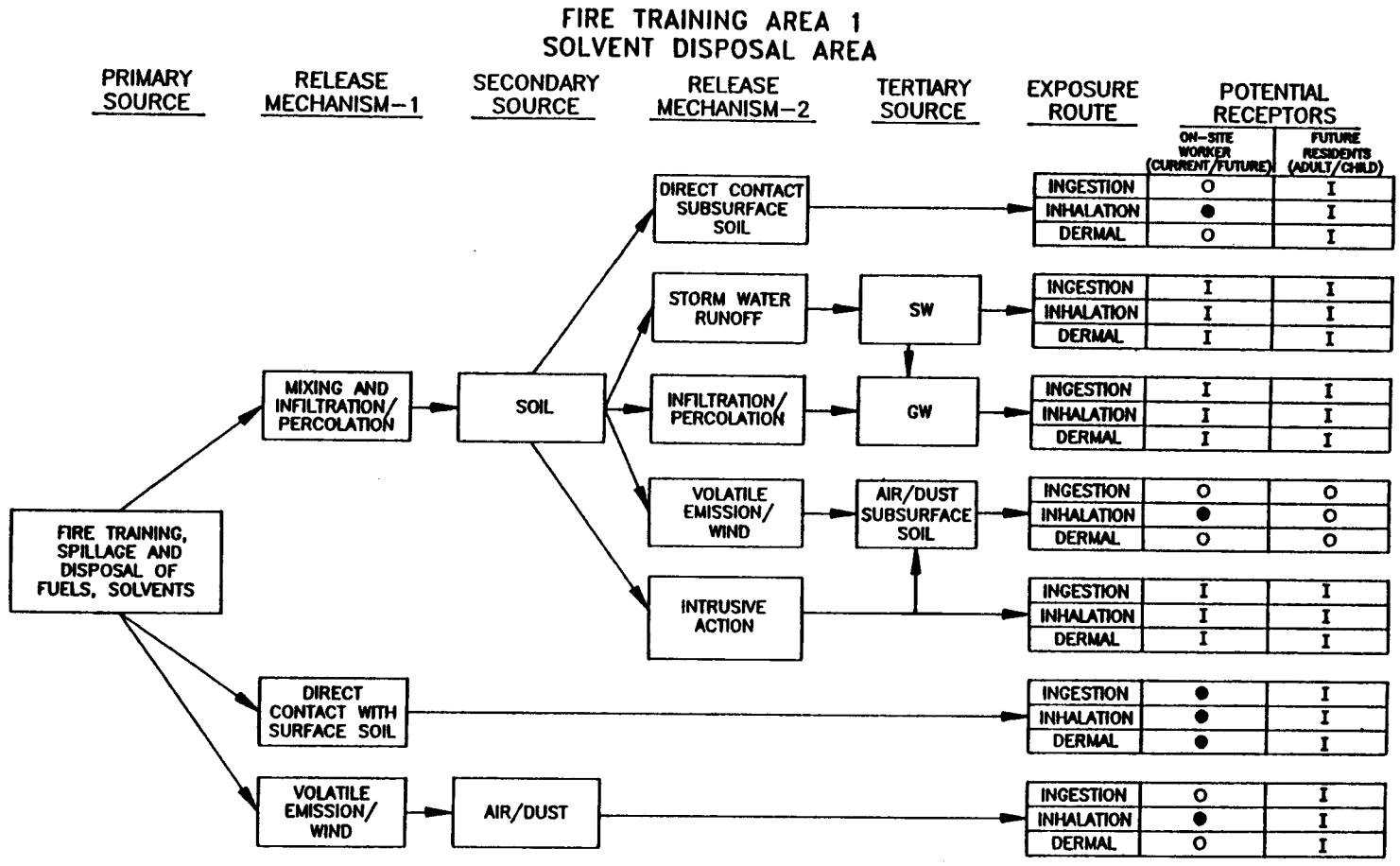

LEGEND

I INCOMPLETE EXPOSURE PATHWAYS
● SIGNIFICANT EXPOSURE PATHWAY
O RELATIVELY INSIGNIFICANT EXPOSURE PATHWAY

SOURCE: Woodward-Clyde, 1995

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Figure 2-1
CONCEPTUAL SITE MODEL
FIRE DEPARTMENT TRAINING AREA No. 1
SWMU No. 78 / IRP No. FT-06
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for Fire Department Training Area No. 1 (SWMU No. 78) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
AGE Drainage Ditch
SWMU No. 34 / IRP No. SD-15

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

AGE Drainage Ditch
SWMU No. 34/IRP No. SD-15
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

AGE Drainage Ditch
SWMU No. 34/IRP No. SD-15

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for AGE Drainage Ditch (SWMU No. 34/IRP No. SD-15) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the Remedial Investigation (RI) for the AGE Drainage Ditch (SWMU No. 34/IRP No. SD-15) performed by Woodward-Clyde (W-C) in 1991, including the baseline risk assessment and results of past investigations, indicate no significant risk at this IRP/SWMU site and, therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at AGE Drainage Ditch (SWMU No. 34/IRP No. SD-15) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendices

Appendix A	Responsiveness Summary
Appendix B	Administrative Record Index

LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AGE	Aerospace Ground Equipment
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COC	Contaminant of Concern
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EP	Extraction Procedure
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
gpm	Gallons per Minute
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
RAA	Risk Assessment Area
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command

LIST OF ACRONYMS

TAL	Target Analytical List
TCL	Target Compound List
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

Aerospace Ground Equipment (AGE) Drainage Ditch, designated as Solid Waste Management Unit (SWMU) No. 34 and Installation Restoration Program (IRP) No. SD-15, is a surface water drainage channel near AGE Facility Building No. 186. Minor spillages of oil and grease from nearby aircraft equipment maintenance and repair zones have occasionally occurred in the area.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. AGE Drainage Ditch (SWMU No. 34) originates on the flightline side of AGE Facility Building No. 186 and runs parallel to Facilities Buildings Nos. 191, 192, and 193, terminating on base at a culvert inlet near Argentina Avenue. The site is shown as Area 1 on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. AGE Drainage Ditch occupies an area 1,200 feet in length, 12 feet in width and approximately 1 foot in depth. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The AGE Drainage Ditch is located in a heavily used portion of Cannon AFB. Several buildings border the drainage ditch. The buildings include the AGE Maintenance Facility Building No. 186, the Squadron Mobility Building No.

191, Equipment Maintenance Building No. 190, and the Aircraft Maintenance Building No. 194. The primary activities in this area are aircraft and equipment maintenance. The concrete parking apron where aircraft are often parked is located immediately southeast of the maintenance buildings. The site is characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Base personnel cross the AGE Drainage Ditch as a shortcut once or twice a day. A few vehicles a day use the road that runs parallel to the ditch, and personnel in Building 191 often sit on the loading docks, which are adjacent to the ditch, and eat their lunch. The site is approximately 2,000 feet from the nearest base housing.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The AGE Drainage Ditch is about 1,200 feet long, 12 feet wide, and 1 foot deep at its deepest point. The side slopes are vegetated with grass above the active channel along the majority of the ditch area. However, the ditch has been regraded due to construction activities associated with construction of the building. At the time of the 1991 RI by W-C, no vegetation was present in the area. The ditch is bounded by the Building 191 loading dock, located approximately 16 feet northwest of the ditch bank, and the Building 190 parking curb, located 15 feet southeast of the ditch bank.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The AGE Drainage Ditch is a depression formed after railroad tracks were removed in the late 1960s. The ditch was originally 1,200 feet long, 12 feet wide (1/3 acre), and approximately 1 foot deep. The ditch receives stormwater runoff from several flightline operations and from

roads. Water carried by the ditch flows into an open field and evaporates. Potential contaminants carried by surface water runoff include oil and grease, fuels, and solvents.

The following is the investigative history of the site. Further discussion of the investigations is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at AGE Drainage Ditch was evaluated by reviewing existing information and conducting an analysis of installation records.

- During 1984 and 1985, a Phase II (Stage 1) investigation was conducted by Radian Corporation (Radian) to determine if environmental contamination had resulted from runoff into the AGE Drainage Ditch (Radian 1986). During this investigation, two soil borings (Borings 15A and 15B) were drilled at the site to depths of approximately 50 feet. Soil samples for chemical analyses were collected to evaluate the impact of past and ongoing activities and to define site-specific hydrogeologic conditions. Boring locations are shown on **Figure 1-3.** Soil samples collected during this investigation were analyzed for oil and grease, lead, and purgeable organic compounds.

- In March 1987, based on results of the Phase II investigation discussed above, a follow-up soil removal investigation was conducted by Radian (Radian 1987) at the AGE Drainage Ditch. This investigation was conducted to determine whether toxic soils existed and, if so, to assist Cannon AFB in the proper removal and disposal of the soils. The investigation consisted of hand-augering 15 shallow boreholes in the most discolored portion of the ditch to a depth of 2 feet (**Figure 1-3**). Soil samples were collected for chemical analysis for total lead, petroleum hydrocarbons, EP-toxicity, metals, and purgeable organic compounds.

- In 1987, a Preliminary Review/Visual Site Inspection (VSI), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted for the USEPA at Cannon AFB by A.T. Kearney, Inc. (A.T. Kearney 1987). The purpose was to identify and evaluate SWMUs to assess the potential for releases of hazardous wastes

or constituents to the environment. Results identified AGE Drainage Ditch as a potential SWMU.

- In September 1991, W-C investigated AGE Drainage Ditch as part of a Remedial Investigation (RI) conducted for 18 IRP/SWMU sites at Cannon AFB. Two soil borings (Borings 0341 and 0342) were drilled and surface and subsurface samples collected for chemical and geotechnical analyses. Results of the W-C investigation and other previous investigations are summarized in Section 2.2.

1.2.2 Period of Operation

The AGE Drainage Ditch (SWMU No. 34) reportedly was created by the removal of railroad tracks in the 1960s. The ditch has functioned as a surface runoff drainage facility since that time.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that the AGE Drainage Ditch was used exclusively as a drainage ditch throughout its period of operation (1960s to present).

1.2.5 Type of Permits Applied For and/or Approved

A RCRA Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs;
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

During its period of operation (1960s to present), the AGE Drainage Ditch received the stormwater runoff not contained in the parking area near former Building 189, located southeast of the AGE Drainage Ditch, because of a broken curb. Building 189 and the curbing along the ditch have been demolished and replaced by a new building, Building 190. The curbing now has stormwater inlets into the AGE Drainage Ditch allowing stormwater runoff into the ditch.

During the W-C RI (1991), field personnel observed runoff from the asphalt and concrete storage areas around Building 186 into the ditch on rainy days. Occasional minor spillage of grease and oil occurs on the storage area during routine maintenance and repair of equipment. During previous investigations, contamination was observed as discolored black soil with a characteristic hydrocarbon color along the ditch bottom (Radian 1986).

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/VSI, RFA conducted A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes

Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.

4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

The RI of this SWMU at Cannon AFB was performed to comply with conditions of the base's RCRA Part B Permit. The HSWA expanded corrective action authorities for permitted RCRA facilities and required that any permit issued to a treatment, storage, or disposal facility under Section 3005(c) of RCRA after November 8, 1984, must address corrective action for releases of hazardous wastes or hazardous constituents from any SWMU at the facility. Results of the 1991 RI of the AGE Drainage Ditch indicate that remediation is not required under RCRA or the USAF IRP. Work Plans and RI reports for Cannon AFB have been provided for review and comment to both EPA Region VI and NMED.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for NFA (No Further Action), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are

undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

AGE Drainage Ditch (SWMU No. 34/IRP No. SD-15) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

The near surface (upper 11 feet) stratigraphy at the AGE Drainage Ditch consists of Tertiary Miocene to Pliocene fluvial deposits of the Ogallala Formation. Based on lithologic information obtained during the RI conducted by W-C in 1991, this IRP/SWMU site is underlain by Ogallala fluvial deposits consisting primarily of well-sorted sand. The total thickness of these Ogallala deposits beneath the SWMU is not presently known; based on regional information, it may be as thick as 390 feet. The fluvial deposits consist of very fine- to fine-grained, well-sorted, silty, calcareous red-brown sands. These sands are comprised predominantly of subangular quartz grains with varying amounts of silt, calcium carbonate, and clay. This unit is comprised of approximately 46 percent sand, 18 percent silt, and 36 percent calcium carbonate and/or clay-sized material. The thickness of this unit is unknown at present due to the fact that the unit was not fully penetrated. Approximately 3 to 5 feet of native topsoil exists above this unit. No groundwater was encountered during the drilling of these borings.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The soils underlying the AGE Drainage Ditch consist of sandy loam and loamy sand of the Amarillo Soil Group with a total thickness of approximately 3 to 5 feet (W-C 1992). The soils consist primarily of fine-grained, well sorted, silty, clayey, unconsolidated red-brown sands. The sands are generally moist to slightly moist at depth, due in part to the constant drainage, pooling and infiltration of surface runoff in the area.

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS 1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations have been conducted at Cannon AFB including the AGE Drainage Ditch. Results of the Phase I IRP Records Search recommended that a limited Phase II monitoring program be conducted to confirm or rule out the presence and/or migration of hazardous contaminants at the AGE Drainage Ditch (CH_2MHill 1983).

A Phase II (Stage 1) investigation was conducted by Radian Corporation in 1984 and 1985 during which two deep soil borings (Borings 15A and 15B) were drilled and samples for chemical analysis collected (**Figure 1-3**). Results of samples collected during the Radian investigation indicated the presence of oil and grease in one sample (15B-1) at 99 mg/kg. However, the duplicate sample analysis did not detect any elevated oil and grease, and the conclusion was made that the oil and grease detected in Sample 15B-1 may be due to natural organic interference. Elevated levels of lead relative to the site average were found in soil sample 15B-1 (35 mg/kg) (Radian 1986). A summary of the sample results is contained in **Table 2-1**. Based on the results of the Phase II (Stage 1) investigation, no further action was recommended at this site.

Results shown in **Tables 2-2** and **2-3** for the follow-up soil removal investigation conducted by Radian in March of 1987 (Radian 1987) indicated that total lead and petroleum hydrocarbon levels in the upper 0.5 foot of soil exceeded background concentrations (compared to a sample collected outside the AGE Drainage Ditch). The elevated levels of lead

and petroleum hydrocarbons were reported to correlate with visible soil discoloration observed during augering. Results of EP-toxicity analysis of shallow soil samples which were collected during the 1987 Radian investigations had shown elevated levels of lead but revealed extremely low or non-detectable levels of RCRA metals as regulated by 40 CFR Subpart D. Based on this information, the soils were defined as non-hazardous.

The Preliminary Review/Visual Site Inspection, RCRA Facility Assessment performed in 1987 by A.T. Kearney, Inc. identified the AGE Drainage Ditch as a potential SWMU. The RCRA Facility Assessment has indicated that the potential for releases to the soil is high due the unlined nature of this SWMU. The potential for releases to groundwater was considered to be lower due to the presence of caliche layers inhibiting downward migration of hazardous constituents. Suggested further action was to continue sampling under the Air Force IRP.

As recommended in Radian's 1987 soil removal investigation report, the drainage ditch soil was tilled in October 1988. This tilling provided aeration to the soil, aiding microbial degradation of contaminants and providing better conditions for renewed vegetation growth.

W-C conducted further sampling at the AGE Drainage Ditch in 1991 to evaluate the nature and extent of potential hazardous contaminants. Two soil borings (Borings 0341 and 0342) were drilled and surface and subsurface samples collected for chemical and geotechnical analyses. One surface sample was collected from 0 to 0.5 feet BGL at a location near boring 0341. Subsurface soil samples were collected at depths ranging from 1 to 9 feet BGL. All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), semi-volatile organic compounds, and Target Analytical List (TAL) metals. Due to laboratory missed holding times for TCL VOCs analyses on several of the original samples, resampling was performed near original borings as required to complete the investigation sampling program.

The analytical results for samples collected at the AGE Drainage Ditch indicate that the soil appears to be contaminated with petroleum hydrocarbons above 100 mg/kg (**Table 2-4**) and low levels of polynuclear aromatic hydrocarbon (PAH) compounds from the surface to 3 feet BGL at soil boring location 0341 (**Table 2-5**). The petroleum hydrocarbon concentrations as shown in **Table 2-4** decrease from the surface to the total depth at this location. Soil samples collected at this location also indicate that the soil contains elevated concentration of lead and zinc that appear to be above background levels (**Table 2-6**). The vertical extent of elevated lead and zinc is presently unknown, since boring 0341 could not be advanced beyond 3 feet

BGL due to utility restrictions. The analytical results also indicated that soil contamination does not appear to extend northeast of the culvert.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined aquifer, with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1,600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays

in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL. Therefore, no hydrogeologic investigation was planned or conducted at this site during the W-C remedial investigation and no groundwater monitoring wells have been installed or site specific hydrogeologic information collected.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water due to activities related to AGE Drainage Ditch; therefore, no surface water information was collected as part of the RI performed by W-C in 1991.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to a risk to the environment or public health due to air emissions from activities associated with AGE Drainage Ditch. No air sampling was performed as part of the 1991 RI by W-C, with the exception of Organic Vapor Analyzer (OVA) screening of the soil samples for potential contamination. However, air modeling was performed in support of the baseline risk assessment.

2.6 POTENTIAL RECEPTORS/PATHWAYS

Potential receptors were identified in a baseline risk assessment (BRA) completed by W-C (1992) for identified Risk Assessment Areas (RAAs), see Section 3.0. Identified RAAs comprise an individual SWMU or a group of SWMUs that are geographically close, have common or similar chemical release sources, and have potentially overlapping exposure pathways. Seven RAAs, RAA1 through RAA7, were identified at Cannon AFB. AGE Drainage Ditch is the only site within RAA6.

2.6.1 Receptors

Basewide, potential human receptors identified in the BRA for current and future exposure scenarios were:

Current Exposure Scenario:

- Maintenance worker (on-site and off-site)
- Residential child (off-site/out of the RAA)
- Residential adult (off-site/out of the RAA)
- Trespassers or visitors (on-site and off-site)

Future Exposure Scenario:

- Maintenance (general duty) worker (on-site and off-site)
- Construction worker (on-site)
- Residential child (on-site)
- Residential adult (on-site)
- Trespassers or visitors (on-site)

Of these, trespassers and on-site and off-site residents/workers were not included in the quantitative risk assessment because their frequency and durations of exposure would be lower than for future residents and workers within the RAA, which were included. Therefore, two potential receptor populations were typically selected for evaluation: (1) current and future SWMU workers; and (2) hypothetical future adult and child residents that may reside at a former SWMU or within a former RAA.

Currently, general-duty workers who work at or adjacent to a given RAA are assumed to be the most likely human receptors. In addition, construction workers at the RAA may also be exposed in the future. The hypothetical residential receptors, assumed to live at current RAAs, represent the population with the upperbound exposure. The presence of such future-use receptors is highly unlikely and evaluation of future hypothetical residents is, therefore, conservative since commercial or industrial land use is the most likely land use scenario associated with Cannon AFB.

Future hypothetical residents and construction workers were not automatically assumed for all RAAs, only for those RAAs with an area of ½-acre or more. This was judged to be a reasonable minimum plot size on which future activities could cause exposure to on-site workers on a continuous basis, and also a reasonable plot size on which any residences would likely be constructed. Therefore, RAAs with areas of less than ½ acres were not evaluated for future construction or residential land use scenarios. The area of which the AGE Drainage Ditch is a part, RAA6, is greater than ½ acre and, therefore, future construction or intrusive action were considered plausible. This is a conservative approach, since residential development of the ditch area is considered unlikely because the ditch serves to convey runoff from nearby buildings and a parking lot.

2.6.2 Pathways

The primary sources of chemicals in this RAA is runoff from the nearby aircraft tarmac, refueling station, vehicle maintenance facilities, and adjacent streets. Chemicals may be transported to soil and surface water in the AGE ditch. Fugitive emisions of volatile chemicals are not expected to be significant from surface runoff, since VOCs were detected at low frequencies and concentrations. Potential exposures associated with chemicals in surface water include dermal contact and those associated with biota (i.e. ingestion, direct contact, and uptake by plants). Chemicals in soil may serve as a secondary source, potentially releasing chemicals to surface water runoff, groundwater, and fugitive dust. Such releases may result in dermal contact in humans and potential exposures to biota, as described above.

Soil. Chemical intakes may also occur via direct dermal contact or via incidental ingestion of soil, paticularly during intrusive actions, such as tilling or excavation of soil in the AGE ditch.

Air. Despite the fact that a road is running parallel to the ditch, the amount of fugitive dust emissions is not expected to be high, due to the heavy vegetation above the active channel.

Groundwater. Exposures to groundwater may include ingestion, inhalation, and dermal contact. This exposure pathway, however, was judged to be incomplete based on a review of the RI data. Metal exceedances above background soil concentrations were relatively small, and the levels of VOCs and SVOCs detected in surface and subsurface soils were also low.

Crop Irrigation by Groundwater. Uptake of chemicals from groundwater used for irrigation of crops, and subsequent ingestion by of crops by humans or biota is another exposure pathway. These pathways are judged to be incomplete because no chemicals were detected in groundwater at concentrations exceeding MCLs or RCRA criteria. Because of their low concentrations and solubilities, metals present in the groundwater used for irrigation are expected to be bound with the oxides of iron and aluminum in the natural soils. Biota found in the ditch, if any, are not expected to be suitable for human consumption.

Based on the above, current and future potential receptors for this site are Maintenance Workers and Future Construction Workers. Based on currently available information, the most important potential exposure pathways include inhalation of fugitive VOCs or dust, and direct contact with soil, resulting in potential ingestion and dermal absorption of chemicals in soil. A Conceptual Site Model for RAA6 is provided in **Figure 2-1**.

3.1 RISK ASSESSMENT APPROACH

A BRA was performed to assess potential adverse human health or ecological effects that would occur with exposure to chemicals if they were released to the environment from waste sources. The BRA was included in the RI at Cannon AFB, performed by W-C in 1991 under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Accordingly, RCRA and CERCLA guidance were followed in performing the BRA to evaluate potential human health impacts (W-C 1992). Under RCRA guidance, the concentrations of site chemicals were compared to RFI criteria and proposed RCRA action levels, which are conservative, and to non-site-specific screening levels. Specific guidance pertaining to RFIs is described in the RCRA Facility Investigation Guidance, Volume I (EPA 1989a), which indicates that a site-specific risk assessment may be performed when the levels of site chemicals in a particular medium exceed the RFI criteria. EPA-derived toxicity values were used to update the RFI criteria/proposed RCRA action levels. Other EPA and State of New Mexico guidance was followed and referenced, as appropriate. The proposed corrective action levels and RFI criteria for noncarcinogens and carcinogens detected at Cannon AFB are shown in **Tables 3-1** and **3-2**, respectively.

The following steps were performed for the Cannon BRA.

- Select chemicals of concern (COCs)
- Evaluate data and compare data for each COC with RFI criteria/proposed RCRA action levels
- Assess toxicity of COCs
- Identify human receptor populations
- Evaluate potential exposure pathways
- Estimate chemical intakes for human receptors
- Characterize risks and hazards

Results of the BRA for RAA6 are summarized in the following sections. The BRA used conservative assumptions of exposure and toxicity to characterize potential health risk so that

risks would not be underestimated. The BRA used validated soil data collected as part of the RI to identify and select chemicals of concern for the quantitative characterization of risk (see Section 3.2). The COCs identified in RAA6 were metals and volatile organic chemicals. These data and predicted ambient air concentrations based on measured soil concentrations and a conservative emission and dispersion box model, were used to estimate chemical intakes for baseline and hypothetical future use human receptors (potential receptors are discussed in Section 2.6). Carcinogenic and non-carcinogenic hazards then were estimated for current and future workers who perform general duty or ground maintenance functions in the SWMUs within RAA6. Future intrusive action or residential scenarios were judged to be plausible for RAA6 because it is larger than ½ acre in area. This approach is considered conservative, since residential receptors are considered unlikely due to drainage patterns into the area. Measured soil concentrations were also compared to RFI criteria and proposed RCRA action levels, which were revised to reflect current EPA-published toxicity values.

3.2 SOILS

Based on the soil data collected during the RI, the following COCs were identified at RAA6: toluene, lead, selenium, and zinc. Analytical data for the COCs in soil (except lead) were compared to the RFI soil criteria/proposed RCRA action levels. None of the COC concentrations exceeded RFI criteria or proposed RCRA action levels. For surface soils, the 95 percent upper confidence limit (UCL) concentrations for RAA6 were well below the current EPA interim guidance (EPA 1994) for residential soil lead cleanup levels (400 mg/kg).

3.3 GROUNDWATER

As discussed in Section 2.6.2, the groundwater exposure pathway is not likely to be a significant path of human exposure and potential risks and hazards associated with groundwater use were not evaluated in the BRA.

3.4 SURFACE WATER

As discussed in Section 2.6.2, surface water runoff is considered to be an insignificant pathway at this SWMU.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. Fugitive dust emissions were estimated for RAAs using a wind erosion model. Emission rates for volatilized organic compounds were estimated by using a steady-state diffusion model. Chemical emissions were assumed to be transported by the wind within the conservative mixing height of the simplified box model. Meteorological data in the Cannon AFB area were used in the air modeling when available and applicable. The potential human receptors were assumed to be within the immediate area of the RAA (i.e., inside the box).

Based on the Risk Characterization performed by W-C as part of the BRA in 1992, the cancer risks for average exposure and RME exposure to inhalation of VOCs and particulates are both below 1.00E-06 for both current and future Maintenance (general duty) Workers.

3.6 TOTAL RISKS/HAZARDS

Exposure pathways evaluated were incidental soil ingestion, dermal contact, and inhalation of volatile chemical compounds and fugitive dust for current and future workers. The results are as follows.

Noncarcinogenic Hazards. Noncarcinogenic hazards for all receptors considered in RAA6 are presented in **Table 3-3**. For both the average exposure and reasonable maximum exposure (RME), subchronic and chronic hazard indexes (HI) are shown for each receptor.

For both the average exposure and the RME, all HIs and hazard quotients represent chronic exposure to the site-related chemicals. For the average and RME exposure scenarios, the total HIs did not exceed EPA's level of concern of unity (1.0) for noncarcinogenic effects. Under the RME scenario, both HIs are below the EPA level of concern by at least three orders of magnitude.

The most significant exposure pathway for both the average and RME exposure scenarios was the soil ingestion of COCs, in soil, which contributed to almost all of the total noncarcinogenic hazard index. Metals were the primary COCs for this exposure pathway.

Carcinogenic Risks. Carcinogenic risks were not present in this SWMU, as indicated in **Table 3-3**, due to a lack of carcinogenic chemicals of concern.

Lead as a Potential Risk/Hazard. The maximum level of lead detected in soils at RAA6 was 500 mg/kg in surficial soil, which exceeds the current EPA interim guidance for residential soil lead cleanup levels (400 mg/kg) (EPA 1994). However, the 95% Upper Confidence Limit (UCL) for lead in surface soil only 145 mg/kg, and for surface and subsurface soil combined is 122 mg/kg, both well below the EPA guidance (400 mg/kg).

Air modeling was performed to determine the lead concentrations in ambient air. For the predicted ambient lead concentrations (RME) for the baseline and intrusive action scenarios, the estimated ambient concentrations of lead were 0.043 $\mu g/m^3$ and 0.0148 $\mu g/m^3$, respectively. Both of these concentrations were well below the EPA's background value of 0.200 $\mu g/m^3$ (EPA 1991b).

3.7 ECOLOGICAL RISK ASSESSMENT

An Ecological Risk Assessment (ERA) was included in the BRA. Concentrations of chemicals in soils at Cannon were evaluated in terms of potential risk to terrestrial biota. The receptor species of concern are kites and raptors and small ground-dwelling mammals. Six metals (copper, chromium, cadmium, zinc, cobalt, and lead) and one semi-volatile organic compound (benzo(a)pyrene) were detected in soils at levels which were considered to be above background. Benzo(a)pyrene, because of its relatively low concentration at near background levels, was not considered to be a chemical of concern. None of the six metals is likely to bioaccumulate through the food chains to levels where it would pose a risk to kites or raptors. Potential risk from these metals to biota was considered to be greatest through direct exposure of small mammals and other ground-dwelling organisms. Based on the calculation of toxicity values for a mouse from incidental soil ingestion, none of the six metals was considered to pose a risk to small mammal populations, which were the key indicator species selected for the ecological risk evaluation.

3.8 SUMMARY

The average and RME exposure risks and hazards were estimated for complete exposure pathways at RAA6 (**Table 3-3**). The total noncarcinogenic HIs for all receptors were below

the EPA's level of concern (1.0) at RAA6 for both individual exposure pathways and combined exposure pathways. The total carcinogenic risks for the average and RME exposures for workers were below the EPA's target risk range of 1.0E-04 to 1.0E-06 (EPA 1989b) for a Superfund site. The UCLs for lead in soil were below the current EPA guidance, as were the concentrations of lead in ambient air.

Based on findings of the BRA and comparison of soil data with risk-based RFI criteria/ proposed RCRA action levels, it was concluded that potential impacts to human health and the environment are not significant in RAA6, which includes only the AGE Drainage Ditch.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for AGE Drainage Ditch, including the BRA and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the RI, including the BRA, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARS were reviewed during the RI for AGE Drainage Ditch, including review of Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
OIL AND GREASE, TOTAL LEAD, AND PURGEABLE ORGANIC COMPOUND CONCENTRATIONS IN SOIL SAMPLES
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

Sample Number	Sample Depth (Ft-BGL)	Oil and Grease (mg/kg)	Total Lead (mg/kg)	Purgeable Organic Compounds (EPA 8010/8020) (μg/kg)
15A-1	3.0-4.1	ND(10)	5.8	ND
15A-2	8.5-9.5'	ND(10)	2.4	ND
15A-3	47.5-50.0	ND(10)	0.93	ND
15B-1	4.0-5.5	99	35	ND
15B-2	9.0-10.5	ND(10)	2.7	ND
15B-3	52.5-54.0	ND(10)	1.2	ND
15B-1a[1]	4.0-5.5	ND(10)	69	ND

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
μg/kg = Micrograms per kilogram
ND = Not detected
( ) = Detection Limit

[1]Duplicate analysis of 15B-1

Source: Final Report, IRP Phase II (Radian 1986)

TABLE 2-2
TOTAL PETROLEUM HYDROCARBON AND TOTAL LEAD CONCENTRATIONS IN SOIL SAMPLES
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

Sample Number	Sample Depth (Ft-BGL)	TPH[1] (mg/kg)		Total Lead[2] (mg/kg)	
1-1[3]	0-1	200	(5.0)	110	(.30)
1-2	1-2	ND	(5.0)	8.6	(.30)
2-1[3]	0-1	120	(5.0)	500	(.30)
2-2	1-2	ND	(4.0)	6.6	(.30)
2-2 (dup)	1-2	NA		6.8	(.30)
3-1[3]	0-1	540	(5.0)	120	(.30)
4-1	0-1	280	(5.0)	26	(.30)
5-1	0-0.6	57	(5.0)	67	(.30)
5-2	0.6-1.5	ND	(4.0)	5.6	(.30)
6-1	0-0.75	15[4]	(5.0)	25	(.30)
6-2	0.75-1.4	ND	(4.0)	8.2	(.30)
6-2 (dup)	0.75-1.4	ND	(5.0)	8.4	(.30)
7-1	0-0.6	ND	(5.0)	62	(.30)
8-1	0-0.6	120	(5.0)	32	(.30)
9-1	0-0.6	120	(5.0)	32	(.30)
9-2	0.6-1.3	ND	(5.0)	7.6	(.30)
10-1	0-0.9	910	(5.0)	62	(.30)
11-1[3]	0-0.6	280	(5.0)	80	(.30)
12-1[3]	0-0.6	320	(5.0)	90	(.30)
13-1	0-0.6	150	(5.0)	35	(.30)

TABLE 2-2 (continued)
TOTAL PETROLEUM HYDROCARBON AND TOTAL LEAD CONCENTRATIONS IN SOIL SAMPLES
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

Sample Number	Sample Depth (Ft-BGL)	TPH[1] (mg/kg)		Total Lead[2] (mg/kg)	
13-2	0.6-2.0	ND	(5.0)	16	(.30)
15-1	0-1.0	120	(5.0)	55	(.30)
20-1	0-0.75	75	(5.0)	45	(.30)
Background	0-0.75	300/ND[5]	(5.0)	13.9	(.30)

ND = Not detected at specified detection limit
NA = Not Analyzed
Ft-BGL = Feet below ground level
( ) = Detection limit
dup = Duplicate sample
mg/kg = Milligrams per kilogram

[1]Infrared Spectrophotometry, EPA Method 418.1
[2]Flame Atomic Absorption Spectrophotometry, Method SW-846 3050
[3]EP-Toxicity analyses run due to high total lead value detected. Results of EP-Toxicity analyses shown in Table 2-3.
[4]Value less than five times detection limit.
[5]False positive value due to vaporization of acetone bottle resulting in contamination of background sample. Rerun of background sample revealed <5 mg/kg when analyzed.

Source: Soil Removal Investigation Report (Radian 1987)

TABLE 2-3
EP-TOXICITY METAL CONCENTRATIONS IN SOIL SAMPLES
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

Analytical Parameters/ Technique	Sample ID / Date Sampled: 1-1 03/30/87		2-1 03/30/87		3-1 03/30/87		11-1 03/30/87		12-1 03/30/87		12-1 (dup) 03/30/87		Background 03/30/87	
EP-Toxicity Metals (mg/L)														
Silver (ICPES)	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)
Arsenic (Flame AA)	.004	(.004)	.004	(.004)	ND	(.004)	.004	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium (ICPES)	1.3	(.009)	1.4	(.009)	1.3	(.009)	1.7	(.009)	1.7	(.009)	1.6	(.009)	0.6	(.009)
Cadmium (ICPES)	.02	(.003)	.02	(.003)	.02	(.003)	.04	(.003)	.04	(.003)	.04	(.003)	ND	(.004)
Chromium (ICPES)	ND	(.007)	.01	(.01)	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)
Mercury (Cold Vapor AA)	ND	(.0005)	ND	(.0005)	ND	(.0005)	ND	(.0005)	ND	(.0005)	ND	(.0005)	ND	(.0005)
Lead (ICPES)	ND	(.042)	ND	(.042)	.06	(.042)	ND	(.042)	ND	(.042)	ND	(.042)	ND	(.042)
Selenium (Hydride AA)	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)

ICPES = Inductively Coupled Plasma (Atomic) Emission Spectrometry
AA = Atomic Absorption Spectrophotometry
ND = Not detected at specified detection limit
( ) = Detection limit

Data collected by Radian at AGE Drainage Ditch.
Source: Soil Removal Investigation Report (Radian 1987)

TABLE 2-4
TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS IN SOIL SAMPLES
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

Boring Number	Sample Depth (Ft-BGL)	TPH (mg/kg)
0341	0 - 0.5	1,180
	1 - 3.0	397
0342	1.5 - 3	45.1 U
	5 - 7	44.6 U
	9 - 11	44.9 U

Ft-BGL = Feet below ground level
mg/kg = Milligrams per kilogram
U = Not detected at the concentration given

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 2-5
POLYNUCLEAR AROMATIC HYDROCARBON CONCENTRATIONS IN SOIL SAMPLES[1]
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

Compound	Boring 0341 Sample Depth (Ft-BGL)		Boring 0342 Sample Depth (Ft-BGL)		
	0-0.5	1-3	1.5-3	5-7	9-11
Phenanthrene	200J	370J	380U	370U	370U
Fluoroanthene	400J	840	380U	370U	370U
Pyrene	270J	600	380U	370U	370U
Anthracene	710U	100J	380U	370U	370U
Chrysene	200J	370J	380U	370U	370U
Benzo(a)anthracene	160J	340J	380U	370U	370U
Benzo(a)pyrene	200J	310J	380U	370U	370U
Benzo(b)fluoranthene	400J	520	380U	370U	370U
Benzo(k)fluoranthene	710U	200J	380U	370U	370U
Dibenzo(a,h)anthracene	710U	53J	380U	370U	370U
Benzo(g,h,i)perylene	300J	400U	380U	370U	370U
Indeno(1,2,3-cd)pyrene	240J	250J	380U	370U	370U

Ft-BGL = Feet below ground level
J = Estimated concentration
U = Not detected at the concentration given

[1] All concentrations are in micrograms per kilogram (µg/kg).

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 2-6
METAL CONCENTRATIONS IN SOIL SAMPLES[1]
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Boring 0341 Sample Depth (Ft-BGL)		Boring 0342 Sample Depth (Ft-BGL)		Background[2]
Element	0-0.5	3	1.5-3	5-7	($\bar{x}$ + 2σ)
Aluminum	4,040	8,230	12,500	9,170	2,571-10,447
Antimony	5 UJ	5.5 UJ	5.2 UJ	5.2 UJ	4.88-5.4
Arsenic	1.6 J	2.8 J	2 J	2 J	0.43-1.95
Barium	148 J	161 J	94.8	163 J	0-903
Beryllium	0.43 U	0.48 U	0.55 J	0.49 J	0.32-0.68
Cadmium	1.3	0.96 U	0.9 U	0.91 U	0.81-1.01
Calcium	39,200	49,100	69,700	122,000	0-193,062
Chromium	12.3	10.4	10.5	8.1	2.67-9.31
Cobalt	2.8 J	2.8 J	4.2 J	3.5 J	1.38-4.06
Copper	15	20.7	14 U	10.8 U	0.00-15.44
Iron	4,680 J	6,710 J	8,920	6,450	2,239-8,683
Lead	40.7	38.1	6.5	5.1	1.76-8.64
Magnesium	1,530	2,330	2,810	3,320	0-11,903
Manganese	83.9	173 J	120	83.4 J	10.88-167
Mercury	0.11U	0.12 U	0.11 U	0.11 U	-- - --
Nickel	7.5 U	7.1 J	9.2	7.1 J	3.57-8.49
Potassium	860 J	1570	2140	1520	632-2,613
Selenium	2.2 J	-R	-R	-R	0.00-1.35
Silver	0.87 U	0.96 U	0.9 U	0.91 U	0.86-0.94
Sodium	319 J	316 U	298 U	299 U	154-540
Thallium	0.22 UJ	0.24 UJ	0.23 UJ	0.23 UJ	0.20-0.24

TABLE 2-6 (continued)
METAL CONCENTRATIONS IN SOIL SAMPLES[1]
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Boring 0341 Sample Depth (Ft-BGL)		Boring 0342 Sample Depth (Ft-BGL)		Background[2]
Element	0-0.5	3	1.5-3	5-7	$(\bar{x} + 2\sigma)$
Vanadium	11.8	16	18.1	19.1	9.26-26.74
Zinc	237 J	60.3 J	22	16.8 J	4.58-21.82

UJ = Estimated as non-detect at instrument detection limit
J = Estimated concentration
U = Not detected at the concentration given
-R = Rejected
-- - -- = No range could be calculated
Ft-BGL = Feet below ground level

[1]All concentrations are in milligrams per kilogram (mg/kg).
[2]Background range calculated from concentrations in Table 2-7 of RI Report (W-C 1992).

Source: Final Remedial Investigation Report for 18 Solid Waste Managment Units (Woodward-Clyde 1992)

TABLE 3-1
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	1,1,1-Trichloroethane	9.0E-02	7200	7200	0.2*	0.2*
	2-butanone (MEK)	5.0E-02	4000	4000	1.75	1.75
	Acetone	1.0E-01	8000	8000	3.5	3.5
	Bromoform	2.0E-02	1600	1600	0.1*,(1)	0.1*,(1)
	Carbon Diaulfide	1.0E-01	8000	8000	3.5	3.5
	Chloroform	1.0E-02	800	800	7	7
	Dibromomethane	1.0E-02	800	800	0.35	0.35
	Ethylbenzene	1.0E-01	8000	8000	0.7*,(2)	0.7*,(2)
	Toluene	2.0E-01	16000	16000	1*	1*
	Xylenes (total)	2.0E+00	160000	160000	10*,(2)	10*,(2)
Semi-Volatiles:	3-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	4-Methylphenol	5.0E-02	4000	4000	1.75	1.75
	2,4,5-Trichlorophenol	1.0E-01	8000	8000	3.5	3.5
	4-Chloroanilline	4.0E-03	320	320	0.14	0.14
	Anthracene	3.0E-01	24000	24000	10.5	10.5
	Butyl benzyl phthalate	2.0E-01	16000	16000	7	7
	Di-n-butylphthalate	1.0E-01	8000	8000	3.5	3.5
	Fluoranthene	4.0E-02	3200	3200	1.4	1.4
	Naphthalene	4.0E-03	320	320	0.14	0.14
	Phenol	6.0E-01	48000	48000	21	21
	Pyrene	3.0E-02	2400	2400	1.05	1.05

TABLE 3-1 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI CRITIERIA FOR NONCARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Chemicals	Chronic Oral R/D (mg/kg/day)	Soil RCRA Action Level (mg/kg)	Soil RFI Citerion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Pesticides:	Methoxychlor	5.0E-03	400	400	0.04*	0.04*
Metals:	Antimony	4.0E-04	32	32	0.014	0.014
	Barium	7.0E-02	5600	5600	2*	2*
	Cadmium, food	1.0E-03	80	80		
	Cadmium, water	5.0E-04			0.005*,(2)	0.005*,(2)
	Chromium III	1.0E+00	80000	80000	35	35
	Chromium VI	5.0E-03	400	400	0.175	0.175
	Chromium, total				0.1*,(2)	0.1*, (2)
	Copper	3.7E-02	2960	2960	1.3**	1.3**
	Lead				0.015**	0.015**
	Manganese	1.0E-01	8000	8000	3.5	3.5
	Mercury	3.0E-04	24	24	0.002*	0.002*
	Nickel	2.0E-02	1600	1600	0.7	0.7
	Selenium	5.0E-03	400	400	0.05*,(2)	0.05*,(2)
	Silver	5.0E-03	400	400	0.175	0.175
	Thallium	7.0E-05	5.6	5.6	0.00245	0.00245
	Vanadium	7.0E-03	560	560	0.245	0.245
	Zinc	2.0E-01	16000	16000	7	7

* = final MCL ** = SDWA action level
(1) = MCL for total trihalomethanes (2) = effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

TABLE 3-2
PROPOSED CORRECTIVE ACTION LEVELS AND RFI
CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
Volatiles:	Benzene	A	1.0E-06	70	2.9E-02	24.14	24.14	5.0E-03*	5.0E-03*
	Bromoform	B2	1.0E-06	70	7.9E-03	88.61	88.61	1.0E-01*,(1)	1.0E-01*,(1)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chloromethane	C	1.0E-05	70	1.3E-02	538.46	538.46	2.69E-02	2.69E-02
	Dibromochloromethane	C	1.0E-05	70	8.4E-02	83.33	83.33	4.17E-03	4.17E-03
	Methylene Chloride	B2	1.0E-06	70	7.5E-03	93.33	93.33	4.67E-03	4.67E-03
	Tetrachloroethene	B2	1.0E-06	70	5.1E-02	13.73	13.73	5.0E-03*	5.0E-03*
	Trichloroethene	B2	1.0E-06	70	1.1E-02	63.64	63.64	5.0E-03*	5.0E-03*
	Vinyl Chloride	A	1.0E-06	70	1.9E+00	0.37	0.37	2.0E-03*	2.0E-03*
Semi-volatiles:	bis(2-Ethylhexyl)phthalate	B2	1.0E-06	70	1.4E-02	50.00	50.00	2.50E-03	2.50E-03
	Benzo(a)anthracene	B2	1.0E-06	70	8.4E-01	0.83	0.83	4.17E-05	4.17E-05
	Benzo(a)pyrene	B2	1.0E-06	70	5.8E+00	0.12	0.12	6.03E-06	6.03E-06
	Benzo(b)fluoranthene	B2	1.0E-06	70	8.1E-01	0.86	0.86	4.32E-05	4.32E-05
	Benzo(k)fluoranthene	B2	1.0E-06	70	3.8E-01	1.84	1.84	9.21E-05	9.21E-05
	Carbazole	B2	1.0E-06	70	2.0E-02	35.00	35.00	1.75E-03	1.75E-03

TABLE 3-2 (continued)
PROPOSED CORRECTIVE ACTION LEVELS AND RFI
CRITERIA FOR CARCINOGENS DETECTED AT CANNON AFB - SOIL AND GROUNDWATER
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Chemical	EPA Weight of Evidence	Assumed Risk Level	Exposure Duration (years)	Oral Slope Factor (mg/k-d)-1	Soil RCRA Action Level (mg/kg)	Soil RFI Criterion (mg/kg)	Groundwater RCRA Action Level (mg/L)	Groundwater RFI Criterion (mg/L)
	Chloroform	B2	1.0E-06	70	6.1E-03	114.75	114.75	1.0E-01*,(1)	1.0E-01*,(1)
	Chrysene	B2	1.0E-06	70	3.0E-02	23.33	23.33	1.17E-03	1.17E-03
	Dibenzo(a,h)anthracene	B2	1.0E-06	70	6.4E+00	0.11	0.11	5.47E-06	5.47E-06
	Indeno(1,2,3-c,d)pyrene	B2	1.0E-06	70	1.4E+00	0.50	0.50	2.50E-05	2.50E-05
	Pentachlorophenol	B2	1.0E-06	70	1.2E-01	5.83	5.83	1.0E-03*	1.0E-03*
Pesticides:	4,4-DDD	B2	1.0E-06	70	2.4E-01	2.92	2.92	1.46E-04	1.46E-04
	4,4-DDE	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	4,4-DDT	B2	1.0E-06	70	3.4E-01	2.06	2.06	1.03E-04	1.03E-04
	alpha-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	gamma-Chlordane	B2	1.0E-06	70	1.3E+00	0.54	0.54	2.0E-03*	2.0E-03*
	Heptachlor epoxide	B2	1.0E-06	70	9.1E+00	0.08	0.08	2.0E-04*	2.0E-04*
Metals:	Arsenic	A	1.0E-06	70	1.8E+00	0.39	0.39	1.94E-05	1.94E-05
	Beryllium	B2	1.0E-06	70	4.3E+00	0.16	0.16	81.4E-06	8.14E-06

* = final MCL

(1) = MCL for total trihalomethanes

(2) = Effective July 30, 1992

Source: Final Report, RI at 18 SWMUs (W-C 1992)

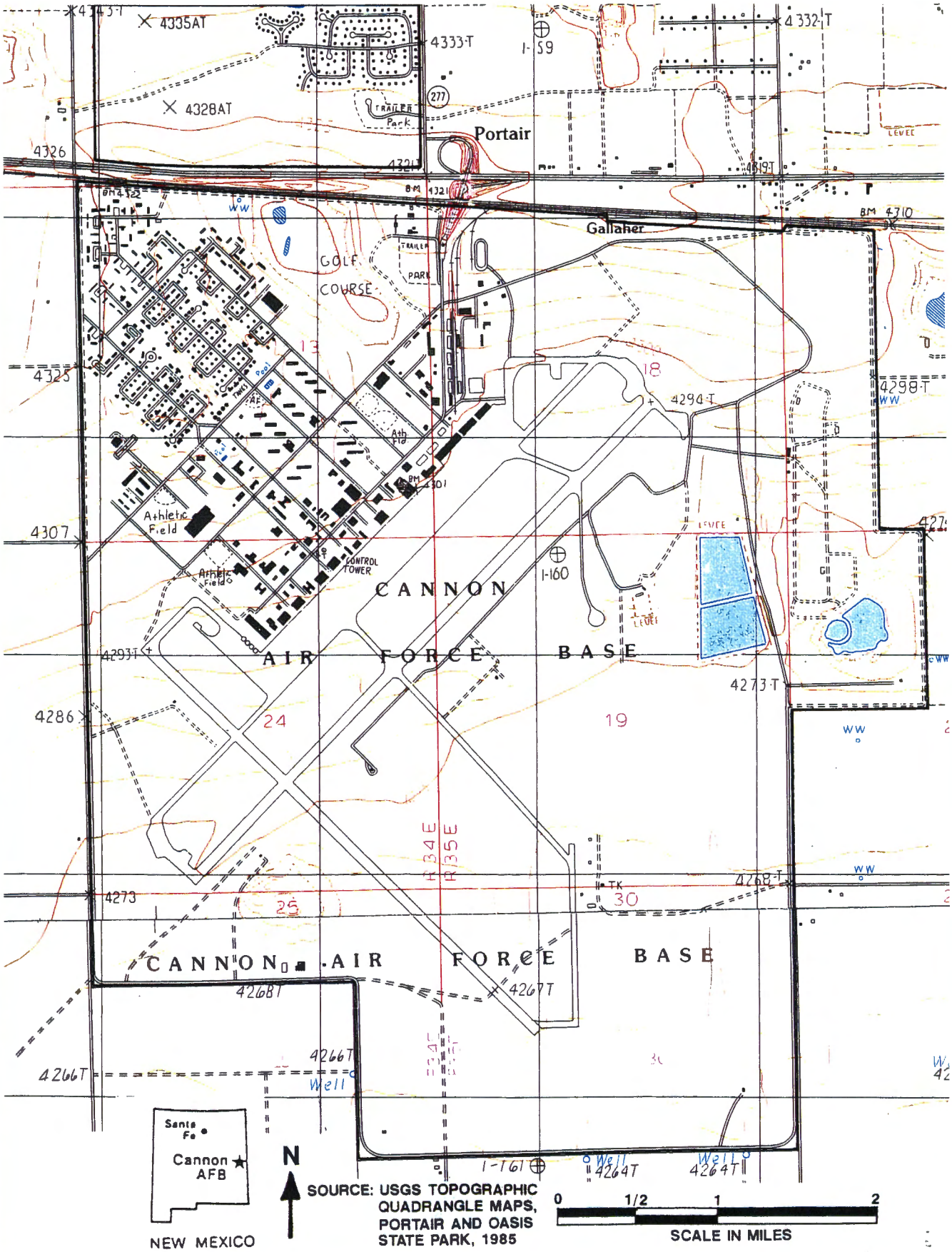
TABLE 3-3
SUMMARY OF RISK CHARACTERIZATION FOR CANNON AFB - RAA6
AGE DRAINAGE DITCH
SWMU NO. 34/IRP NO. SD-15
Cannon Air Force Base, New Mexico

	Average Exposure			Reasonable Maximum Exposure		
Receptor/Pathway	**Cancer Risk[1]**	**Subchronic Hazard Index**	**Chronic Hazard Index**	**Cancer Risk**	**Subchronic Hazard Index**	**Chronic Hazard Index**
Current Worker - Maintenance						
-- Soil Ingestion	0.00E+00	1.73E-06	3.20E-06	0.00E+00	1.31E-04	1.80E-04
-- Dermal Contact - Soil	0.00E+00	2.94E-12	2.94E-11	0.00E+00	1.29E-10	1.29E-09
-- Inhalation - VOCs	0.00E+00	7.08E-07	7.08E-07	0.00E+00	2.76E-06	2.76E-06
-- Inhalation - Particulates	0.00E+00	0.00E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	0.00E+00	2.43E-06	3.91E-06	0.00E+00	1.34E-04	1.83E-04
Future Worker - Intrusive						
-- Soil Ingestion	0.00E+00	1.82E-05	3.37E-05	0.00E+00	1.68E-04	2.30E-04
-- Dermal Contact - Soil	0.00E+00	6.20E-12	6.20E-11	0.00E+00	8.27E-11	8.27E-10
-- Inhalation - VOCs	0.00E+00	9.30E-08	9.30E-08	0.00E+00	4.15E-07	4.15E-07
-- Inhalation - Particulates	0.00E-00	0.00E-00	0.00E-00	0.00E-00	0.00E-00	0.00E-00
Total	0.00E-00	1.83E-05	3.38E-05	0.00E-00	1.69E-04	2.31E-04

[1]No carcinogenic chemicals of concern were identified.

Source: Final Report, RI at 18 SWMUs (W-C 1992)

FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

AGE DRAINAGE DITCH
SWMU No. 34 / IRP No. SD-15
Cannon Air Force Base, New Mexico

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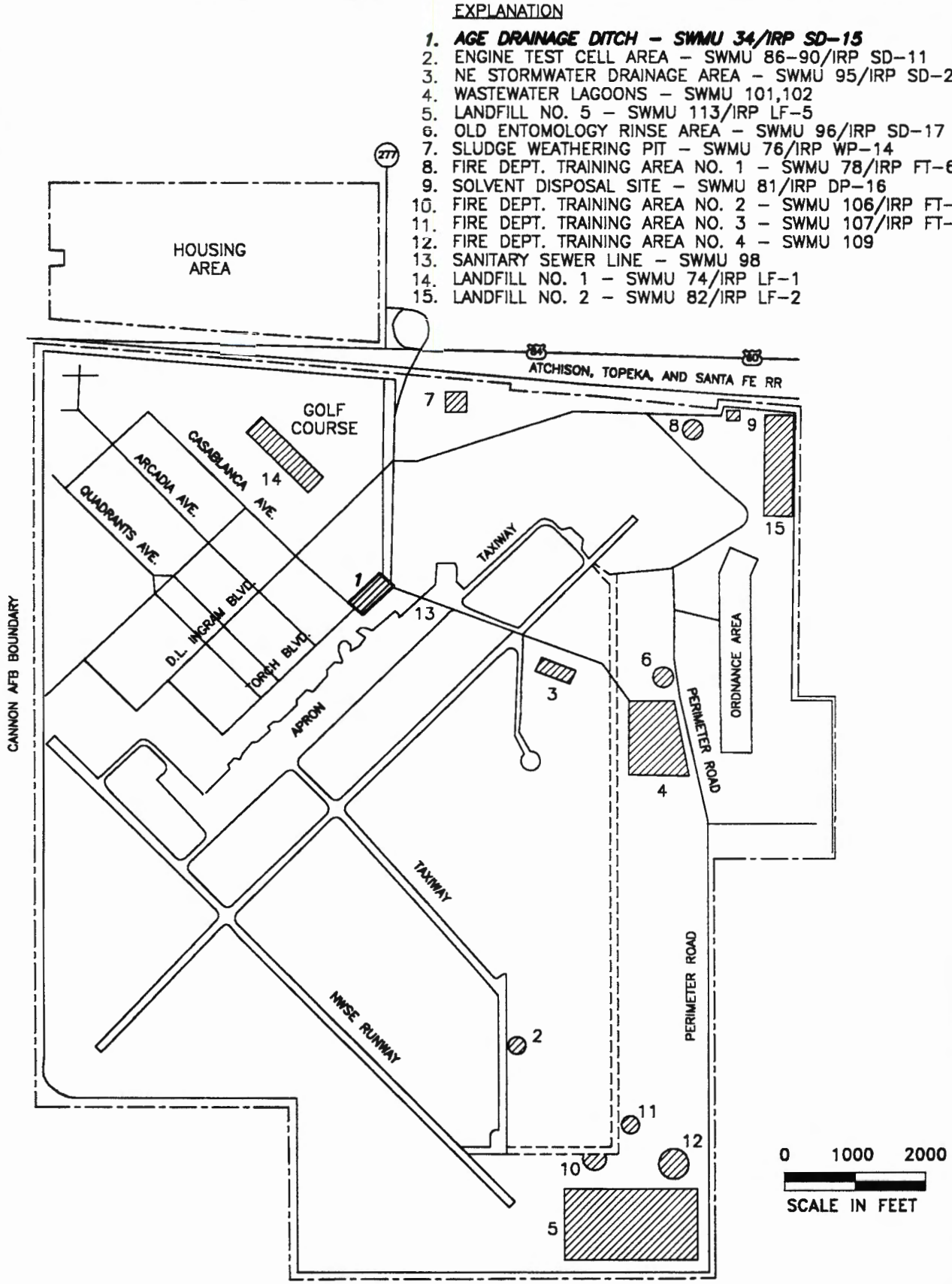


SOURCE: Woodward-Clyde, February1996

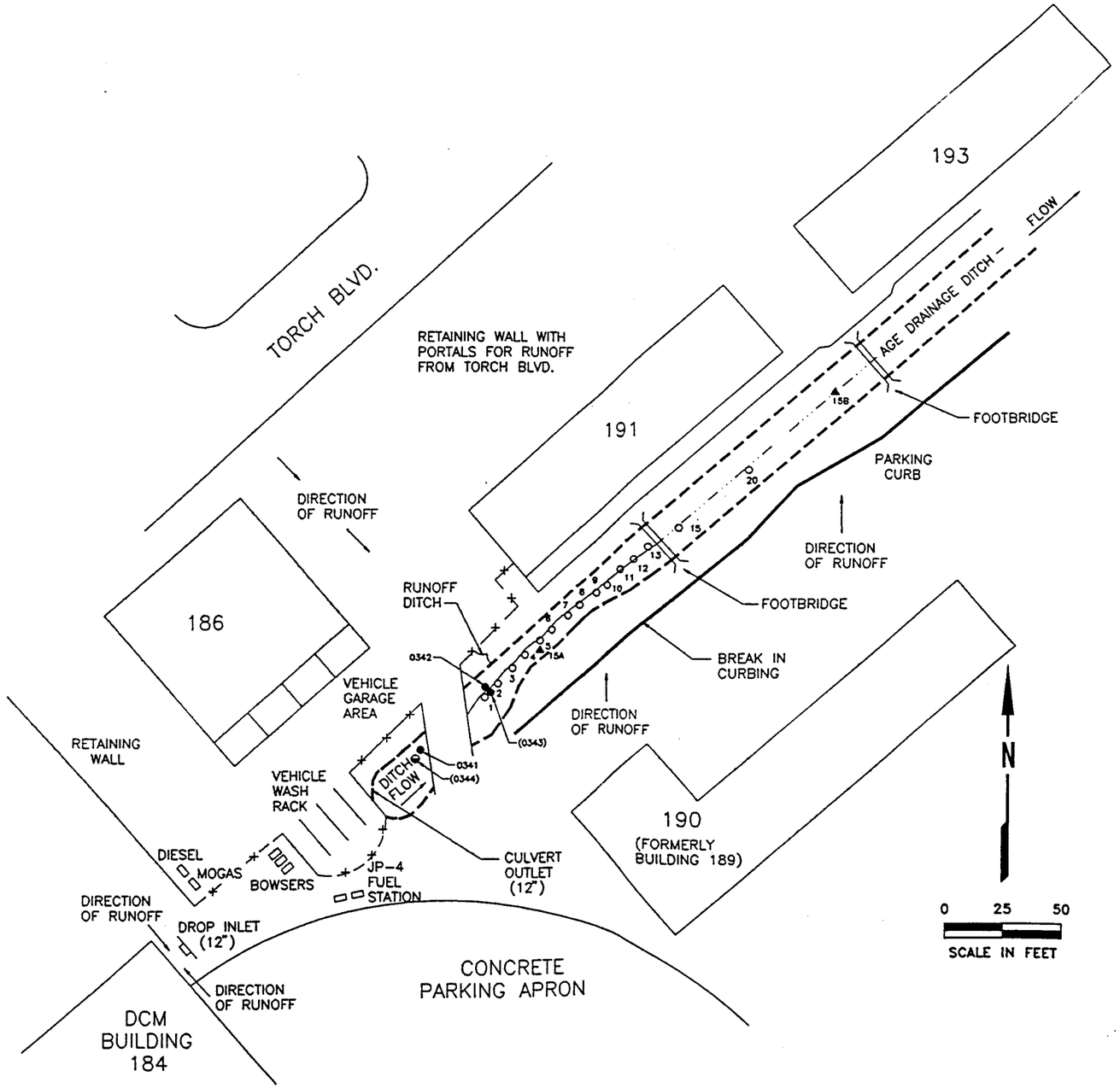
HARZA Consulting Engineers and Scientists

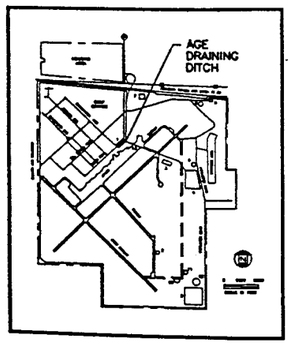
Figure 1-2

IRP/SWMU SITE LOCATION MAP

AGE DRAINAGE DITCH
SWMU No. 34 / IRP No. SD-15
Cannon Air Force Base, New Mexico

c:\pm5\misc\newmex1.pm5





LEGEND

▲ 15B	RADIAN 1984–1985 FIELD INVESTIGATION SOIL BORING LOCATION
○ 15	RADIAN 1987 FIELD INVESTIGATION SOIL BORING LOCATION
● 0342	W–C 1991 FIELD INVESTIGATION SOIL BORING LOCATION
◒ 0341	W–C 1991 FIELD INVESTIGATION SURFACE SOIL SAMPLE LOCATION
- - - -	SWMU BOUNDARY
190	BUILDING NUMBER

NOTE: THE NUMBERS IN PARENTHESIS CORRESPOND TO REDRILLS/RESAMPLES OF THE ORIGINAL BORING/SAMPLE

SOURCE: Woodward-Clyde, February 1996

HARZA Consulting Engineers and Scientists

Figure 1-3

LOCATION OF SOIL BORINGS

AGE DRAINAGE DITCH
SWMU No. 34 / IRP No. SD-15
Cannon Air Force Base, New Mexico

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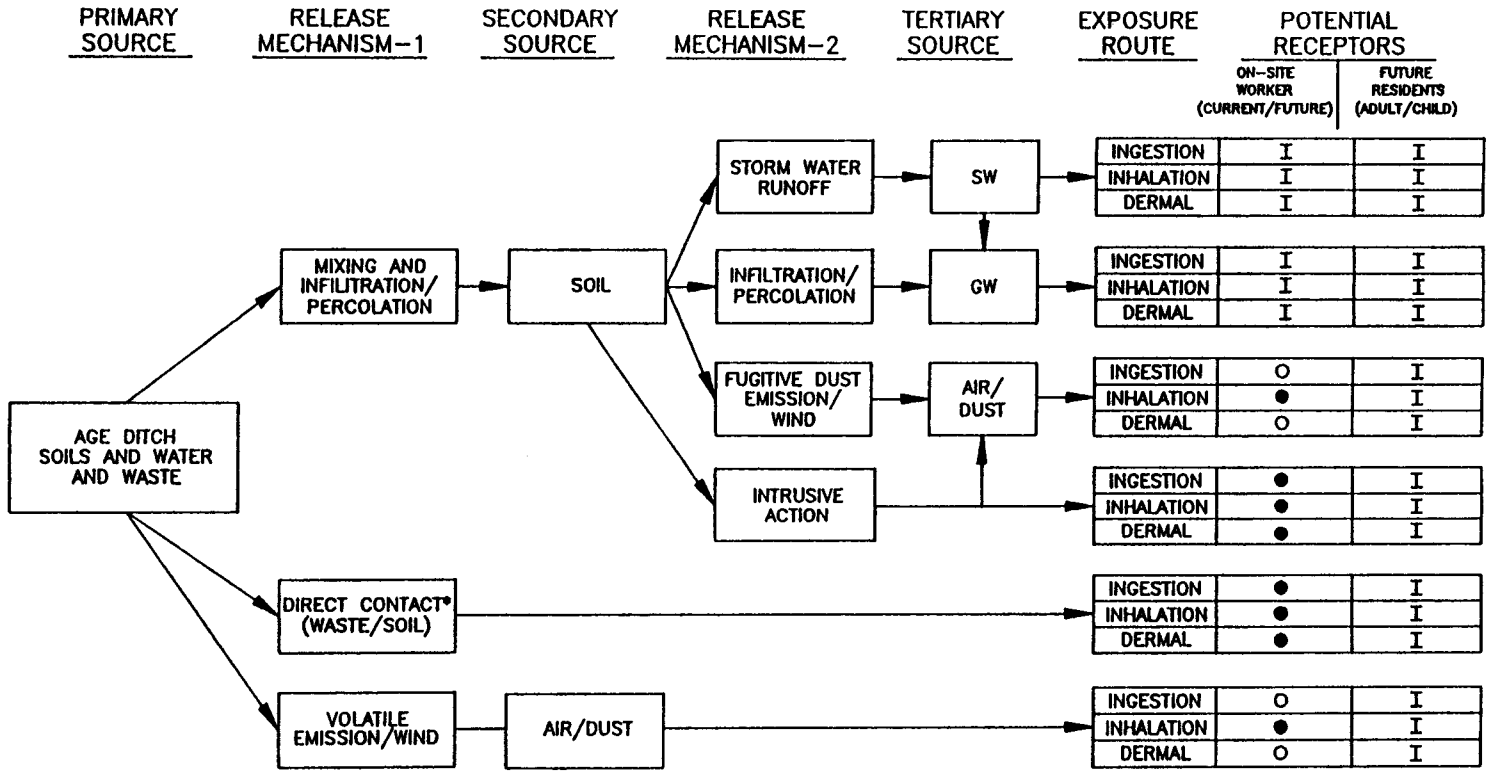
AGE DRAINAGE DITCH



LEGEND

- I INCOMPLETE EXPOSURE PATHWAY
- ● SIGNIFICANT EXPOSURE PATHWAY
- O RELATIVELY INSIGNIFICANT EXPOSURE PATHWAY
- * TILLING PERFORMED IN OCT. 1988

SOURCE: Woodward-Clyde, October 1992

HARZA Consulting Engineers and Scientists

Figure 2-1
CONCEPTUAL SITE MODEL
AGE DRAINAGE DITCH
SWMU No. 34 / IRP No. SD-15
Cannon Air Force Base, New Mexico

c:\pm5\misc\newmex2.pm5

APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the remedial investigation (RI) performed by Woodward-Clyde (W-C) under contract to the U.S. Army Corps of Engineers - Omaha District (USACE) at Cannon AFB for AGE Drainage Ditch (SWMU No. 34) from September 1, 1991 through October 15, 1992 (W-C 1992). The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B Permit conditions, as well as the DOD IRP. This RI included performance of a baseline risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Cannon Air Force Base, New Mexico. Radian Corporation. September 1986.

  This report is the second phase of a four part IRP and is designed to determine if environmental contamination has resulted from base activities.

- Soil Removal Investigation Report, AGE Drainage Ditch Site 15, Cannon Air Force Base, New Mexico. Radian Corporation. June, 1987.

  This report details the follow-up soil removal investigation of the AGE drainage ditch.

- Preliminary Review/VSI Report RCRA Facility Assessment, Cannon Air Force Base, Clovis, New Mexico. A.T. Kearney, Inc. July 1987.

  This report summarizes the results of a file review, visual site inspection, and data evaluation for suspected SWMUs and AOCs.

- Final Environmental Impact Statement, Realignment of Cannon Air Force Base, Curry County, New Mexico. United States Air Force. May 1990.

  This EIS evaluates the realignment of forces and equipment at Cannon AFB associated with the movement of 46 F-111 aircraft to the base.

- Final Installation Restoration Program Remedial Investigation, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. January, 1990.

  This report is the RI of four IRP sites at Cannon AFB including SD-11, SD-12, SD-20, and FT-9.

- Final Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico. W-C. 1992.

  This report is a Remedial Investigation to determine the nature and extent of potential contamination at 18 SWMUs.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Drum Disposal Pit
IRP Site DP-33

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

HARZA *Consulting Engineers and Scientists*

January 1997

TITLE PAGE

DECISION DOCUMENT

Drum Disposal Pit
IRP No. DP-33
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Drum Disposal Pit
IRP No. DP-33

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the Drum Disposal Pit (IRP No. DP-33) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Based on available information, no significant risk or threat to public health or the environment exists at Drum Disposal Pit (IRP DP-33). Therefore, No Further Response Action Planned is warranted at this site.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the Drum Disposal Pit (IRP No. DP-33) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from past releases of contaminants. The activities performed at this site followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
ANSC	Area of No Suspected Contamination
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
gpm	Gallons per Minute
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

The Drum Disposal Pit, designated as Installation Restoration Program (IRP) No. DP-33, is located in the northeast area of the base. The site is where a buried drum was uncovered and its contents spilled on the ground during earthwork operations performed at the base in 1991. The drum appeared to have contained petroleum waste liquid. The earthwork operations were halted to allow for remediation of the site. Remedial action was performed by the IT Corporation (IT) from March to October of 1994. The cleanup operation resulted in the excavation and disposal of twenty-five 55-gallon drums containing residual petroleum products and associated contaminated soils.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. The Drum Disposal Pit is located in the northeast area of the base adjacent to Perimeter Road, and east of the Civil Engineering Container Storage Area (SWMU 77). The site location is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. According to available information, the Drum Disposal Pit Site was previously the location of an aircraft hangar. The hanger was demolished approximately 30 years ago (mid 1960s). The unit is located within an area characterized by the Cannon AFB Base Comprehensive Plan as an Open Area. Open Areas are defined as

conservation areas and required buffer space. The site is characterized as Industrial according to the U.S. Air Force's Rational National Standards Initiative. To the south and west of Drum Disposal Pit is an Aircraft Operations and Maintenance Facilities Area.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The Drum Disposal Pit (DP-33) is located in the northeast section of the base, approximately one mile from the nearest on base housing.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The Drum Disposal Pit is in an open area of the base.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site

The DP-33 Drum Disposal Pit was found accidentally during earthwork at the base in 1991. The site was not uncovered as a problem area until that time. The Drum Disposal Pit DP-33 was added to the IRP in July of 1992. Excavation related activities began on March 8, 1994 and terminated on October 7, 1994.

1.2.2 Period of Operation

The period of operation of the Drum Disposal Pit is unknown but is suspected to be late 1940s to early 1950s.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

The Drum Disposal Pit was used to dispose of drums containing petroleum products.

1.2.5 Type of Permits Applied For and/or Approved

A Resource Conservation and Recovery Act (RCRA) Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs; and
- Implement corrective measures for each SWMU that requires them.

1.2.6 History of Releases

The site was discovered when a bulldozer operator uncovered the top of a buried barrel containing oily waste in 1991. Earthmoving operations were immediately halted. The area was remediated in 1994. Phase I of the remediation project consisted of an initial site visit, mobilization, exploratory excavation and trenching, drum and contaminated soil excavation , and

collection of confirmation and profile samples. At the termination of the excavation, disposal alternatives and backfill sources were identified.

The exact number of drums unearthed is unknown because the drums were crushed and badly deteriorated. Approximately 25 drums were compacted and added to the contaminated soil stockpile. An approximate total of 450 cubic yards of soil was excavated. Small quantities of residual liquid were found. The liquids were sampled and field Haz-Cat testing was performed on each of nine samples collected. All the field tests showed negative results.

Exploratory trenching was undertaken to determine if other drums existed in the area. One trench extended 60 feet west and the other extended 90 feet east. The trenches were excavated to a depth of 8 feet and a width of 2 ½ feet. No evidence of drums or visible signs of contamination was encountered. The trenches were backfilled with the excavated soil.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environement Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
3. 1992 Disposal Pit DP-33 added to IRP.
4. 1994 Disposal Pit DP-33 removal action completed.

An interim removal action occured at the Drum Disposal Pit in 1994. Approval to backfill the site, after remediation, was provided to Cannon AFB by the State of New Mexico, Environmental Department, Ground Water Protection and Remediation Bureau in a letter dated September 1, 1994.

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses the Drum Disposal Pit (DP-33) one of the two IRP sites which do not have SWMU numbers or AOC designations at Cannon AFB. The site is categorized as No Further Response Action Planned.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Ninety percent of Cannon AFB is covered by surface soil of the Amarillo series. The soils were formed in the Blackwater Draw Formation of unconsolidated alluvium deposits of Pleistone age. Permeability of these loams is moderate and ranges from 1E-3 to 4E-4 cm/sec. The Amarillo soils overlie a 25-50 foot thick white chalky caliche zone that occurs at about 4 feet below the surface and is part of the Ogallala Formation. The caliche is underlain by sand, silts, and clay which may extend up to 400 feet below land surface. Where the sediments are saturated they form part of the High Plains Aquifer (Ogallala Aquifer). The base of the aquifer is predominantly sandstone beds of Triassic age Dockum Group.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985 (Hale 1992). Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Confirmation, backfill, and profile samples were taken upon completion of excavation at the site. Ten confirmation samples (CAFB1 to CAFB10) were collected from the excavation area, two from the excavation floor and two from each of the four sidewalls. Two backfill samples were taken from the soil stockpiles (CAFB11 to CAFB12), and two composite profile samples were taken from potential backfill (CAFB13 to CAFB14). Samples were collected from the locations shown in **Figure 1-2**. All chemical analyses of soil samples were performed by the IT Corporation's Middlebrook laboratory using standard EPA Methods. The samples were analyzed for volatile organic compounds (VOCs) (EPA Method 8240), semi-volatiles organic compounds (SVOCs) (EPA Method 8270), pesticides and PCBs (EPA Method 8080), selected metals (EPA Methods 6010 and 7471), and total petroleum hydrocarbons (TPH) (EPA Methods 418.1 and 8015 modified). The maximum detectable concentrations of compounds found in all the above samples are shown below.

Xylene (12 µg/kg)	Endosulfan I (5 µg/kg)
DDE (3.7 µg/kg)	DDT (8.8 µg/kg)
Chlordane (14 µg/kg)	Antimony (8 mg/kg)
Barium (524 mg/kg)	Beryllium (0.9 mg/kg)
Chromium (21 mg/kg)	Copper (16 mg/kg)
Iron (15,500 mg/kg)	Lead (52 mg/kg)
Manganese (226 mg/kg)	Mercury (0.14 mg/kg)
Silver (3.2 mg/kg)	Nickel (17 mg/kg)
Potassium (2,700 mg/kg)	Sodium (143 mg/kg)
Silver (3.2 mg/kg)	Thallium (32 mg/kg)
Vanadium (30 mg/kg)	Zinc (111 mg/kg)

Total recoverable petroleum hydrocarbons (1,380 mg/kg)

Total petroleum hydrocarbons
- diesel fuel (12 mg/kg)
- JP-4 (16 mg/kg)

Due to the elevated TRPH level in one confirmation sample (CAFB9), one additional sample (CAFB15) was collected in the area of CAFB9 at a depth of 3 feet below the bottom of the

excavation to verify the extent of TRPH contamination. Sample CAFB15 was found to contain a TRPH concentration of less than 54 mg/kg.

The two disposal profile samples (CAFB11 and CAFB12), collected from the contaminated soil stockpiles, were analyzed by the toxicity leaching procedure (TCLP) for VOCs (EPA Method 8240), SVOCs (EPA Method 8270), pesticides (EPA Method 8080), metals (EPA Method 6010), and TPHs (EPA Methods 418.1 and 8015 modified). Compounds found in detectable concentrations in the sample extracts are shown below.

Barium (1.3 mg/L)	Beryllium (0.003 mg/L)
Cadmium (0.006 mg/L)	Chromium (0.03 mg/L)
Copper (0.02 mg/L)	Iron (0.32 mg/L)
Manganese (2 mg/L)	Potassium (4 mg/L)
Silver (0.34 mg/L)	Sodium (207 mg/L)
Zinc (0.29 mg/L)	

Two samples (CAFB13 and CAFB14) were collected from the proposed backfill stockpiles. Sample CAFB13, which was collected from the stockpile of the top six inches of soil removed from the excavation area, contained 577 mg/kg TRPH. The sample collected from the proposed borrow area (CAFB14) was found to contain 177 mg/kg TRPH. As a result of the laboratory analysis of the stockpiles, the proposed backfill materials were rejected and an alternative borrow area was identified on the base.

Two additional soil samples (CAFB16 and CAFB17) were collected from contaminated stockpiles and were analyzed for disposal characterization. The contaminated soil was determined to be non-hazardous. None of the compounds found in the profile samples were present in concentrations requiring the assignment of hazardous waste codes in accordance with 40 CFR 261.31, 261.32, or 261.33. A total of 610 cubic yards of contaminated soils and crushed drums was transported to Controlled Recovery in Hobbs, New Mexico for landfarming on October 4-7, 1994.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1,600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

Currently there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 feet bgs and the contaminated soil at the Drum Disposal Pit was removed. No groundwater monitoring wells were installed or site specific hydrogeologic information collected as part of the response action.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed

depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Currently, there does not appear to be a risk to surface water from the site since contaminated soil from the Drum Disposal Pit was excavated and removed from the site.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

There is no reason to believe that there would be a risk to the environment or public health due to air emissions from the Drum Disposal Pit (DP-33) since all contaminated soil was removed from the site.

2.6 POTENTIAL RECEPTORS

All contaminated soil at the Drum Disposal Pit was excavated and removed from the site. Therefore, a discussion of potential receptors is not applicable at this site.

3.0
DATA ANALYSIS/RISK ASSESSMENT

Although a significant release appears to have occurred at the Drum Disposal Pit, none of the compounds found in the profile samples were present in concentrations requiring the assignment of hazardous waste codes in accordance with 40 CFR 261.31, 261.32, or 261.33. Furthermore, the contaminated soil was excavated, removed and deposited in an appropriate disposal facility. The excavated area was backfilled with soil from Cannon AFB which met the standards of the State of New Mexico, Environmental Department, Ground Water Protection and Remediation Bureau. Because no detected concentrations of chemicals at this site pose an unacceptable human health risk, it is recommended that no further investigation of this site is necessary. Therefore, a discussion of data analysis/risk assessment is not applicable to this site.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the investigation for the Drum Disposal Pit (IRP No. DP-33) the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the investigation, the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs reviewed included Chemical-Specific ARARs, To-Be-Considered Materials, and Location-Specific ARARs. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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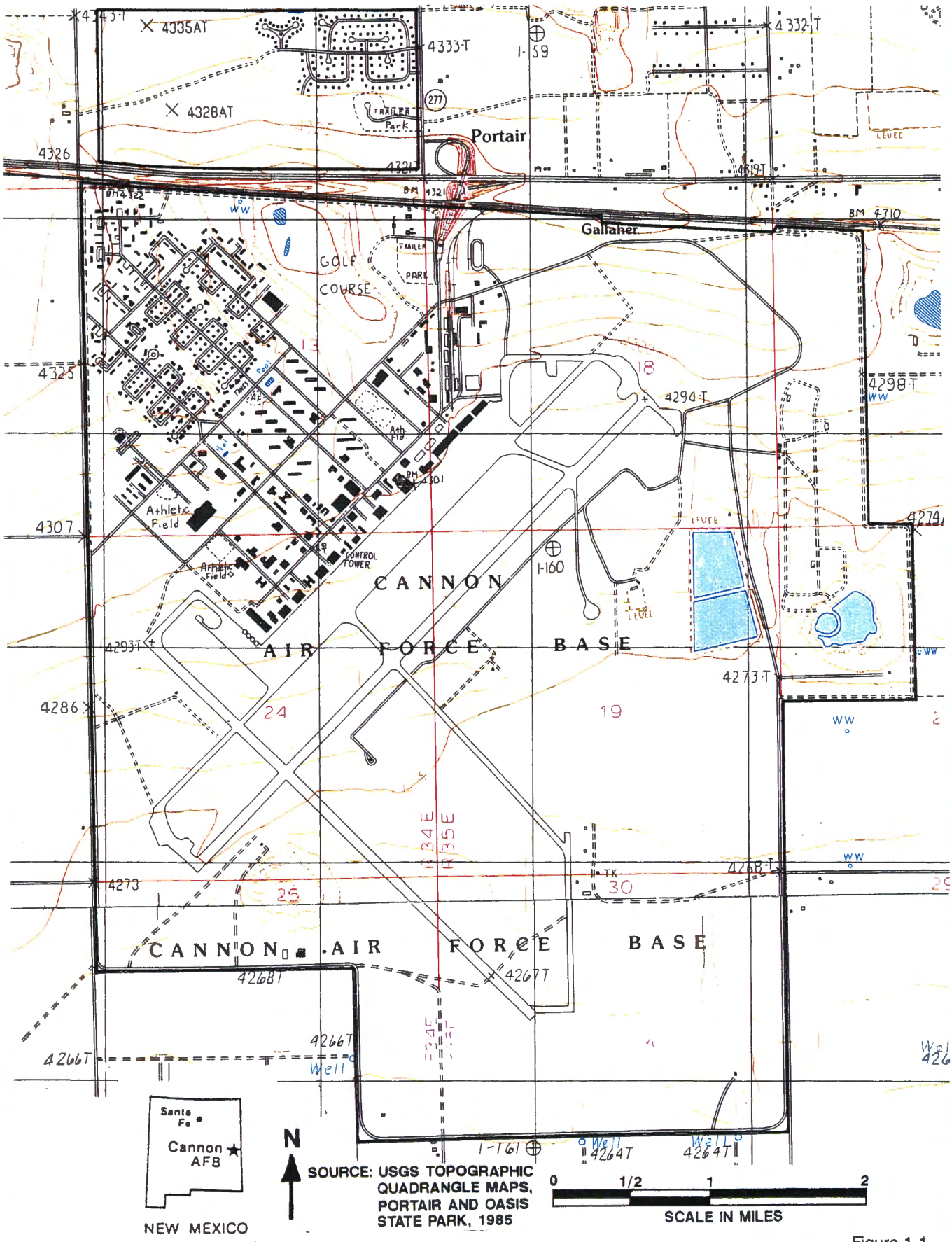
FIGURES



SOURCE: Woodward-Clyde, February1996

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Figure 1-1

GENERAL VICINITY MAP

DRUM DISPOSAL PIT
IRP Site DP-33
Cannon Air Force Base, New Mexico

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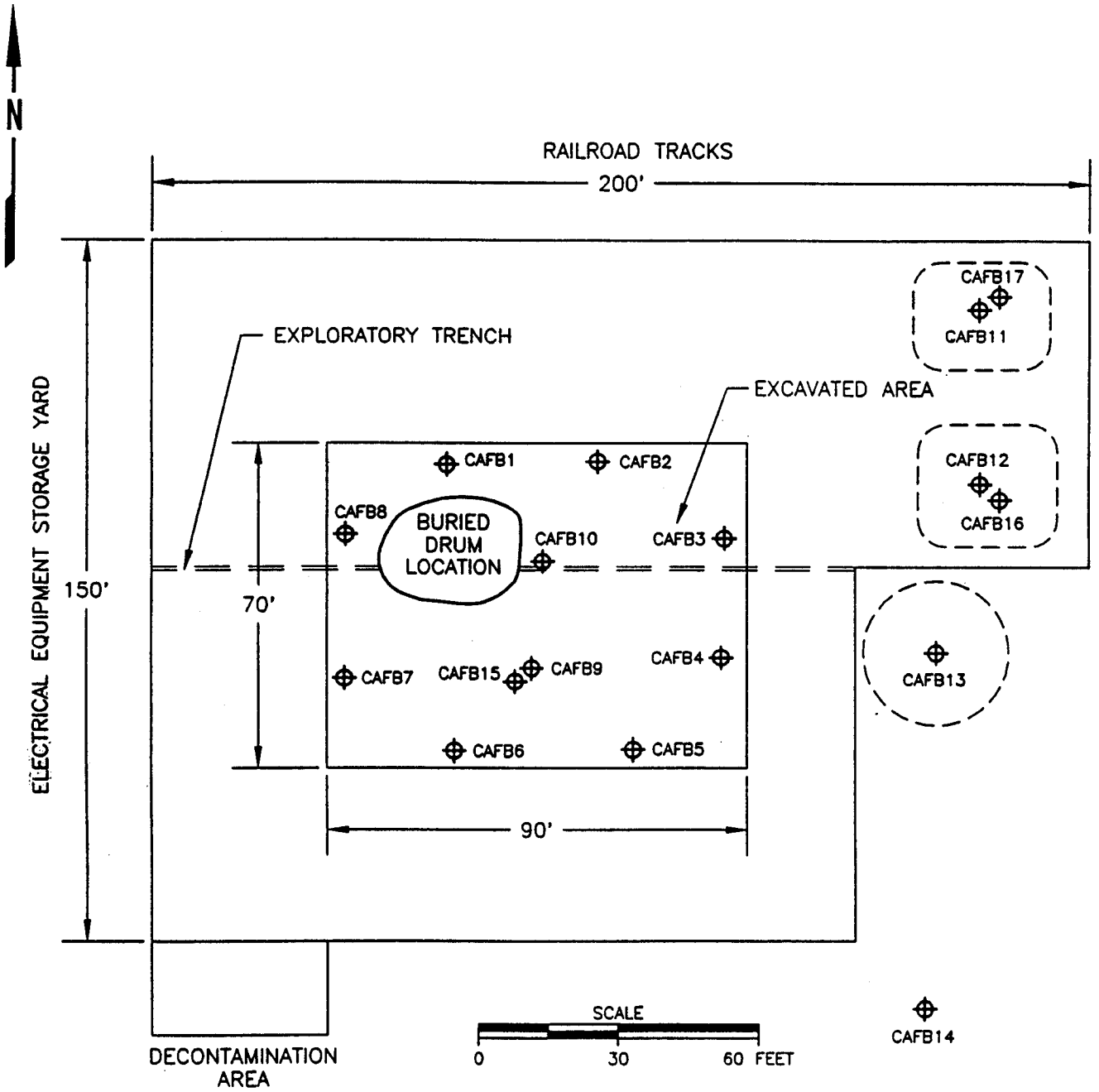

SOURCE: International Technology Corporation, January 1995

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Figure 1-2

SITE PLAN FOR RAPID RESPONSE ACTION

DRUM DISPOSAL PIT
IRP Site DP-33
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on information contained in the following report. This report describes the results of investigations and analyzes potential impacts to public health and the environment.

- Final Project Report, Rapid Response Corrective Action, DP-33 Drum Removal, Contract No. CZQZ 947033, Cannon Air Force Base, New Mexico. IT Corporation. January 1995.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Blown Capacitors Site
AOC C / IRP No. OT-10

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

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January 1997

TITLE PAGE

DECISION DOCUMENT

Blown Capacitors Site
AOC C/IRP No. OT-10
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Blown Capacitors
(AOC C/IRP No. OT-10)

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for the Blown Capacitors site (AOC C/IRP No. OT-10) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Based on available information, no significant risk or threat to public health or the environment exists at Blown Capacitors site (AOC C/IRP No. OT-10), and the site can be classified as an Area of No Suspected Contamination (ANSC). Therefore, No Further Response Action Planned is warranted at this site.

V. Declarations

I have determined that the No Further Response Action Planned alternative at the Blown Capacitors site (AOC C/IRP No. OT-10) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from past releases of contaminants. The statutory preference for further treatment is not satisfied because the contaminated soil was excavated immediately after the spill and no further contamination remains.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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Appendix A	Responsiveness Summary
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LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AFR	Air Force Range
ANSC	Area of No Suspected Contamination
AOC	Area of concern
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
DPDO	Defense Property Disposal Office
EPA	U.S. Environmental Protection Agency
gpm	Gallons per Minute
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VSI	Visual Site Inspection

1.1 SITE LOCATION AND DESCRIPTION

The Blown Capacitors site, designated as Area of Concern (AOC) C and Installation Restoration Program (IRP) No. OT-10, is located in the northwest area of the base. The site is the spot where three pole-mounted capacitors exploded in 1978 and approximately 6 gallons of oil, thought to contain PCBs, were released to the ground surface. Approximately 100 cubic yards of soil were excavated and drummed immediately following the incident.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, a fire department training area, and a munitions storage area are located south and east of the base active runways (USAF 1990).

Site Location. The Blown Capacitors site is located in the northwest corner of the base, about 300 feet northwest of Housing Facility No. 1437 and approximately 500 feet south of the Santa Fe Railroad. The site location is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U. S. Air Force has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. The Blown Capacitors site is the location of a power pole that houses six capacitors. The surrounding land is designated for use as Outdoor Recreation in the Cannon AFB Base Comprehensive Plan (W-C 1995). The site is characterized as Open Space according to the U.S. Air Force's Rational National Standards Initiative.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. The Blown Capacitors site (AOC C/IRP No. OT-10) is located in the northwest corner of the base, about 300 feet northwest of Housing Facility No. 1437.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

The Blown Capacitors site is in an open area of the base on the edge of the Old Golf Course.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

Three pole-mounted capacitors exploded in 1978 in the northwest area of the base. Approximately 6 gallons of oil thought to contain PCBs were released to the ground surface. Approximately 100 cubic yards of soil were excavated and drummed immediately following the incident. The drummed soil was disposed of off-base in a permitted disposal facility.

The following is the investigative history of the site. Further discussion of the investigation is provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). During the records search, the existence and potential for migration of hazardous material contaminants at the Blown Capacitors site (AOC C/IRP No. OT-10) was evaluated by reviewing existing information and conducting an analysis of installation records. The IRP Phase I study determined that clean-up activities were adequate to eliminate the potential for contamination. The site was not considered to present significant concern for adverse effects on health or the environment and was not examined during IRP Phase II studies.

Thus, specific media sampling and analytical testing were not conducted and data quality objectives were not established for the site.

- A site visit was made at the site by Woodward-Clyde (W-C) in 1992. No visible evidence of the accidental spill was observed (W-C 1995).

1.2.2 Period of Operation

The Blown Capacitors site (AOC C/IRP No. OT-10) was the site of an accidental spill in 1978. The soil which appeared to be affected by the spill was cleaned up immediately.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Site OT-10 is the location of a power pole mounted with six capacitors. The area where the spill occurred is open space.

1.2.5 Type of Permits Applied For and/or Approved

A Resource Conservation and Recovery Act (RCRA) Part B Permit was issued to Cannon AFB in 1989. The Permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the Permit;

- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs; and
- Implement corrective measures for each SWMU that requires them.

Under the Part B Permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

Three of the six capacitors which were mounted on a power pole at Site OT-10 were struck by lightning and ruptured in 1978. Approximately 6 gallons of oil thought to contain PCB were released on the ground. The contaminated soil was collected in 55-gallon drums and processed through the Defense Property Disposal Office (DPDO) for disposal. There is no other known record of releases from this site.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/Visual Site Inspection (VSI), RCRA Facility Assessment (RFA) conducted by A.T. Kearney.
3. 1989 RCRA Part B Storage Permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1994 Appendix II and III Phase I Reports approved by EPA Region VI.
5. 1994 RFI Appendix II and III Phase II Work Plans approved by EPA Region VI.

The Blown Capacitors site (AOC C/IRP No. OT-10) was incorrectly labeled as an AOC in the RFA report (A.T. Kearney 1987).

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and
- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for No Further Action (NFA), 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

The Blown Capacitors site (AOC C/OT-10) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Ninety percent of Cannon AFB is covered by surface soil of the Amarillo series. The soils were formed in the Blackwater Draw Formation of unconsolidated alluvium deposits of Pleistone age. Permeability of these loams is moderate and ranges from 1E-3 to 4E-4 cm/sec. The Amarillo soils overlie a 25-50 foot thick white chalky caliche zone that occurs at about 4 feet below the surface and is part of the Ogallala Formation. The caliche is underlain by sand, silts, and clay which may extend up to 400 feet below land surface. Where the sediments are saturated they form part of the High Plains Aquifer (Ogallala Aquifer). The base of the aquifer is predominantly sandstone beds of Triassic age Dockum Group.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Approximately 6 gallons of oil thought to contain PCBs were released to the ground surface in 1978. Immediately following the incident approximately 100 cubic yards of soil were excavated, placed in drums, and disposed of in an off-base permitted disposal facility. No visible evidence of the accidental spill was observed in a site visit by W-C in April of 1992 (W-C 1995). Therefore, there does not appear to be any soil contamination at this site.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

The blown capacitors spilled an estimated six gallons of oil on the ground, immediately after which 100 cubic yards of soil was removed and disposed of off site. Therefore, no penetration

of contaminated materials is likely to have occurred. In addition, the water table is approximately 270 below ground level (BGL), and the presence of caliche layers would tend to inhibit downward migration of hazardous constituents, if any were present.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed of by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) Permit since the requirement for a NPDES Permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

The IRP Phase I concluded that the clean-up activities were adequate to eliminate the potential for contamination. There does not appear to be any surface water contamination from the Blown Capacitors site (AOC C/OT-10).

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Since 100 cubic yards of soil were removed and disposed of off site after the six-gallon spill, there is no reason to believe that there would be a risk to the environment or public health due to air emissions from the Blown Capacitors site (AOC C/OT-10).

2.6 POTENTIAL RECEPTORS/PATHWAYS

The soil affected by the oil spill from the three blown capacitors was immediately excavated and properly disposed of at the time of the accident in 1978. As a result of the Records Search and a site visit, there is no indication that any hazardous substance or petroleum product was stored, disposed of, or remains at the Blown Capacitors site. The suspected site thus qualifies as an Area of No Suspected Contamination (ANSC), and poses no risk to human health or the environment. Therefore, a discussion of potential receptors and pathways is not applicable to this site.

3.0
DATA ANALYSIS/RISK ASSESSMENT

The soil affected by the oil spill from the three blown capacitors was excavated and properly disposed of at the time of the accident in 1978. As a result of the Records Search and a site visit, there is no indication that any hazardous substance or petroleum product was stored, disposed of, or remains at the Blown Capacitors site. The suspected site thus qualifies as an Area of No Suspected Contamination (ANSC), and poses no risk to human health or the environment. Therefore, a discussion of data analysis/risk assessment is not applicable to this site.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the investigation for the Blown Capacitors site (AOC C/OT-10) the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

The No Further Action alternative is believed to be consistent with Applicable or Relevant and Appropriate Requirements (ARARs). A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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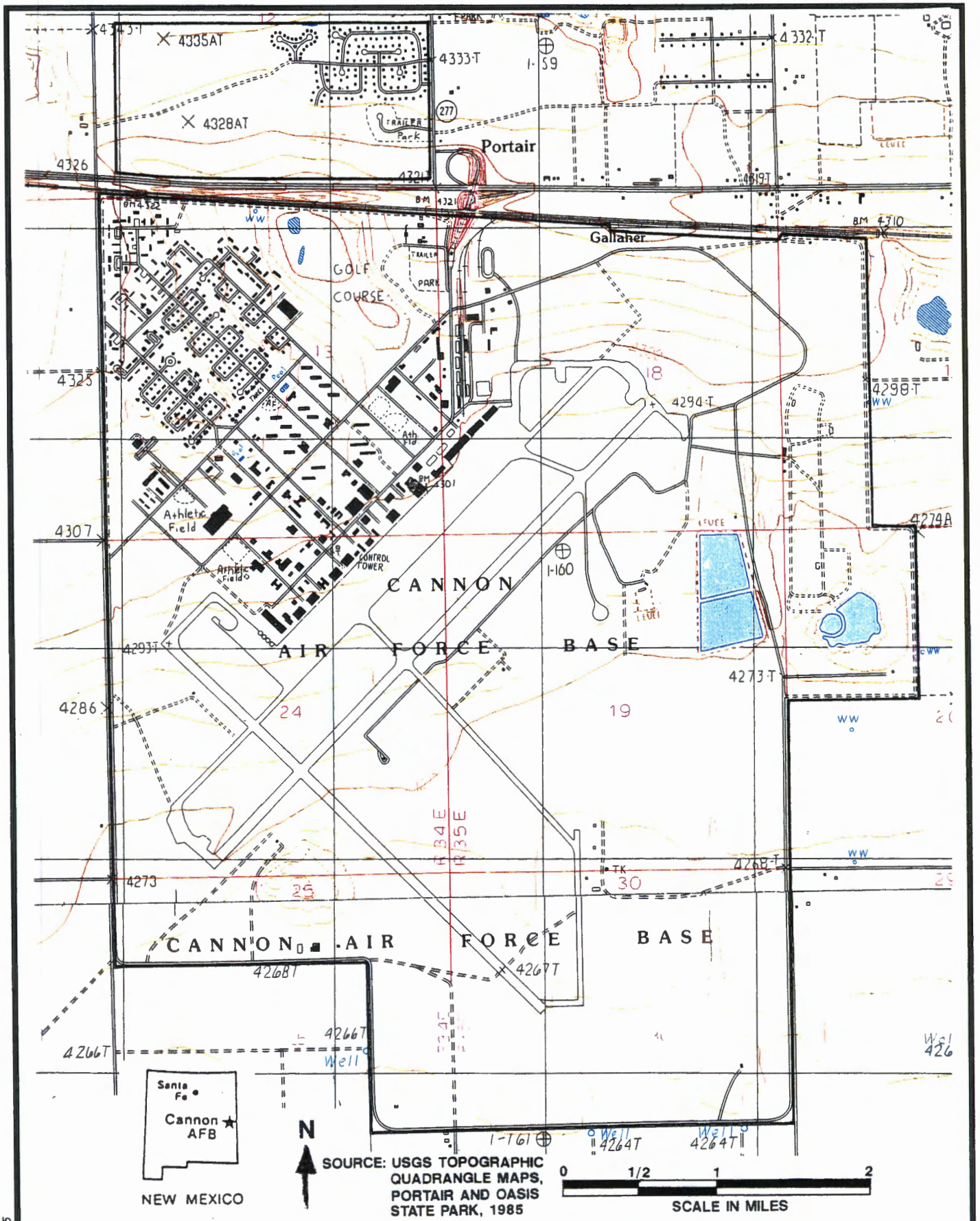
FIGURES



SOURCE: Woodward-Clyde, February1996

HARZA Consulting Engineers and Scientists

Figure 1-1

GENERAL VICINITY MAP

BLOWN CAPACITORS SITE
AOC C / IRP No. OT-10
Cannon Air Force Base, New Mexico

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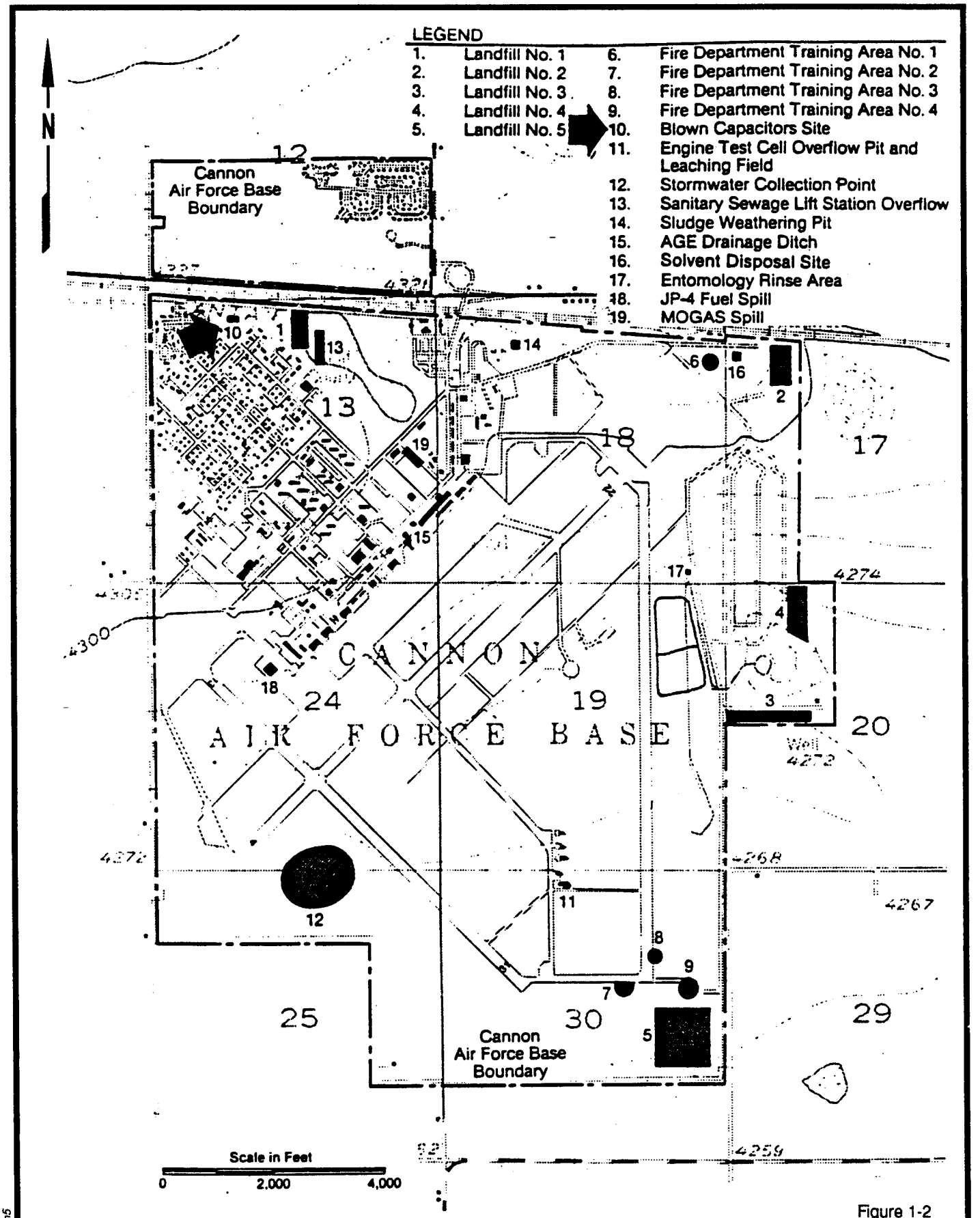

SOURCE: EA Engineering, Science and Technology, Inc., November 1990

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Figure 1-2

IRP/SWMU SITE LOCATION MAP

BLOWN CAPACITORS SITE
AOC C / IRP No. OT-10
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - DOCUMENTS REVIEWED

This Decision Document is based on information contained in the following reports. These reports describe the results of investigations and analyze potential impacts to public health and the environment.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Volume 1, Final Report for Cannon Air Force Base, New Mexico. Radian Corporation. September 1986. Volumes 2 and 3, Appendix A-M, Draft Report for Cannon AFB, New Mexico. Radian Corporation. June 1985.

  These reports are the second phase of a four part IRP and are designed to determine if environmental contamination has resulted from base activities.

- Landfill 5, Cell 3, Geotechnical Summary Report, U.S. Army Corps of Engineers, Tulsa District, September 1988.

- Installation Restoration Program, Phase IV-A, Site 17 - Entomolgy Rinse Area, Final Remedial Action Plan and Conceptual Documents, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. December 1988a. Installation Restoration Program, Phase IV-A, Site 17 - Entomolgy Rinse Area, Final Environmental Assessment, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. December, 1988b.

  This report is the final phase of a four part IRP investigation of SD-17.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.

CAFB 99-017

Headquarters, Air Combat Command
(HQ-ACC/CES/ESVW)
Directorate of Engineering and Services
Langley Air Force Base, Virginia

U.S. ARMY CORPS OF ENGINEERS
Omaha District

DECISION DOCUMENT
Sanitary Sewage Lift Station Overflow Pit
SWMU No. 75 / IRP No. SD-13

Cannon Air Force Base
Clovis, New Mexico

U. S. AIR FORCE
Installation Restoration Program
Contract No. DACW45-94-D-0044

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January 1997

TITLE PAGE

DECISION DOCUMENT

Sanitary Sewage Lift Station Overflow Pit
SWMU No. 75/IRP No. SD-13
Cannon Air Force Base
Clovis, New Mexico

USACE Contract No. DACW45-94-D-0044
HARZA Environmental Services, Inc.
Delivery Order No. 0009

JANUARY 1997

DECLARATION

DECLARATION

I. Base Name and Location

Cannon Air Force Base
Curry County
Clovis, New Mexico

II. Site Name and Location

Sanitary Sewage Lift Station Overflow Pit
SWMU No. 75/IRP No. SD-13

III. Statement of Basis and Purpose

This decision document presents the selected remedial action for Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75/IRP No. SD-13) at Cannon Air Force Base (AFB), City of Clovis, Curry County, New Mexico. The remedial action was chosen in accordance with the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

IV. Description of Selected Remedy: No Further Response Action Planned (NFRAP)

Results of the RI (Remedial Investigation) for the Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75/IRP No. SD-13) performed by Radian Corporation (Radian) in 1985, and the outcomes of past investigations indicate no significant risk at this IRP/SWMU site and. Therefore, No Further Response Action Planned is warranted.

V. Declarations

I have determined that the No Further Response Action Planned alternative at Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75/IRP No. SD-13) is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment from releases of contaminants due to past disposal practices. The RI of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B permit conditions. The activities performed for this RI followed the Department of Defense (DOD) IRP and were conducted to be consistent with CERCLA, SARA, and the NCP.

U.S. AIR FORCE

_____ By: _____

Date

Title: _____

STATE OF NEW MEXICO

_____ By: _____

Date

Title: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY

_____ By: _____

Date

Title: _____

DECISION SUMMARY

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LIST OF ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
AOC	Area of concern
AFR	Air Force Range
ARAR	Applicable or Relevant and Appropriate Requirements
BGL	Below Ground Level
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CMD	Corrective Measures Design
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
CRP	Community Relations Plan
CUZ	Compatible Use Zone
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
gpm	Gallons per Minute
HSWA	Hazardous and Solid Waste Amendment of 1984
IRP	Installation Restoration Program
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
POL	Petroleum, Oil, and Lubricants
PRG	Preliminary Remedial Goals
RCAP	RCRA Corrective Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TAC	Tactical Air Command
USACE	U.S. Army Corps of Engineers - Omaha District
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture Soil Conservation Service

LIST OF ACRONYMS

USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Services
VSI	Visual Site Inspection

1.0
INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

Sanitary Sewage Lift Station Overflow Pit, designated as Solid Waste Management Unit (SWMU) No. 75 and Installation Restoration Program (IRP) No. SD-13, is an overflow pit designed to retain sanitary sewage in the event of pump station failure. The pit was once used in February of 1983 when 100,000 to 150,000 gallons of raw domestic sewage were bypassed to the pit when the lift pumps failed. The raw sewage remained in the pit for approximately one week after which the sewage was recycled to the repaired lift station. An analysis of a wastewater sample in February 1983 determined it to be ignitable (hazardous by EPA criteria). The Sanitary Sewage Lift Station Overflow Pit is located in the northwest area of the base.

1.1.1 Location

Base Location. Cannon Air Force Base (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 south of the intersection of U.S. Highway 84/60 and New Mexico Highway 277. The Melrose Air Force Range (AFR) is an off-base facility located approximately 25 miles west of Cannon AFB, occupying an area of approximately 77,190 acres. A general vicinity map of Cannon AFB is shown in **Figure 1-1**, and an IRP/SWMU site location map for Cannon AFB is shown in **Figure 1-2**.

Base facilities include the airfield area with operation, maintenance, and support facilities located primarily northwest of the active runways. Base housing is located in the northwest quarter of the base and also north of the base, west of New Mexico Highway 277. Additional ancillary base support facilities such as wastewater lagoons, fire department training area, and munitions storage are located south and east of the base active runways (USAF 1990).

Site Location. Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75) is located in the northwest section of the base, approximately 600 feet south of the Atchison

Topeka and Santa Fe Railroad and approximately 100 feet southwest of Landfill No.1. The site is shown on **Figure 1-2**.

1.1.2 Site Topography and Area

Cannon AFB is located within a flat plain which slopes gently towards the east and southeast. Sanitary Sewage Lift Station Overflow Pit site occupies an area 100 ft by 600 ft and is 2 to 3 feet deep. Additional discussion of physiographic features in the area of Cannon AFB is provided in Section 2.1.2.

1.1.3 Adjacent Land Uses

General Land Use. Land use within Curry County is primarily agricultural. The county has a total land area of 897,000 acres, 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (USAF 1990). Lands surrounding Cannon AFB are classified as irrigated farmland of statewide importance. Principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. Cattle ranching is practiced throughout the county.

The City of Clovis is the commercial center for eastern New Mexico, and western Texas and is one of the primary growth centers in a 17-county area. The Clovis planning area boundary includes a five-mile area around the city. Currently, no land use or zoning controls restrict the type and amount of construction in the proximity of Cannon AFB.

Facility Land Use. Land uses within Cannon AFB include residential, commercial (businesses, offices, commissary, etc.), industrial (facilities associated with base operations), recreational, and vacant land. The U.S. Air Force (USAF) has also designated Compatible Use Zones (CUZs) around Cannon AFB. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. Within these CUZs, the local communities or county governments are responsible for adopting appropriate land use controls to prevent incompatible development. The county has not passed zoning ordinances controlling development around Cannon AFB. Incompatible land use (in regard to the Air Force's CUZs) has occurred to the northeast of the base and includes both commercial and residential development.

Site Land Use. Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75) is located within an area characterized as Open Area according to the Cannon AFB Base Comprehensive Plan (W-C 1995). Open Areas are defined as conservation areas and required buffer space. The site is also characterized as Open Space according to the U.S. Air Force's Rational National Standards Initiative. The pit is located in an area of the base which was formerly the site of the old golf course. Since the original IRP investigation (1983), the area has been reworked twice to improve drainage around the old golf course and to create new water "hazards" for the new section of the golf course. There are no visible remnants of the pit.

1.1.4 Location and Distance to Nearby Populations

Facility. Cannon AFB is located approximately 7 miles west of the City of Clovis. Revised 1990 Bureau of Census data reports the population of Curry County and the City of Clovis as 44,020 and 32,767, respectively. In 1990, Cannon AFB had a resident population of approximately 4,650, including military personnel and their dependents (USAF 1991).

Site. Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75/IRP No. SD-13) is located in the northwestern area of the base. Cannon AFB on-site housing is located less than 1,000 feet and the base boundary is 400 feet from the site.

1.1.5 General Surface and Groundwater Resources

There are no permanent surface water features on Cannon AFB other than two wastewater lagoons and an adjacent playa lake which receives the wastewater effluent. The playa lake has no surface outlet and the effluent is disposed of by infiltration and evaporation. Another playa lake near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base and loses most of it to infiltration and evaporation.

The main groundwater resource underlying the site is the Ogallala aquifer, which is part of the regional High Plains Aquifer. The Ogallala aquifer is unconfined and at Cannon AFB is located at an approximate depth of 270 feet below ground level (BGL). Discharge from the aquifer occurs through well pumping and from springs along eroded margins, outside of the Cannon AFB area. Numerous water wells on and around the base draw water from this aquifer for potable and irrigation water supply.

1.1.6 Surface and Subsurface Features

Sanitary Sewage Lift Station Overflow Pit is an open area 100 feet wide, 600 feet long, and 2 to 3 feet deep and appears as a rectangular, grass-covered depression. Since the original IRP investigation, the area has been reworked twice to improve drainage around the old golf course. At the present time, the site appears as a rectangular, grass-covered depression. There are no visible remnants of the pit.

1.1.7 Ecology

Natural flora of Cannon AFB consist of dominant grasses and forbs species typical of short grass prairies, which cover over 50 percent of the area. A variety of bird life and small animals inhabit the prairie grasslands, but no large wild mammals are present at Cannon AFB.

There are no known federal threatened or endangered plant or animal species occurring on Cannon AFB (CH_2M Hill 1983; USFWS 1987; USAF 1990). The swift fox, long-billed curlew, western snowy plover, ferruginous hawk, and Texas horned lizard, all Category 2 candidate species, may be found in Curry County (USFWS 1992). Federally listed threatened or endangered species occurring within a 50 mile radius of Cannon AFB include the bald eagle and the peregrine falcon. The black-footed ferret is a federal endangered species listed as occurring in the area, but is possibly extinct in this former range.

The only state-endangered species known to occur in Curry County is the Bairds sparrow. The Bairds sparrow may be present mainly during autumn migration in the eastern plains and southern lowlands (USAF 1990). The tall-plains spurge is a state sensitive plant species which is potentially found in sandy areas and sandy roadsides in the area (NMNHP 1992).

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

1.2.1 Establishment of Site/Investigative History

The Sanitary Sewage Lift Overflow Pit served as an emergency overflow containment area for a lift station in the northwest area of the base. The pit was used once in February 1983 when

100,000 to 150,000 gallons of raw domestic sewage were bypassed to the Pit when the lift pumps failed.

The following is the investigative history of the site. Further discussion of the investigations in provided in Section 2.2.

- In 1983, a Phase I IRP Records Search was performed by CH_2M Hill at Cannon AFB to identify and evaluate suspected problems associated with past hazardous material disposal and spill sites (CH_2M Hill 1983). The relative hazardous substance problem potential to human health or the environment at this site was evaluated using Hazard Assessment Rating Methodology (HARM) during the IRP Phase I studies. This model considers four aspects of the hazard posed by a specific site: 1) the possible receptors of the contamination, 2) the waste and its characteristics, 3) the potential pathways for waste contaminant migration, and 4) any efforts to contain the contamination. The overall HARM rating score of 47 for the site was one of the lowest (range 42 to 66) for IRP sites at Cannon AFB.

- During the IRP Phase II (Stage 1) investigation conducted by Radian Corporation (Radian), the Sanitary Sewage Lift Station Overflow Pit (Radian 1986) was investigated to determine if environmental contamination had occurred based on a wastewater analysis. During this investigation, two 5-ft hand-augered soil borings were performed, one at the overflow discharge and the other near the lowest point in the basin, as shown on **Figure 1-3**. Soil samples were collected at 1 and 4 foot depths and analyzed for chemicals of concern (COCs) including purgeable aromatics and halocarbons, oil and grease, and total metals.

1.2.2 Period of Operation

Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75) was used once in 1983 when it was filled with 100,000 to 150,000 gallons of raw sewage. The sewage remained in the pit for about a week. The pit is no longer in use.

1.2.3 History of Ownership

The area currently occupied by Cannon AFB was farmland before the facility was established in 1929 as Portair Field, a civilian passenger terminal. The U. S. War Department (now

Department of Defense) took control of Portair Field in 1942, renaming it Clovis Army Air Base, at which air training facilities were provided for air crews during World War II. The base was deactivated in 1947. In 1951, it was reassigned to the Tactical Air Command (TAC) and reactivated as Clovis AFB. The base was renamed Cannon AFB in 1957. Since 1971, the primary mission of the base has been to develop and maintain tactical fighter wings. Cannon AFB was reassigned to the Air Combat Command (ACC) in 1992.

1.2.4 Site Use over Period of Operation

Available information indicates that Sanitary Sewage Lift Station Overflow Pit was used as an emergency overflow containment area for a lift station in the northwest area of the base.

1.2.5 Type of Permits Applied For and/or Approved

A Resource Conservation and Recovery Act (RCRA) Part B permit was issued to Cannon AFB in 1989. The permit requires the USAF to complete the following tasks, as part of the base RCRA Corrective Action Program (RCAP):

- Conduct a RCRA Facility Investigation (RFI) on each SWMU defined in the permit;
- Prepare an Interim Corrective Measures Plan (CMP) for the SWMUs requiring Corrective Measures Implementation (CMI);
- Prepare a Corrective Measures Study (CMS) Proposed Plan for the CMI SWMUs;
- Prepare a Corrective Measures Design (CMD) for the CMI SWMUs; and
- Implement corrective measures for each SWMU that requires them.

Under the Part B permit, the Defense Reutilization and Marketing Office allows the storage of hazardous waste at the facility for up to one year before disposal.

1.2.6 History of Releases

In February 1983, 100,000 to 150,000 gallons of raw domestic sewage were bypassed to the pit when the lift station pumps failed. The waste remained about one week after which the sewage was recycled to the repaired lift station. An analysis of a wastewater sample in February 1983, showed the sample to be ignitable (hazardous by EPA criteria). Based on the

analysis, it is suspected that a small residual of petroleum, oil, and lubricants (POL) may have been present in the wastewater overflow and may have percolated into the ground.

1.2.7 Enforcement Activities

Key regulatory dates and actions at Cannon AFB include the following (W-C 1995):

1. 1983 IRP Records Search conducted by CH_2M Hill.
2. 1987 Preliminary Review/Visual Site Investigation (VSI), RCRA Facility Assessment (RFA) conducted by A.T. Kearney.
3. 1989 RCRA Part B storage permit issued to Cannon AFB by U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED). The Hazardous and Solid Wastes Amendments of 1984 (HSWA) section lists SWMUs and Areas of Concern (AOCs) requiring investigations in Appendix I, II, and III.
4. 1992 Appendix I RFI data approved by EPA Region VI.
5. 1994 Appendix I RFI Report approved by EPA Region VI. Survey for 19 SWMUs supplied to County Clerk's office.

This unit was originally scheduled for investigation during the Appendix I, Phase I RFI; however, in October 1990, EPA Region VI concluded that the Sanitary Sewage Lift Station Overflow Pit warrants NFA (No further Action)..

1.3 COMMUNITY PARTICIPATION

Community relations activities at Cannon AFB to date include the following (W-C 1995):

- Publication and release for public comment of the RCRA hazardous waste permit application;
- Establishment of information repositories at public and Cannon AFB libraries, including fact sheets, technical summaries, site reports, the Cannon AFB Community Relations Plan (CRP), and other information used to support decision-making;
- Maintenance of a mailing list of all interested parties in the community;
- CRP update in 1995; and

- Creation of a Restoration Advisory Board in 1995, to provide opportunities for ongoing community input and participation in IRP activities.

1.4 SCOPE AND ROLE OF RESPONSE ACTION

This decision document addresses one of 79 SWMUs and AOCs at Cannon AFB. There are and 8 additional sites at Melrose AFR. Of the 79 sites at Cannon AFB, 15 sites have been approved for NFA, 36 sites have been proposed for NFA and are awaiting regulatory approval, 19 sites are undergoing Interim Corrective Actions, 5 sites are undergoing or requiring Further Evaluation as part of the RFI process, and 4 sites are under Long Term Monitoring.

Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75/IRP No. SD-13) has been categorized as requiring NFA.

2.1 GEOLOGICAL SETTING, PHYSIOGRAPHY, AND CLIMATOLOGY

2.1.1 Geological Setting

Geologic units immediately underlying Cannon AFB Sanitary are Tertiary (Miocene to Pliocene) fluvial deposits of the Ogallala Formation (W-C 1992). These consist predominantly of well-sorted sands with scattered thin caliche layers and, based on regional information, may be up to 390 feet thick in the general area.

Soil samples were collected at a depth 1 and 4 feet in the locations shown in **Figure 1-3**. The Site topsoil reaches to a depth of 4 feet and is wet, dark clay with organic debris. The topsoil is underlain by caliche. The total thickness of the caliche is unknown but assumed to be about 20 feet, based on boring logs of site LF-1 nearby.

2.1.2 Physiography

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). 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). Elevations in the vicinity of Cannon AFB 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 at 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 and during periods of rainfall form ephemeral playa lakes. Playa lakes have no external surface drainage and lose water by infiltration and evaporation. Without recharge, the playas typically 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. There are no areas of the base located within a floodplain.

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 (USGS 1985). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.1.3 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 39°F to a July high of 78°F. Extreme daily temperatures range from -11°F to 106°F. Average monthly precipitation ranges from 0.4 inch in winter months to 2.7 inches in July. The maximum recorded 24-hour rainfall is 4.7 inches, which occurred in August 1985. Rainfall occurs eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 15 inches. The mean annual lake evaporation is 69 inches/yr. Prevailing winds are from the west at an average of 8 mph (USAF 1990).

2.2 SOILS

2.2.1 Soil Description

The Amarillo fine sandy loam, 0- to 2-percent slope phase soil is the most common soil type found on Cannon AFB. The U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1958) describes this soil as consisting of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths of 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The color of the surface soil is brown (7.5 YR 5/5, dry), and subsurface soils are reddish-brown (5 YR 4/4, dry) to yellowish-red (15 YR 5/6, dry). The calcic C horizon underlying the Amarillo fine sandy loam is white. The Amarillo fine sandy loam soil type is present on all relatively flat surfaces at the base but is also found on slopes associated with playas. A small area of Amarillo loamy sand, 0- to 2-percent slope phase is mapped in the southeast corner of the base. 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 (USDA-SCS 1958).

2.2.2 Soil Contamination

Several investigations conducted at Cannon AFB encompassed soils at Sanitary Sewage Lift Station Overflow Pit. Results of the Phase I IRP Records Search (CH_2M Hill, 1983) recommended a limited Phase II investigation program to confirm or rule out the presence and/or migration of hazardous contaminants at the site. The Phase II (Stage 1) investigation was conducted by Radian in 1984 and 1985, during which two 5-foot deep hand-augured boreholes were performed (**Figure 1-3**). Boring 13A was located at the overflow discharge where debris, paper, and other wastes were observed. Boring 13B was located near the lowest elevation of the basin where the greatest concentrations of wastes were suspected. No purgeable halocarbon or aromatic compounds were detected. Oil and grease was found in all samples at relatively low levels. Metals concentrations varied within the normal range for soils as shown in **Table 2-1**.

2.3 GROUNDWATER

2.3.1 Hydrogeological Setting

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 region. 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 redbeds of the Dockum Group, which serve as a basal confining layer. The Ogallala is a water table, or unconfined, aquifer with a southeasterly regional gradient of about 10 to 15 feet/mile (Weeks and Gutentag 1981). Well yields vary from less than one gallon per minute (gpm) in thin silts and sands up to 1600 gpm in thick sands and gravels. Water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985). The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water.

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet and is influenced by the configuration of the erosional unconformity surface marking the top of the Dockum Group.

The local groundwater gradient is southeasterly at 7 to 15 feet/mile (USAF 1990). 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 205 gpm to 1,150 gpm. Specific capacities range from 11.4 gpm/foot to 27.9 gpm/foot (Lee Wan and Associates 1990).

Rough estimates of hydraulic conductivity were made using data from aquifer pumping tests in water wells 5 and 9 at Cannon AFB (Lee Wan and Associates 1990). Hydraulic conductivity values were found to be approximately 2.0×10^{-3} cm/sec. Other tests on water well 8 indicated a hydraulic conductivity of 2.0×10^{-2} cm/sec. These estimates may be low based on comparison to published data for sands and gravels (Freeze and Cherry 1979) and to groundwater flow velocities reported in Kearney (1987), equivalent to hydraulic conductivities of approximately 1.0×10^{-1} cm/sec. The presence of abundant interstitial clays in the Ogallala formation may account for the variable and comparatively low values of hydraulic conductivity.

Recharge to the Ogallala is primarily by infiltration of precipitation. Kearney (1987) indicates that the recharge rate may be as much as 1.0 inch/yr. Due to the high evapotranspiration rate and low precipitation, recharge 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 allows deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and the lack of caliche directly below, playas. Caliche is soluble in rainwater and is leached over time to form percolation pathways.

Discharge from the Ogallala Aquifer occurs through springs located along the eroded margins and well pumping. Spring discharge is not known to occur on or near Cannon AFB; however, domestic and irrigation water wells are common on and around the base. The rate of discharge exceeds local recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. From the 1930s to 1980, a decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico. Luckey (et al. 1981) states, "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry County, New Mexico to Crosby County, Texas."

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

2.3.2 Groundwater Contamination

The Phase II, Stage I investigation was conducted in part due to the proximity of the site to a potable water well (800 feet). Presently, there does not appear to be any substantial risk to the groundwater since the depth to groundwater is approximately 270 ft BGL and the caliche zone attenuates and isolates oil and grease from infiltrating far enough into the subsurface to affect the groundwater.

2.4 SURFACE WATER

2.4.1 Surface Water Setting

Cannon AFB is located in the Southern High Plains region typified by smooth and gently sloping, undulating surface topography on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The dominant surface water features in the area are small temporary lake basins known as playas. A playa located near the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the base. Two wastewater lagoons also are located on base. These have a combined surface area of 32 acres and are operated in series. The treated wastewater effluent from the lagoons is channeled into an adjoining playa lake. The effluent to the playa lake is disposed by evaporation and infiltration. The wastewater treatment system reportedly does not require a National Pollutant Discharge Elimination System (NPDES) permit since the requirement for a NPDES permit was waived in 1975. Cannon AFB has no permanent surface water features other than the wastewater lagoons and associated playa lake (USAF 1990).

Regional drainage in Curry County is predominantly to the southeast and east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys (known locally as draws) that extend almost from the western edge of the Southern High Plains to the eastern boundary of the plateau. The valleys or draws eventually drain into one of three major river valleys: the Red, the Brazos, or the Colorado River Valleys. Although the draws extend to the river valleys as drainage systems, they seldom contribute actual flow to the rivers except during periods of unusually

high rainfall. The bulk of the precipitation is lost to evapotranspiration and infiltration. The playa lakes serve as low-point collection areas for surface runoff in areas not drained by the draws. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation and infiltration (USAF 1990).

2.4.2 Surface Water Contamination

Presently, there does not appear to be a risk to surface water at the Sanitary Sewage Lift Station Overflow Pit. Drainage generally flows toward the pit. Therefore, no surface water sampling was performed as part of this RI.

2.5 AIR

2.5.1 Air Quality Setting

The atmosphere around 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 atmospheres (USAF 1990).

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 area in the United States having the most frequent and highest levels of 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.

2.5.2 Air Contamination

Presently, there does not appear to be a risk to the environment or public health due to air emissions from activities associated with Sanitary Sewage Lift Station Overflow Pit . No air sampling was performed as part of the RI.

2.6 POTENTIAL RECEPTORS/PATHWAYS

The only source of contaminant release at the Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75) was domestic raw sewage. Once mixed with surface or subsurface soil, the chemicals may then be released to other media (e.g., air or groundwater). There are three potentially complete and significant human exposure pathways at the site: direct contact (i.e., ingestion and dermal contact) with soil, inhalation of airborne emissions from soil, and domestic use of groundwater on the base and the base boundary.

Potential receptors include base workers (e.g. military and base personnel, and base contractors), hypothetical future construction workers, residents on the base, occasional base visitors (e.g., families of military personnel, visitors at these sites without restricted access), and residential receptors at the base boundary that may use groundwater on the base and at the base boundary.

The soil exposure pathways (including soil ingestion, dermal contact, and inhalation of airborne contaminants) are potentially complete and significant pathways for SWMU workers and hypothetical future construction workers, residents on the base, and occasional base visitors.

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

Surface water runoff is considered to be a potential pathway at this SWMU although there was rarely enough water to fill the pit to overflowing. Most water collected is either evaporated or percolated into the soil.

3.1 RISK ASSESSMENT APPROACH

The RI at Cannon AFB was performed under the regulatory framework of both RCRA and the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA). Under RCRA guidance, the concentrations of site chemicals were compared to non-site-specific screening levels.

There are three potentially complete exposure pathways at Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75): direct contact with soil; inhalation of soil; and domestic use of groundwater at the base or at the base boundary. Potential receptors include base workers (e.g. military and base personnel, and base contractors), hypothetical future construction workers, base residents, occasional base visitors (e.g., families of military personnel, visitors at these sites without restricted access), and residential receptors at the base boundary that may use groundwater on the base and at the base boundary. A complete discussion of potentially complete exposure pathways is provided in Section 2.6.

3.2 SOILS

Based on the shallow borings which were collected during the IRP Phase II, Stage I study (Radian, 1985), the Sanitary Sewage Lift Station Overflow Pit contained no purgeable halocarbons or aromatic compounds. All samples contained measurable amounts of oil and grease at relatively low levels. Variable metal concentrations were found in the soils but generally within the normal range for soils.

Oil and grease was found in all samples at relatively low levels ranging from 26 to 67 mg/kg. The study determined that oil and grease, detected in small quantities, may be attributed to naturally occurring organics. Volatile organic compounds, the chemicals of primary concern, were not detected.

Maximum detected soil concentrations of metals which exceeded background concentrations (see Section 2.2.2) were compared to conservative EPA Region IX Preliminary Remedial Goals (PRGs) for residential soil (EPA 1994) to evaluate whether a significant release (i.e.,

that could pose a significant risk to human health) had occurred at the Stormwater Collection Point. EPA Region IX PRGs were used for comparison because they are a comprehensive and up-to-date list of PRGs derived using accepted risk assessment methodologies. A summary of chemicals detected in soil samples at the Sanitary Sewage Lift Station Overflow Pit (SWMU No.75) is shown in **Table 2-1**. Only one soil sample reported a detected metal concentration in excess of the PRG. Boring 13B-2 contained a manganese concentration of 550 mg/kg which is greater than the 380 mg/kg PRG. Although the manganese level is high for residential soil, it is quite low for industrial soil where the PRG is 8,300 mg/kg. Additionally, the 550 mg/kg is only slightly above background soil concentrations at Clovis, New Mexico (500 mg/kg), as shown in **Table 2-1**. Presently, the Sanitary Sewage Lift Station Overflow Pit is not a residential area and it is unlikely to become one in the future. An open space land use is more likely for this site at Cannon AFB.

The oil and grease and the manganese are not expected to percolate into the groundwater due to the presence of the caliche layer. Levels of oil and grease and manganese are also relatively low and could be considered unlikely to reach groundwater in their sampled concentrations.

3.3 GROUNDWATER

Groundwater beneath Cannon AFB is potable and used for domestic purposes both on and off the base. Therefore, exposures to groundwater by current and future residents is possible. However, the Ogallala Aquifer is more than 270 feet deep and groundwater monitoring well data elsewhere at Cannon AFB has revealed no aquifer contamination. Also, the fate and transport properties of the chemicals detected in the soil samples does not indicate high mobility, the local geology/hydrogeology (which includes clay and caliche layers) appear to be protective of the groundwater, and a groundwater monitoring program is in place elsewhere at Cannon AFB and is expected to continue. Therefore, it was judged that the groundwater exposure pathway is not likely to be a significant path of human exposure.

3.4 SURFACE WATER

Surface water is a potential pathway at this SWMU although, given the low precipitation rates in the area, the pit is filled infrequently and the water evaporates and percolates quickly.

3.5 AIR

Fugitive dusts or volatilized chemical constituents emanating from primary or secondary sources may impact the ambient air and may be transported from the source. The non-site-specific risk of exposure to airborne contaminants is included in the PRGs discussed for soil in Section 3.2.

3.6 SUMMARY

Four soil samples were collected from shallow borings at this SWMU. A screening-level risk evaluation was performed by comparing maximum detected concentrations to background levels and PRGs. The Sanitary Sewage Lift Station Overflow Pit contained no purgeable halocarbons or aromatic compounds. All four samples contained measurable amounts of oil and grease. Variable metal concentrations were found in the soils. One soil sample, with a detected metal concentration (manganese) above background level, exceeded the PRGs for residential soils but was well below the level for industrial soil. The manganese concentration in the soil sample was only marginally above manganese background concentrations. The caliche layer provides protection for the groundwater from the low levels of oil and grease. The caliche and clay layers in the subsurface will prevent the migration of the manganese. Low levels of oil and grease and manganese are unlikely to reach groundwater (approximately 270 feet BGL) in their sampled concentrations. Because no unacceptable health risk exists, no further evaluation of the SWMU is recommended.

4.0
DESCRIPTION OF NO FURTHER RESPONSE ACTION PLANNED (NFRAP) ALTERNATIVE

4.1 ALTERNATIVE CONSIDERED

Based on results of the RI for Sanitary Sewage Lift Station Overflow Pit, including the comparison with the PRGs and results of past investigations, the NFRAP alternative is appropriate for this IRP/SWMU site.

4.2 CONSISTENCY WITH ENVIRONMENTAL LAWS

Based on the results of the IRP Phase II, it is unlikely that the No Further Action alternative is consistent with Applicable or Relevant and Appropriate Requirements (ARARs). However, no formal review of ARARs was conducted as part of the IRP. A summarized list of the major ARARs is provided below.

Chemical-Specific ARARs. Chemical-specific ARARs at the Federal level include the Safe Drinking Water Act and RCRA, and at the State level include New Mexico Water Quality Act, the New Mexico Hazardous Waste Act, and the New Mexico Solid Waste Regulations.

To-Be-Considered Materials. To-Be-Considered Materials include Potential Screening Concentration for Inorganic Compounds in Soil, based on RFI Guidance and Proposed RCRA Action Levels.

Location-Specific ARARs. Location-Specific ARARs at the Federal level include RCRA, E.O. 11988 Protection of Floodplains, E.O. 11990 Protection of Wetlands, Clean Water Act Section 404, Endangered Species Act, Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, and others, and at the State level include the New Mexico Endangered Species Act and the New Mexico State Cultural Properties Act.

5.0
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TABLES

TABLE 2-1
OIL AND GREASE, METALS, AND PURGEABLE ORGANICS IN SOIL SAMPLES
SEWAGE LIFT STATION
SWMU NO. 75/ IRP NO. SD-13
Cannon Air Force Base, New Mexico

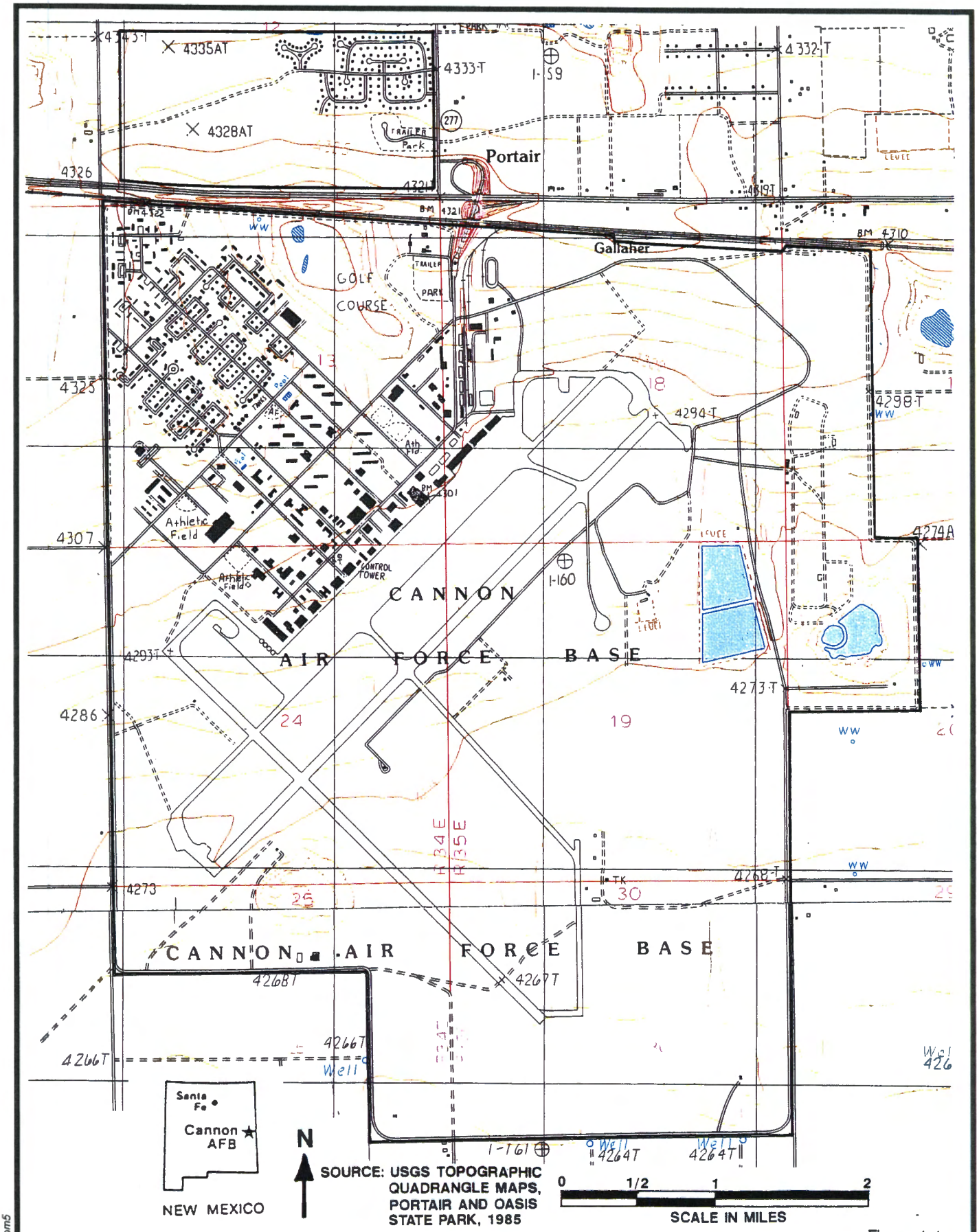
Sample No.	Ag	As	Ba	Cd	Cr	Cu	Hg	Mn	O/G	Pb	Se	Zn	Purgeable Organics** (EPA 8010/8020)
	(concentrations in mg/g)												
13A-1	1.6	2.6	98	0.20	5.3	9.1	0.38	2.5	65	9.6	1.3	23	ND
13A-2	1.4	1.6	87	ND	5.5	7.1	0.24	120	26	7.6	1.5	24	ND
13B-1	ND	2.6	100	0.22	7.5	7.5	0.14	330	55	9.9	1.3	20	ND
13-2	0.54	2.1	130	0.34	7.4	7.4	0.12	550	28	2.0	1.2	18	ND
13-B-2a*	0.70	3.1	140	0.59	9.7	9.5	0.16	210	67	7.2	2.2	25	NA
Background Levels[1]	--	6.5	500	--	30	20	0.032	500	--	15	0.15 -0.20	45	--
PRGs for residential soil[2]	380	22	5,300	38	380	2,800	23	380	--	400	380	2,300	--

* duplicate analysis
**concentrations in μg/kg
ND = not detected
NA = not analyzed

[1]Clovis, New Mexico (W-C 1992)
[2]PRGs are the EPA Region IX Preliminary Remedial Goals (EPA 1994)

Data from the IRP Phase II Stage 1 investigation by Radian, 1985.
Source: EA Engineering, Science, and Technology, Inc. 1990

FIGURES



SOURCE: Woodward-Clyde, February1996

Figure 1-1

GENERAL VICINITY MAP

SANITARY SEWAGE LIFT STATION OVERFLOW PIT
SWMU No. 75 / IRP No. SD-13
Cannon Air Force Base, New Mexico

HARZA *Consulting Engineers and Scientists*

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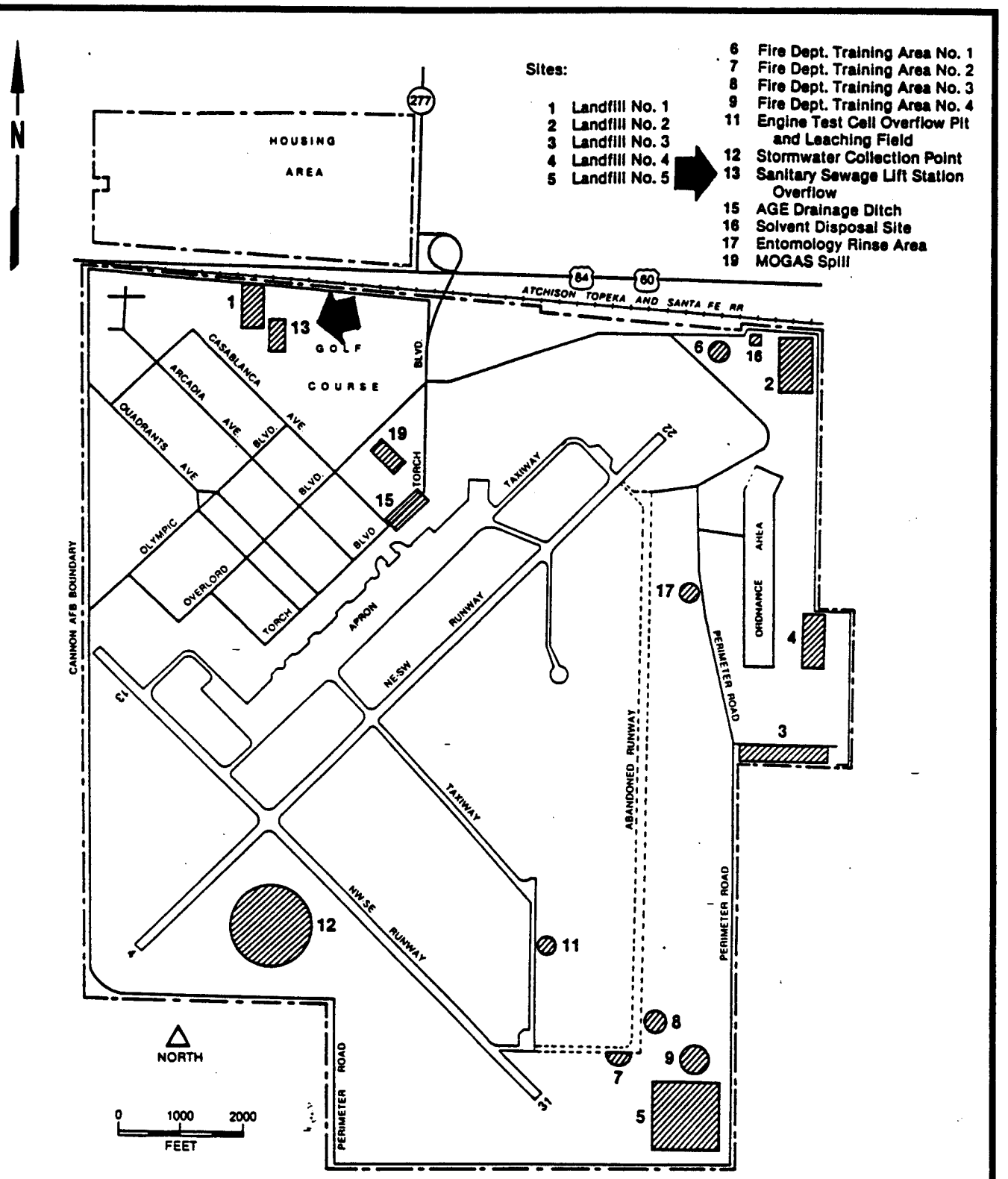

SOURCE: EA Engineering, Science and Technology, Inc., November 1990

HARZA *Consulting Engineers and Scientists*

Figure 1-2

IRP/SWMU SITE LOCATION MAP

SANITARY SEWAGE LIFT STATION OVERFLOW PIT
SWMU No. 75 / IRP No. SD-13
Cannon Air Force Base, New Mexico

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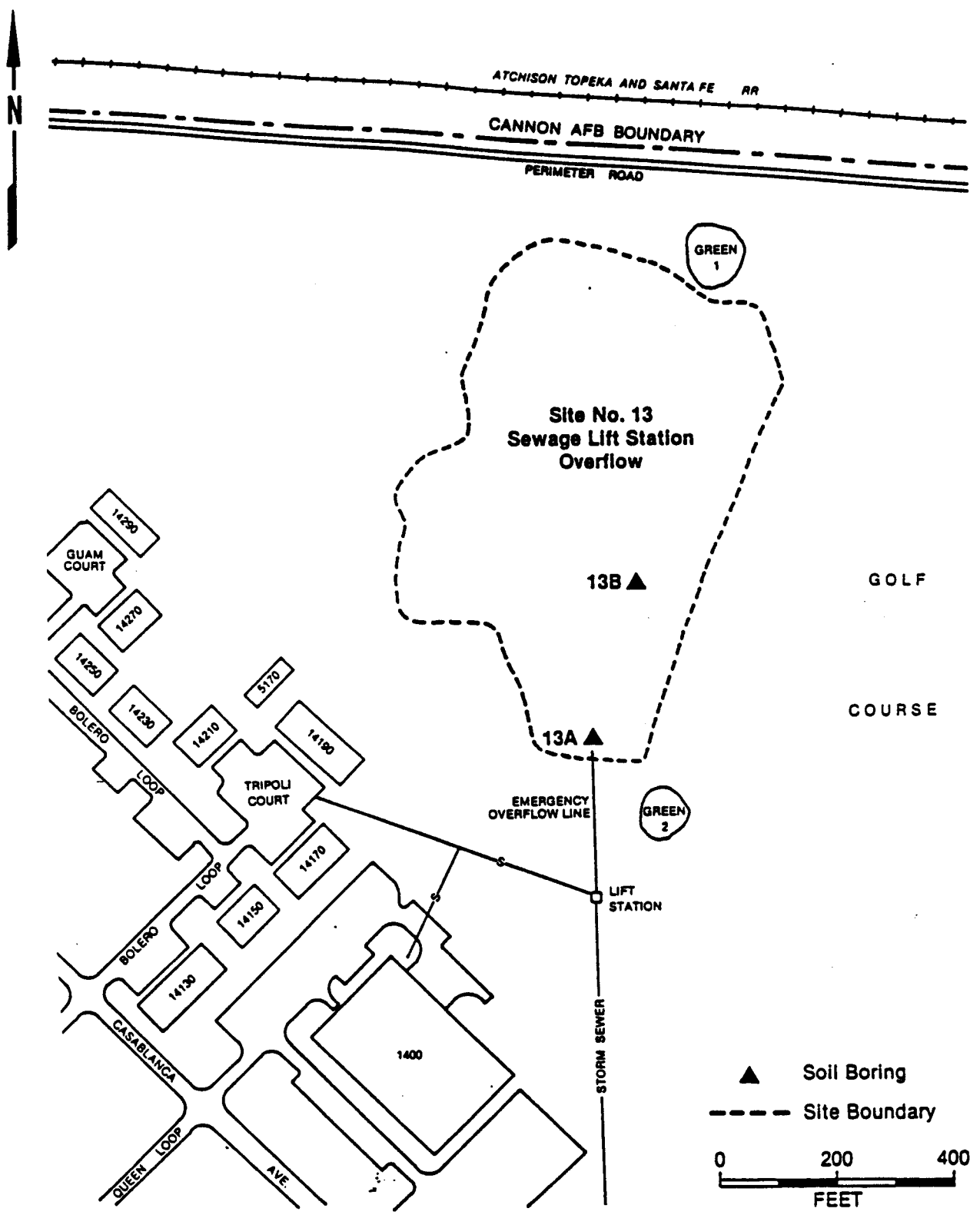

SOURCE: EA Engineering, Science and Technology, Inc., November 1990

HARZA Consulting Engineers and Scientists

Figure 1-3

LOCATION OF SOIL BORINGS

SANITARY SEWAGE LIFT STATION OVERFLOW PIT
SWMU No. 75 / IRP No. SD-13
Cannon Air Force Base, New Mexico

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APPENDICES

APPENDIX A - RESPONSIVENESS SUMMARY

To be completed after public review and comment.

APPENDIX B - ADMINISTRATIVE RECORD INDEX

This Decision Document is based on the results of the IRP Phase I study performed by Radian for Sanitary Sewage Lift Station Overflow Pit (SWMU No. 75) from 1984 to 1986. The remedial investigation of this IRP/SWMU site at Cannon AFB was performed to comply with Cannon AFB's RCRA Part B permit conditions, as well as the DOD IRP. This RI included performance of a risk assessment to analyze the potential impacts to public health and the environment based on results of the field investigation. Additional information concerning the background activities and previous investigation results were obtained from a review of the following documents.

- Installation Restoration Program, Records Search for Cannon Air Force Base, New Mexico. CH_2M Hill. August 1983.

  This report is the first phase of a four part IRP and is designed to identify past potential problems associated with hazardous waste disposal sites.

- Installation Restoration Program Phase II - Confirmation/Quantification Stage I, Volume 1, Final Report for Cannon Air Force Base, New Mexico. Radian Corporation. September 1986. Volumes 2 and 3, Appendix A-M, Draft Report for Cannon AFB, New Mexico. Radian Corporation. June 1985.

  These reports are the second phase of a four part IRP and are designed to determine if environmental contamination has resulted from base activities.

- Landfill 5, Cell 3, Geotechnical Summary Report, U.S. Army Corps of Engineers, Tulsa District, September 1988.

- Installation Restoration Program, Phase IV-A, Site 17 - Entomolgy Rinse Area, Final Remedial Action Plan and Conceptual Documents, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. December 1988a. Installation Restoration Program, Phase IV-A, Site 17 - Entomolgy Rinse Area, Final Environmental Assessment, Cannon Air Force Base, Clovis, New Mexico. Walk, Haydel and Associates, Inc. December, 1988b.

  This report is the final phase of a four part IRP investigation of SD-17.

- Management Action Plan, Cannon Air Force Base, Clovis, New Mexico. W-C 1995.

  This is the Management Action Plan for the IRP program at Cannon AFB.