DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 1606TH AIR BASE WING (MAC)
KIRTLAND AIR FORCE BASE, NEW MEXICO, 87117-5000

9 SEP 1991

Mr Benito Garcia, Chief
Hazardous and Radioactive Waste Bureau
NM Environment Department
PO Box 26110
Santa Fe, NM 87502

Dear Mr Garcia

Attached are copies of the closure plans for the base sewage lagoons, golf course, and golf course pond required by the 29 July 1991 Compliance Order. Also attached is a copy of the Base-wide Closure Plan.

If you have any questions, please contact Mr John Gould at 846-2773.

Sincerely

Thomas A. Norris

THOMAS A. NORRIS, Colonel, USAF
Director
Environmental Management Division

4 Atch
Base-wide Closure Plan
Sewage Lagoon Closure Plan
Golf Course Main Pond
Closure Plan
Golf Course Closure Plan

BASE-WIDE CLOSURE PLAN FOR UNITS REQUIRING CLOSURE AT KIRTLAND AIR FORCE BASE ALBUQUERQUE, NEW MEXICO

September 10, 1991

Prepared for:

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SECTION 1.0

1.0 EXECUTIVE SUMMARY

Kirtland Air Force Base (KAFB) hereby submits a Base-Wide Closure Plan (BWCP). The document is written in response to the New Mexico Environment Division's (NMED) Notice of Violation of June 13, 1991. This plan has been prepared in accordance with the April 1987 EPA Guidance Manual on Hazardous Waste Land Treatment Closure/Post Closure and 40 CFR 265 Subpart G. This plan is an updated version of the November 30, 1990 Closure Plan submittal containing comments from the N.O.V.

This document includes the Closure and Post Closure Core Plan and preliminary information for waste management units located at KAFB. The waste management units consist of sites that require closure because they may have received hazardous wastes from operations on KAFB. A list of units that require closure plan design is included in section 4 of this plan.

The purpose of this document is to serve as a baseline closure plan for all KAFB units currently requiring closure and any additional units that currently do not require closure but may require closure in the future. It contains general information that pertains to all the specific units that will be addressed in separate supplements. The closure details for specific units will be addressed in separate documents referred to as supplements to the BWCP. This BWCP, as well as reference documents and supplements, addresses the specific requirements of 40 CFR Part 265 Subpart G set forth in the State of New Mexico Hazardous Waste Management Regulations (HWMR-5).

KAFB proposes to close the individual units using one of the six conceptual designs presented in this report. Once data is obtained from the site characterization phase, which involves a sampling and testing program, one of the six designs described in section 6.0 will be adopted for closure.

The supplements contain site specific information and are written with the understanding that the reader is familiar with the BWCP. It is intended that the reader will use the BWCP and other referenced documents for general information and clarification while reviewing the supplements. The BWCP and supplements are parallel documents; they both discuss the same topics accordingly, under the same section numbers and headings. Section 2.0 describes the waste management unit location, land use and population distribution. Section 3 describes the physical and hydrogeological conditions at the site and the ground-water monitoring system. Sections 4.0 and 5.0 describe the waste disposal practices at the waste management sites and the results of sampling and contamination investigations. Section 6.0 details the closure design and risk assessment process. Section 7.0 addresses the volume of material and various specific regulatory requirements related to closure, and section 8.0 describes the post closure care plan. Analytical results are presented in summary form in appendix A. Details of the closure design and, the list of contaminants of concern appear in the unit supplements in appendix B and C, respectively.

The 1989 Installation Restoration Program (IRP) Stage 2 work plan written by the USGS has also been provided to NMED. This document will be used for site characterization activity and serve as a guide for the site-specific work plans. This document is included by reference as appendix D.

Quality control procedures are governed by the September 1989 Sampling and Analysis Plan (SAP) written by the United States Geological Survey (USGS), which has been sent separately to NMED. Portions of this document appear in appendix E. The USGS is currently developing the sampling and analysis program (SAP) needed for the Installation Restoration Program (IRP) that addresses specific sampling activity at each unit. This document has been submitted to NMED under separate cover, and is referenced in appendix E.

The sampling and analysis program is designed to identify the presence of contaminants that appear on the Reference Chemical List from 40 CFR Part 264 Appendix IX, a copy of this list is included in Appendix F. Site health and safety plans that apply to closure activities will be specific for each site. These unit-specific plans will be developed from the guidelines in appendix G.

SECTION 2.0

2.0 SITE DESCRIPTION

2.1 Location and Site History

Kirtland Air Force Base is located in central New Mexico southeast of and contiguous to the city of Albuquerque (figures 2-1 and 2-2). KAFB is owned and operated by the United States Air Force; it encompasses over 82,000 acres and contains 742 buildings totaling 5.6 million square feet of floor space. Present land uses for areas adjacent to the base are as follows:

- North – residential and retail areas
- East – mountainous rural area, national forest lands
- South – Isleta Indian reservation lands and uninhabited areas
- West – residential and business areas, Albuquerque International Airport, and undeveloped land owned by University of New Mexico.

The most prominent physiographic features of this area are the Rio Grande Valley to the west and the Sandia-Manzano Mountains to the east. A Kirtland Air Force Base General Topographic Map is provided for reference (figure 2-3).

Three areas within the base are operated by the Department of Energy (DOE) and are not under the control of the Air Force. Facilities in these areas (DOE Areas I, II, and III) are operated and maintained by Sandia National Laboratories (SNL), a research and development contractor for the DOE, and have been included in the IRP Phase I study. Because of the classified nature of the research activities performed by the DOE and SNL, details of waste generation are less comprehensive than those for other sections of the base operated by the Air Force. SNL is responsible for its own hazardous waste management and disposal program. Waste disposal sites operated by the DOE and SNL and waste management practices conducted by these organizations are not discussed in this report. The disposal sites that are not operated by the Air Force are listed separately in the 1985 IRP Phase II Program Report.

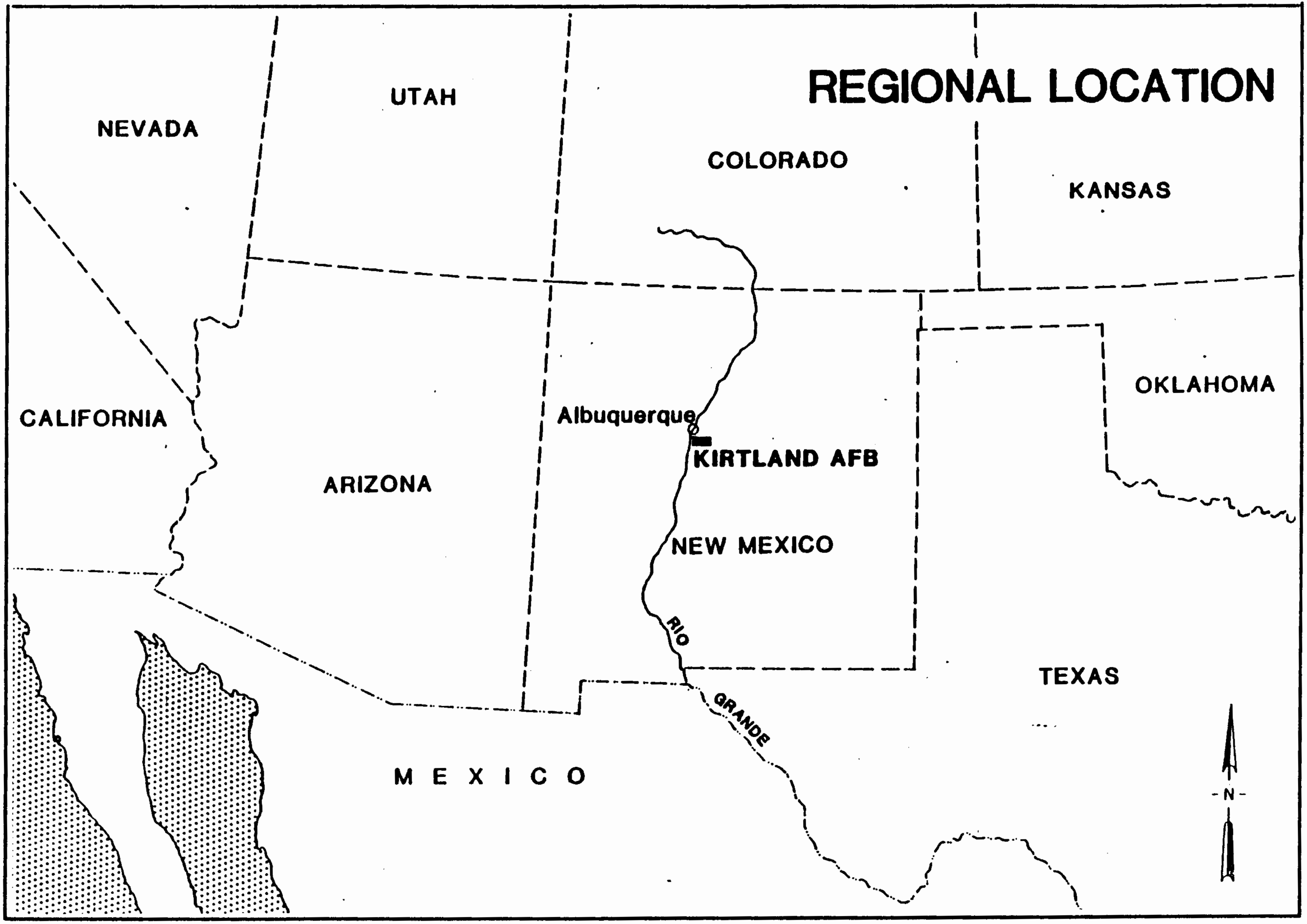


FIGURE 2-1
REGIONAL MAP

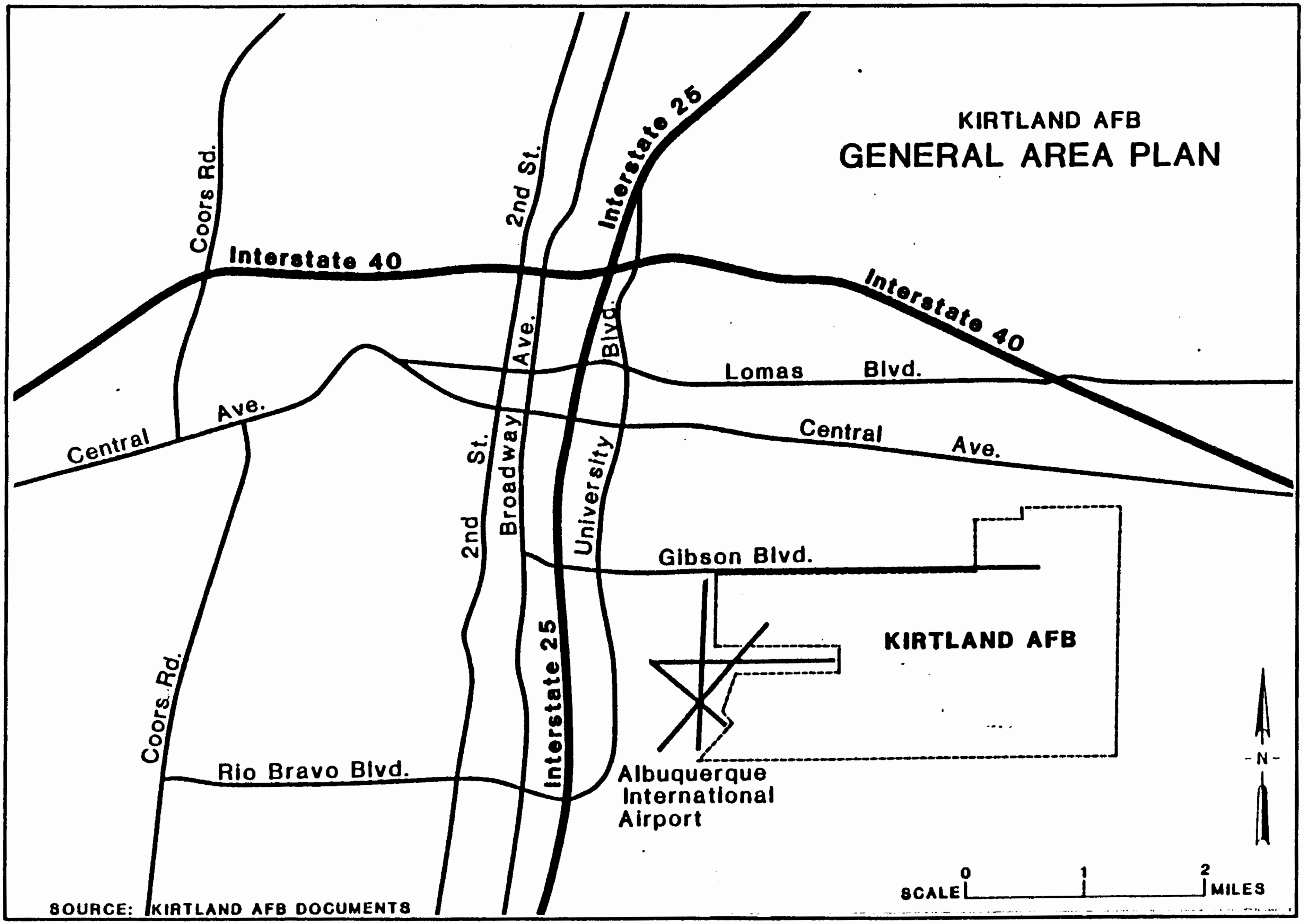
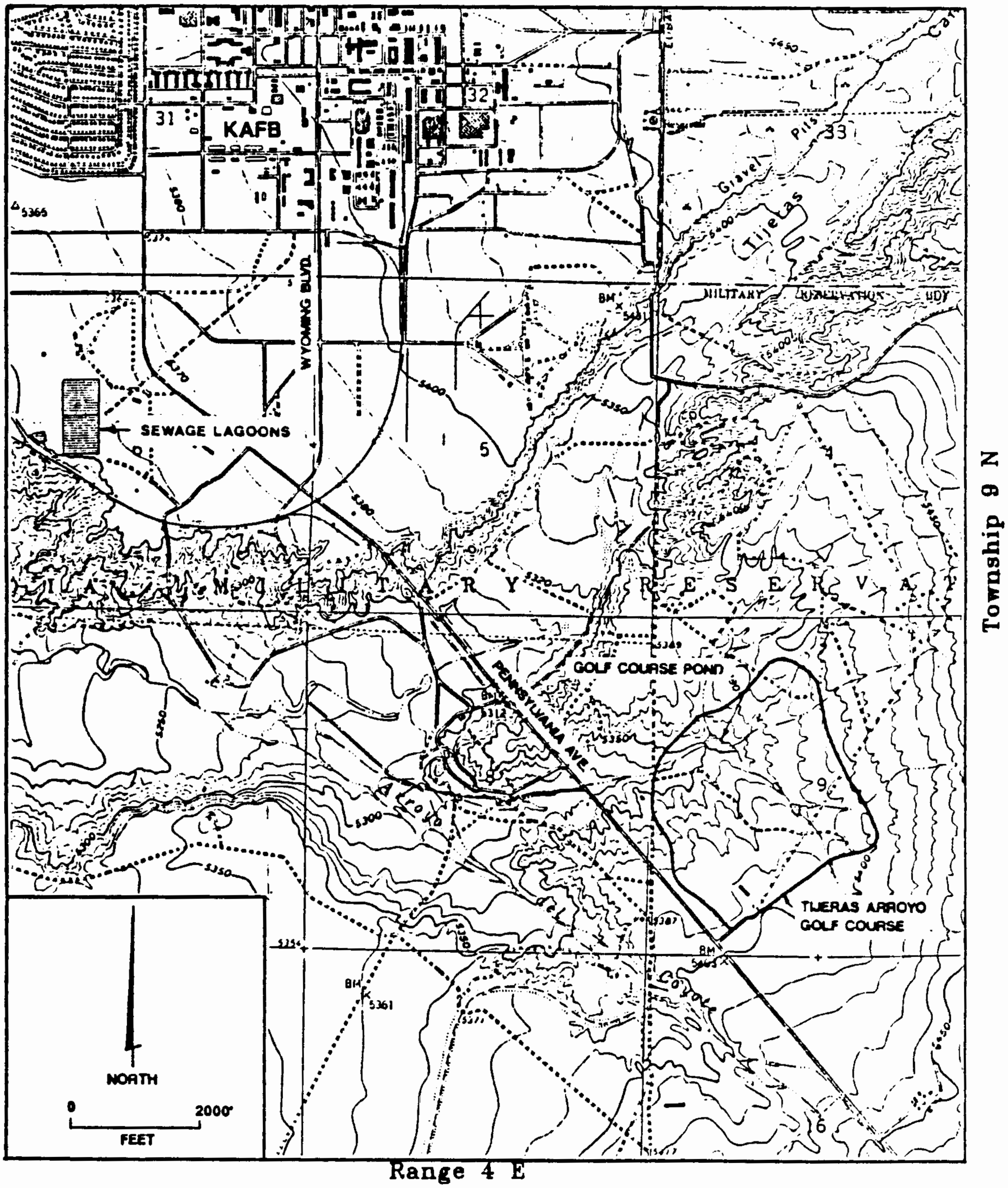


FIGURE 2-2

GENERAL LOCATION MAP OF KIRTLAND AIR FORCE BASE

Figure 2-3

Site Topography Map



Construction of Albuquerque Army Air Base began in January 1941, almost a year before the United States entered World War II. The name of the base was changed to Kirtland Field in 1942. Four squadrons from the 19th Bombardier Group were assigned to the base and a Combat Crew Training School and the Air Force's Advanced Flying School were housed there. Other facilities on the base during this period included buildings for the training of aviation mechanics, maintenance facilities for the bombardier air depot, a convalescent center, and buildings housing a support division for the Manhattan Project.

Sandia Corporation (now Sandia National Laboratories) was located on Oxnard Field, which subsequently became Sandia Base and which is now known as Kirtland AFB East. Its primary mission was the development of nuclear weapons, a research directive that was continued after the war ended.

Manzano Base was constructed in 1947 as an annex to Sandia Base. The area has been used primarily for storage of aerospace resources.

In 1948, Kirtland Field became Kirtland Air Force Base, and in 1971, Sandia Base, Manzano Base, and Kirtland Air Force Base merged and became known as Kirtland Air Force Base. The base has essentially evolved into a research, development, and training center hosting various military organizations.

A more detailed description of Kirtland Air Force Base history is presented in the 1981 IRP Phase I Records Search Report.

The basic missions of Kirtland Air Force Base are to support Department of Defense (DoD) research and development programs and to train pararescue medics. KAFB provides technical facilities, procurement, and logistical support for over 100 tenant organizations. It also maintains aircraft and pilot facilities, including ramp space, taxiways and aircraft barrier systems for the training of pilots.

The support function for the base is performed by the 1606th Air Base Wing, which controls all the administrative, security, maintenance, housekeeping, pay, medical care, housing, fire protection, legal assistance, law enforcement, environmental, and logistical support for the base. The 1606th Air Base Wing was established July 1, 1977.

2.2 Surrounding Land Use – General

All units at the base are located on land owned by the Federal Government. Some land areas within the outer perimeter of the KAFB are operated by DOE. Beyond the base boundaries to the north are the Veterans Administration and Air Force Medical Center and a recreational park operated by the city of Albuquerque. Other properties to the north of the base are privately owned and consist of both commercial enterprises and private residences. Within the east boundary of the base are Sandia National Laboratories and the Manzano Mountains further to the east. Vacant land owned by KAFB and technical areas in use by both Kirtland and Sandia lie between the main base area and the southern base boundary. The Lovelace Inhalation Toxicology Institute is located near the south base boundary. Vacant land owned by the Isleta Indian Reservation borders the entire south side of the base. To the west of the site is the Albuquerque International Airport and undeveloped land owned by the University of New Mexico.

2.3 Population Distribution and Exposure

The KAFB complex is located in the southeast quadrant of the city of Albuquerque. Located within the perimeter of the base are a variety of Air Force and other DoD facilities. An estimated 16,660 people are employed at KAFB; this number varies constantly due to changes of personnel on temporary assignment and transfers of military personnel. As of January 1988, the population of the adjacent city of Albuquerque and nearby areas was approximately 500,000 (City of Albuquerque, 1990).

Kirtland AFB is a military installation which limits public access to its facilities. Those areas with known hazardous materials have further security controls and only those workers who must conduct operations at the facility are permitted access. This minimizes the potential for exposing casual workers and the general public to hazardous materials and closure activities.

Site-specific information on the potential to be exposed to hazardous wastes is discussed in the corresponding section of the supplemental closure plan for each closure unit.

SECTION 3.0

3.0 PHYSICAL ENVIRONMENT

3.1 Climate and Meteorology

The KAFB site is located west of the foothills of the Sandia and Manzano Mountains on a high, arid plateau that slopes gently westward toward the Rio Grande. The climate is characterized as arid continental (U.S. Army Corps of Engineers, 1979). Abundant sunshine, low humidity and precipitation, and a broad seasonal range of temperatures typify climatic conditions at the site. The following sections provide information concerning local climatology for the years 1978 to the present (NOAA, 1988).

3.1.1 Temperature

Based on climatological data for Albuquerque from the National Weather Bureau, average annual temperatures range from a high of 81.7 °F to a low of 31.7 °F (NOAA, 1988). Average daily temperatures commonly range from a high of 91 °F to a low of 50 °F during the summer months and a high of 60 °F to a low of 24 °F during the winter.

3.1.2 Precipitation

Average annual precipitation is 8.4 inches at the Albuquerque International Airport (U.S. Soil Conservation Service 1972), most of which occurs during the months of July and August. The summer rains are normally related to local convective activity, and thunderstorms, often intense, build up during the afternoon hours. The average annual snowfall is 10 inches at the Albuquerque International Airport.

The average monthly precipitation in the Albuquerque area ranges from less than 1 inch during November through March to more than 1.25 inches in July and August. The winter months are typically dry with monthly snowfalls seldom exceeding 3 inches. Snow rarely lasts longer than 24 hours in the non-mountainous areas of the city. Typically, the summer months receive almost half of the annual moisture in the form of brief but locally heavy thunderstorms. Prolonged periods of continuous precipitation are rare. Storms generating tornados are rare (NOAA, 1988).

3.1.3 Evapotranspiration

Evapotranspiration is the loss of water from a land area through transpiration of plants and evaporation from the soil. Transpiration is the process by which water is absorbed by plants and is evaporated into the atmosphere from the plant surface. The low annual rainfall and high average temperatures create an environment exhibiting low humidities and high evaporation rates. Relative humidity varies as much as 40% on a daily basis in Albuquerque. Highs in humidity range from 80% to 40%, lows range from 40% to 15%, with an average annual range in humidity of 65% to 30% (NOAA, 1988). Gross annual pond evaporation is approximately 65 inches, which is 6 to 7 times greater than annual precipitation. Actual evapotranspiration has been determined to be about 95% of precipitation in this climatic regime, and the remaining 5% is divided equally between runoff and recharge (U.S. Army Corps of Engineers, 1979).

3.1.4 Winds

Winds in the Albuquerque area are generally light to moderate. Average wind speeds range from 7 to 12 mph, with maximum gusts averaging 40 mph. The prevailing wind direction from May through October is from the south or southeast, and the mean wind speed is 7 to 12 mph. From November through April, the prevailing wind direction is from the north or north-northwest and the mean wind speed is 6 to 12 mph. Occasionally, strong storms from the east cause high winds to flow westward from Tijeras Canyon into the eastern side of the city of Albuquerque. These winds average 40 mph but have been known to gust to 50 mph.

3.2 Geology and Soils

3.2.1 Regional Geology

The KAFB site is located within the Albuquerque Basin of the Rio Grande Rift, a major structural trough of Neogene age that extends from southern Colorado to south-central New Mexico. The rift formed in the last 30 million years as an en-echelon series of elongate, north-trending structural basins that contain up to 17,000 feet of sedimentary and volcanic deposits.

Rocks exposed in the Albuquerque Basin area range in age from Precambrian to Holocene. Outcrops of pre-basin Precambrian, Paleozoic, and Mesozoic rocks are almost entirely confined to the Sandia and Manzano Mountains that form the bordering structural rims of the basin. Upper Cenozoic volcanics of primarily basaltic composition occur in the basin along with contemporaneous basin fill (Kelley, 1977).

A series of coalescing alluvial fans extend along the base of the eastern uplifts that bound the basin from Las Piños to the Sandia Mountains. The KAFB site is located on a broad alluvial fan that was formed from the weathering and erosion of rocks in the Sandia and Manzano Mountains to the east.

3.2.2 Geology and Soils of Kirtland Air Force Base

The KAFB site lies on the upper surface of an alluvial fan and other deposits associated with the Tijeras Arroyo drainage system. These earth materials consist of sand, gravels, and clays deposited by paleodrainages transporting sediments from the eroding Sandia and Manzano Mountains. Thick channel deposits of sand and gravel are inter-bedded with thinner strata of clays and silts deposited in over-bank and other low-energy environments.

Several soil types are present at the KAFB site. The Latene Series consists of deep, well-drained sandy loam that forms in old alluvium and mixed eolian sediments. Permeability is moderate, ranging from 0.6 to 2.0 inches per hour (U.S. Soil Conservation Service, 1977). Runoff, water erosion, and soil blowing hazards are moderate.

Wink Series soils consist of Wink fine sandy loam and the Wink-Embudo complex. Wink Series soils are deep, well drained soils that form on pediment surfaces in old unconsolidated alluvium modified by wind. Permeabilities range from 2.0 to 6.0 inches per hour (U.S. Soil Conservation Service, 1977). Runoff is medium in the Wink fine sandy loam; water erosion is slight to moderate; and hazard of soil blowing is moderate. Potential for flooding and poor compaction exists in soils of the Wink-Embudo complex.

3.2.3 Site Geology and Soils

Individual site geology and soil conditions for each solid waste management unit are contained in the corresponding section number in the supplement.

3.3 Hydrogeology

3.3.1 Regional Hydrogeology

The principal ground-water unit underlying the Albuquerque area consists of a thick, extensive water-table aquifer hosted by the unconsolidated sediments of the Santa Fe Group (Tertiary) and younger alluvial and colluvial deposits. These deposits lie in the Albuquerque Basin, a deep structural depression that is part of the Tertiary Rio Grande rift. The Albuquerque Basin fill is known to be at least 10,000 feet deep (Kelley, 1977). The lithology of the Santa Fe Group generally changes from coarse sand-and-gravel alluvial fan deposits near the mountain front on the east to finer, more clay-rich units in the axial valley of the Rio Grande.

On a regional scale, the potentiometric surface of the aquifer slopes eastward and westward from the Rio Grande and southerly along the valley. Because the topographic slope rises from the river and the water table drops, the aquifer's upper surface becomes progressively deeper to the east and west away from the river. This regional configuration is complicated by cones of depression formed by withdrawals from Air Force and city of Albuquerque wells.

The water table lies within a few feet of the land's surface in the valley near the river, but is several hundred feet below the surface in the eastern part of Albuquerque.

The aquifer is recharged from three major sources. Infiltration from the Rio Grande and subsurface flow along the rift from the north provide the majority of the recharge. Additional recharge is provided by infiltration of runoff from the western front of the Sandia Mountains. Discharge is primarily by withdrawals from city wells, southerly subsurface flow, and regional evapotranspiration. Records indicate that the water table under Albuquerque/KAFB is dropping at the rate of several feet per year as the result of these withdrawals.

Much of the aquifer underlying Albuquerque is composed of sand and gravel deposits and exhibits transmissivities ranging from 7,500 to 600,000 gallons per day per foot (Bjorkland and Maxwell, 1971). By volume, the majority of water rights in the Albuquerque area are owned by the city of Albuquerque, which withdraws several hundred thousand acre-feet per year from the aquifer (United States Army Corps of Engineers, 1979).

3.3.2 Hydrogeology of Kirtland Air Force Base

The discussion of site hydrogeology presented in this section is based on data obtained during the installation of monitor wells adjacent to the various sites discussed in the closure plans. The USGS (1989) has prepared a report containing geologic and geophysical logs, detailed cross-sections, and well construction details. This report has been previously submitted to NMED. Additional information is contained in Installation Restoration Program (IRP) reports Phase I (1981) and Phase II (1985). The IRP documents are supporting documents to this report and provide greater detail.

At Kirtland Air Force Base, ground water lies at a depth of approximately 475 feet below the surface, or at an elevation of approximately 4,880 feet. Water level data indicate that a northerly ground-water gradient exists at the site, but some local variations are evident. The ground-water gradient is influenced by the pumping of the Kirtland AFB wells in the vicinity and the city of Albuquerque water supply wells to the north and northwest of the site. The gradient varies across the site. The aquifer is hosted by sand and gravel deposits. Additional data on the hydrogeologic environmental restoration conditions at KAFB are being developed by USGS as part of KAFB's Installation Restoration program. This information will be provided when it becomes available from the USGS.

3.3.3 Site Hydrogeology

Specific hydrogeology at each site is contained in the individual site supplements to this Base-Wide Closure Plan.

SECTION 4.0

4.0 HAZARDOUS WASTE MANAGEMENT UNITS

A number of hazardous waste management units exist within the boundaries of Kirtland Air Force Base. This BWCP contains general information applicable to all units. When additional specific unit closure plans are required, they will be developed as supplements to this base-wide plan as agreed upon between KAFB and NMED. KAFB anticipates a number of supplements will be written in the future. Each supplement will include a description of the size and type of unit being considered for closure. Other information concerning waste characteristics and management practices specific to the unit under study can be found in the corresponding section of the Unit Closure Plan Supplement documents.

4.1 Sizes and Types of Candidate Units

The specific unit closure plan supplements contain information on each of these hazardous waste management units.

4.2 Waste Characteristics

Waste characteristics specific to each candidate unit are discussed in the corresponding section of the unit supplement plans. Waste characterization was conducted according to accepted procedures as specified in 40 CFR 261, 265 and 267 as appropriate.

4.3 Waste Management Practices

A broad spectrum of waste management systems are practiced at Kirtland AFB. Because of the aircraft operation and maintenance activity being conducted, typical waste streams include petroleum, oils and lubricants; organic solvents from maintenance and cleaning operations, and acids from battery shops. Because of the wide variety of research and laboratory activities, potential waste streams can include laboratory chemicals, chemical laser fuels, and exotic "one-of-a-kind" chemicals from research projects. Waste management practices specific to each solid waste management unit will be detailed in the unit supplement.

SECTION 5.0

5.0 DOCUMENTED RELEASES

5.1 Release History

Release history is specific to the individual units for all sites regulated under RCRA and will be described in corresponding section of the Unit Closure Plan Supplements.

5.2 Work Plan and Sampling Program

Specific work plans will be prepared for each candidate site. The work plan will contain objectives of the entire project site under study. An integral part of the work plan is the sampling program. When releases are suspected, a sampling program will be designed to determine the impact of the releases. The sampling program is the portion of the work plan designed to define the level and extent of contamination. These sampling programs will be specifically developed for each unit. The general objectives of a work plan and sampling program is described in the following sections.

5.2.1 General Objectives

To determine the nature and extent of potential contamination, a work plan and sampling program for each unit regulated under RCRA, will be developed and described in each of the unit supplement plans. Samples collected from the units will be submitted to an "EPA-approved" laboratory for chemical analyses. The work plan, sampling program, analyses and testing programs will be designed in order to accomplish the following:

- Define waste characteristics of sludges and near-surface soils
- Evaluate the lateral and vertical extent of vadose zone contamination in the vicinity of each unit
- Evaluate the levels of contaminants that may exist in the soil
- Evaluate the nature of hazardous constituents
- Evaluate the possibility of other undocumented waste disposal

- Evaluate the possibility of contaminants affecting ground water
- Evaluate the possibility of contaminants affecting surface water

5.2.2 Sampling Procedures

In general the sampling procedures at the individual sites will follow the guidelines detailed in the Sampling Analysis Plan or SAP. This document will be the governing procedures manual for sampling, sample handling, laboratory procedures, data handling and quality assurance.

The complete SAP has been provided to NMED under separate cover. For reference, certain parts of this document have been reproduced and included as part of this Base-Wide Closure Plan, in appendix E. This SAP is designed to meet the requirements of the Qualit-y Assurance program detailed in: Test Methods for Evaluating Solid Wastes, EPA guidance document (SW 846), Chapter I. Sampling and analysis procedures will be in accordance with 40 CFR 261 and 265 in addition to guidelines in SW-846.

Sample sizes, containers, preservatives, and analytical methods will be determined by the testing laboratory. A summary of test methods used to analyze these samples is shown in table 5-1. Proposed container types and preservatives are listed in table 5-2 and 5-3.

The Work plan is a separate document from the sampling plan. The IRP Stage 2 work plan details the planned approach and location of contamination assessments at various sites. This document has been sent under separate cover to NMED. and is included only be reference as appendix D. Portions of the work plan are summarized in the unit closure plans. The Sampling and Analysis Plan (SAP) has been developed for the IRP by USGS and addresses specific sampling activity at each unit. Portions of this document, are copied and included in appendix E.

5.2.3 Sampling of Sludges

Sludges will be sampled according to the Installation Restoration Program (IRP), Sampling and Analysis Plan for IRP by USGS and the Stage 2 Work Plan referenced in appendix E. Stratified random sampling techniques will be used and composite samples will be tested in accordance with 40 CFR 261 and Test Methods for Evaluating Solid Waste Physical/ Chemical Methods (SW846), specifically Part III, Chapter 9. Unit sampling and test results will be presented in appendix A of the specific unit supplements, which is reserved for each supplement, and are not included as a part of this plan.

Table 5-1

Summary Of Test Methods

Solid/Wastes

EPA 8240	Volatile Organics
EPA 8270	Semivolatile Extractable Organics
EPA 8010	Halogenated Volatile Organics
EPA 8020	Aromatic Volatile Organics
EPA 8040	Phenols
EPA 8080	Organchlorine Pesticides & PCBs
EPA 8100 or EPA 8310	Polynuclear Aromatic Hydrocarbons
EPA 8120	Chlorinated Hydrocarbons
EPA 6010	Metals: Cd, Cr, Pb, Mn, Ba Si, Fe, Al, Sb, Be, Co, Cu, Mo, Ni, Ag, Tl, V, Zn
EPA 7060	Arsenic
EPA 7740	Selenium
EPA 7471	Mercury
EPA 7421	Lead
EPA 3237	Organic Lead
EPA 9070/9071	Oil and Grease
SM 209F	% Solids
EPA 9045	pH
EPA 1010	Flashpoint
EPA Reactivity	Cyanide/Sulfide
EPA 340.1/340.2	Fluoride
EPA 680	PCBs
EPA 8120 (modified)	Chlorinated Hydrocarbons

Water Samples

EPA 8240* EPA 624	Volatile Organics
EPA 8270* EPA 625	Semivolatile Extractable Organics
EPA 8280* EPA 613	Polychlorinated dibenzo-dioxins (PCDD), polychlorinated dibenzo-furans PCDF
EPA 8010 EPA 602	Halogenated Volatile Organics
EPA 8040 EPA 604	Phenols
EPA 8080* EPA 608	Organochlorine pesticides and PCBs
EPA 450.1	Total Organic Halogens
EPA 9040 EPA 150.1	pH
EPA 9050 EPA 120.1	Conductance
EPA 410.1	Chemical Oxygen Demand
EPA 413.2	Oil and Grease
EPA 160.1	Total Dissolved Solids
EPA 310.1	Alkalinity

Table 5-1 (cont'd)

Summary Of Test Methods

Solid/Wastes		Water Samples
EPA 8140*	Organophosphate pesticides	
EPA 8150*	Chlorinated herbicides	
EPA 8310	Polynuclear Aromatic Hydrocarbons	
EPA 6010* EPA 200.7	Metals	
EPA 7060* EPA 206.2	Arsenic	
EPA 7740* EPA 270.2	Selenium	
EPA 7470* EPA 245.1	Mercury	
EPA 7421 EPA 239.2	Lead	
EPA 7196	Chromium (VI)	
ASTM 3237 EPA 9030* EPA 376.1	Organic Lead Sulfide	
EPA 9012* EPA 353.3	Cyanide (CN)	
EPA 340.2	Fluoride	
EPA 300.0	Chloride, Nitrate, Sulfate	
EPA 353.1	Nitrate/Nitrite	
EPA 9066 EPA 420.2	Total Phenolics	
EPA 415.1	Total Organic Carbon	
EPA 418.1	Petroleum Hydrocarbons	

Table 5-2

Summary of Sampling Parameters, Containers, Preservatives and Analysis Methods for Water Samples

Parameter	Container	Preservative	EPA Method
Volatile Organic Compounds	(2) 40 ml VOA Vials	1,4	601/602
EP TOX-Metals	(1) 500 ml plastic bottle	2,4	ICP/AA
pH	(1) 500 ml plastic bottle	4	9040

Table 5-3

Sampling Parameters, Containers, Preservatives and Analysis Methods for Soil Samples

Parameter	Container	Preservative	EPA Method
Volatile Organic Compounds	(1) 250 ml jar	4	8010/8020
Metals	(1) 500 ml glass jar	4	6010
pH	(1) 500 ml glass jar	4	9045
pH	(1) 150 ml plastic jar	–	–

field determined

1 Add HC1 until pH <2

2 Add HNO^3 until pH<2

4 Refrigerate to 4 °C

5.2.4 Sampling of Surface and Subsurface Soils

Specific locations and sampling of test holes at each site and the location of monitoring wells are specific to the units. This information is detailed in the unit closure plans.

In general, boreholes will be identified, drilled, and sampled to establish the depth of contaminant migration, if any, in each unit. Samples from boreholes will be collected using a hollow stem auger rig equipped with a continuous core sampling device. Prior to the sampling and boring program at each hole, all equipment will be thoroughly steam cleaned to prevent cross contamination.

As appropriate, near surface soil samples may be taken with a hand auger or hammer driven sampler. Prior to the sampling and boring program at each hole, all equipment will be thoroughly steam cleaned to prevent cross contamination.

5.2.5 Sampling of Background Soil Conditions

If data on background soil conditions are necessary, one borehole near each unit will be identified, drilled and sampled to establish a baseline for the contaminants of concern listed in appendix C and the chemicals listed in appendix F. Background levels that contain natural contamination will be individually evaluated with NMED.

5.2.6 Sampling of Vadose Zone

If contamination is known or suspected to exist in soils at the unit, a vadose zone investigation will be conducted to determine the lateral and vertical extent of contamination. Data collected during an investigation will be used to determine if the potential for ground-water contamination exists.

5.2.7 Sampling of Ground Water

Ground-water wells, when required, will be installed and sampled to determine if contaminant migration has affected ground-water conditions under each unit. Rather than locate wells inside the units, and possibly establishing an annulus for contaminant migration, the wells will be established outside the perimeter of the units. This will help to prevent potential avenues of downward contaminant migration. Kirtland will establish ground-water monitoring systems and plans in accordance with 40 CFR 265.90-265.93.

5.2.8 Results

When sampling of sludge and soil has been accomplished, the laboratory results will be included in appendix A in the supplemental closure plans. The complete sampling and analysis results will be submitted when available from the laboratory along with any evaluation about the significance of these results.

5.3 Analytical Results and Priority Testing

Initial sampling and testing will address the contaminants of concern listed in appendix C of each supplement. These contaminants will be identified during initial investigatory activity. If contaminants of concern are identified in surface sludges, they will be used as indicating parameters for tracking contaminant migration in near surface and deep vadose zone soil samples. Indicator parameters will also be used to test possible migration in ground water.

Following testing and the removal of contaminants of concern, KAFB will test additional soil samples to show that any 40 CFR Part 261 appendix IX (listed in appendix F) constituents that may remain in the unit are at the same or at lower levels than established background conditions. Those contaminants that will be allowed to remain will be below levels posing a threat to human health and the environment based on calculations that establish allowable task assessment levels. Application will then be made for clean closure status after this analysis is complete. The decision tree diagram contained in section 6 outlines the procedures for appropriate testing sequences that result.

5.4 Quality Assurance/Quality Control

To assure complete and correct results, the analytical laboratory will perform quality assurance/quality control (QA/QC) analyses of blanks and duplicates for all analytes and/or methods. The QA/QC data and guidelines are provided in the Quality Assurance Project Plan for Kirtland AFB prepared by USGS on February 15, 1989. QA/QC program for sampling conforms to SW 846 guidelines. These procedures are detailed in the SAP and portions have been included in appendix E for easy reference.

5.4.1 Lab Standards and Acceptable Surrogate Recoveries

This is specific to each unit and is contained in the supplement plans.

5.4.2 Surrogate Recovery Report

This is specific to each unit and is contained in the supplement plans.

5.5 Discussion of EPTOX versus TCLP Testing

Included in the supplements when necessary.

SECTION 6.0

6.0 CLOSURE DESIGN

6.1 Closure Goals

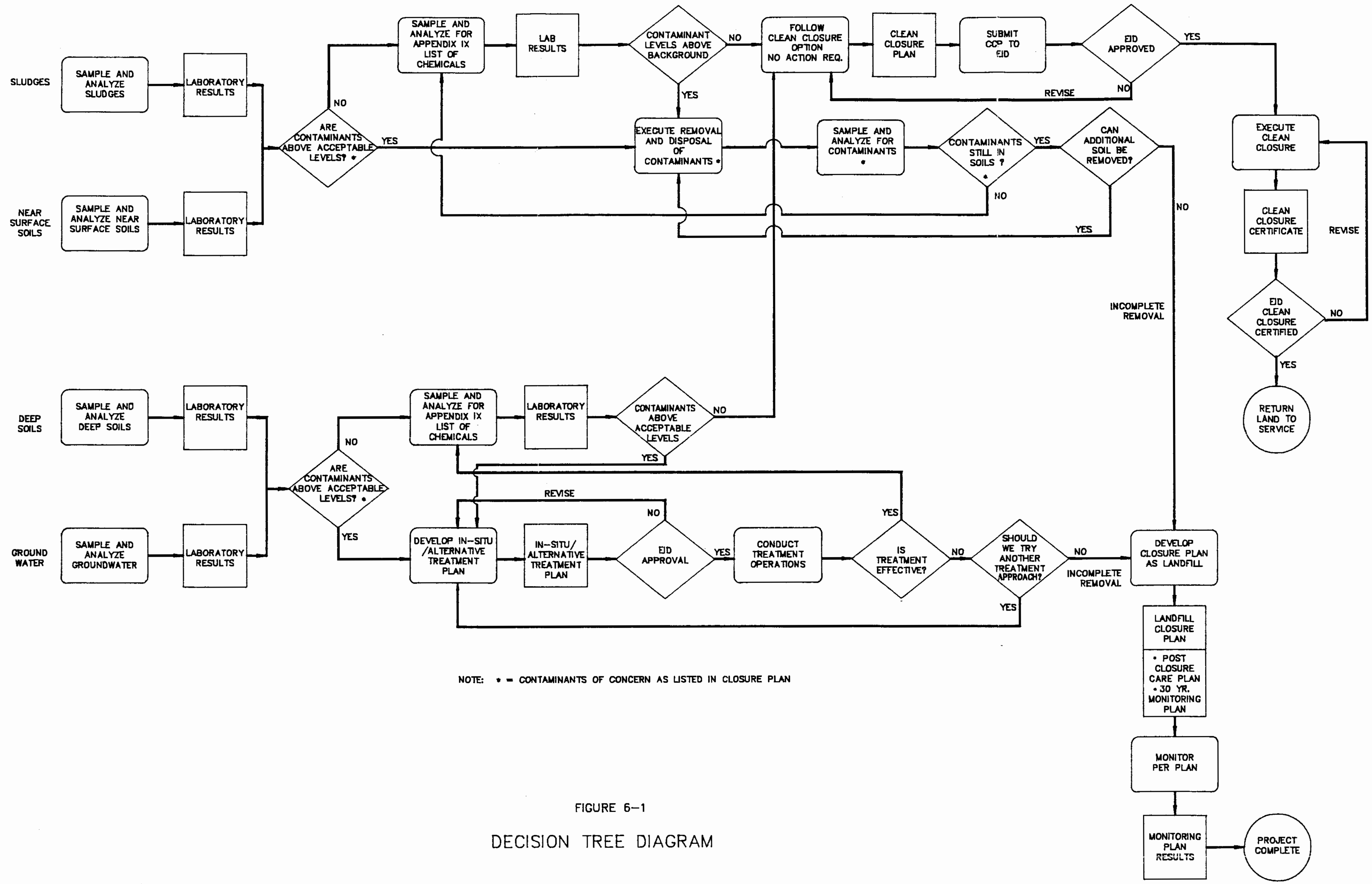
Closure design will be based upon a standard that minimizes the need for further maintenance and minimizes or eliminates post-closure escape of hazardous waste, hazardous constituents leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.

Many of the solid waste management units may have inadvertently received hazardous waste as a result of past uncontrolled discharges. At some sites, the hazardous waste may have been actively treated by the receiving unit or the waste may have degraded or volatilized. Site assessments at each of these units may correctly find that hazardous wastes of concern are no longer present in the unit. Some of the units may be regulated under HSWA not RCRA. HSWA require corrective action, whereas RCRA requires closure plans. For these sites, a no-action alternative will be recommended. This alternative is presented in section 6.2.

Where hazardous waste or hazardous waste constituents are detected within the unit, one of the other five alternatives listed in section 6.2 will be recommended in a supplemental closure plan.

6.2 Closure Alternatives

The Decision Tree Diagram, figure 6-1, indicates the effect that contamination presence and migration will have on the type of closure alternative used. There are currently six alternatives that would satisfy closure criteria. Depending upon whether or not contaminants exist, one of the following general alternatives can be used for closure of the units:



NOTE: * = CONTAMINANTS OF CONCERN AS LISTED IN CLOSURE PLAN

FIGURE 6-1

DECISION TREE DIAGRAM

1. Clean Closure/No Contamination/No Action

Condition: Hazardous constituents do not exist in sludges, surface and subsurface soils, or ground water. Clean closure can be achieved by no action. The unit can be put into service or closed and abandoned.

2. Clean Closure by Removal of Materials for Off-site Disposal

Condition: Hazardous constituents exist in the unit in sludges and near-surface soils only. Clean closure can be achieved by removal of contaminated materials and off-site disposal of those materials. A risk assessment may be performed to determine acceptable levels of contaminants that can remain in the soils without creating health hazards.

3. Clean Closure With On-site Treatment

Condition: Hazardous constituents exist in sludges and soils, but not in the ground water. Clean closure with on-site treatment methods will be achieved through a variety of mechanisms such as degradation or volatilization of contaminants. If contaminants remain at low levels, a risk assessment will be performed to determine at what level contaminants can remain.

4. Closure as Landfill with Treatment Condition of Ground Water

Condition: Hazardous constituents exist in unit and have contaminated ground water. Containment or removal of the hazardous constituents is required and remediation of ground water is necessary. Contingency plan is required to address provisions for closure in place.

5. Closure as Landfill/Leave Contaminated Materials in Place

Condition: Hazardous constituents exist in sludges and near surface and deep soils but have not contaminated ground water. Cost of removal or treatment for clean closure exceeds cost of closure as a landfill. Contingency plan is required to address provisions for closure in place.

6. Combination of Above Alternatives or Innovative Technology

The sixth alternative may employ a combination of techniques or an innovative technology that will be presented in the supplemental plans.

Each of the closure method alternatives, and the criteria that would be used to determine which method would be employed, are presented in the following sections.

6.2.1 Clean Closure

If it is found to be physically and economically feasible to remove and dispose of all contaminated materials, clean closure will be the method of choice. It is anticipated that if the subsurface soils are contaminated to a depth of three feet or less, clean closure can be initiated and will be the method of choice.

6.2.2 Clean Closure Goals

The goal of clean closure will be to remove all contaminated materials that would pose an unacceptable risk to the environment or human health. With this goal in mind, the following standards for closure will be used:

- Toxic Characteristic Leaching Procedure (TCLP) tests as listed in 40 CFR Part 261 will be used as the guidelines for determining if wastes are hazardous.
- Health based risk assessment calculation are used to establish the acceptable levels of contaminants that are allowed to remain in the unit
- The Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCL) or Water Quality Control Commission (WQCC) levels (whichever is lowest) times 20,000 may also be used to establish acceptable residual values of contaminants in soils.
- The Human Health Standards for volatile and semi-volatile organic compounds, as listed in Section 3-103.A of the New Mexico Water Quality Control Commission (WQCC) Regulations, will be used as the guidelines for determining organic contamination in ground water.
- Certification of clean closure will be done following tests to show that no 40 CFR Part 264, Appendix IX constituents remain above locally established background levels. Tests will also show that, for the contaminants that do remain, the levels are below the levels established by the risk assessment.

The WQCC standards were chosen as guidelines for establishing acceptable contamination in ground-water only. No RCRA standards exist for volatile and semi-volatile compounds in soil. Therefore, risk assessment and TCLP values are used.

Standards for closure were included for metals, volatile organics, and semi-volatile organics; these are the contaminants of concern to environment and human health. For several reasons, inorganic compounds such as nitrates and chloride were intentionally excluded from the proposed closure standards, even though they are included in the WQCC standards:

- Nitrates and chlorides are not considered to be hazardous, ignitable, toxic, or corrosive, and are considered to be "harmful" or undesirable only when found in elevated concentrations in drinking water.
- Nitrates and chlorides are naturally occurring in the native soils, and elevated concentrations would also be commonly found in soil that had come into contact with domestic wastewater.
- Closure of domestic sewage lagoons and removal of soil containing nitrates and chlorides is usually not performed; therefore, removing soil that contains these compounds in excess of the WQCC standard is not required.

6.2.3 General Risk Assessment Theory

As instructed by NMED, in the N.O.V. of June 13, 1991, a risk assessment was performed on contaminants of concern at specific units undergoing interim status closure at KAFB under RCRA. Results of the risk assessments are specific to each unit, and details are included in the supplemental plans. A summary of the risk assessment process is provided below, as it may be used for other closure plans in addition to those subject to the provisions of the NOV. The following Risk Assessment Process is Used for All Closure Plans at Kirtland AFB.

Data obtained from analysis of samples was reviewed and summarized in tabular form. These data tables are in Appendix A of the supplemental closure plan for each unit. These tables show the analytical values obtained by the laboratory for each type of analysis, and indicate the medium analyzed. For example, analyses for organic contaminants in ground water, TCLP extractable metals content in sludges, and total metals analyzed in soils appear on three separate tables. These tables also display the highest concentration found for each compound and the number of times the compound was detected. The highest concentration was used to establish the baseline for the contaminant of concern listed in appendix C.

After the contaminants of concern were identified, a risk level was calculated for each contaminant. The risk assessment values were calculated based on slope factors (PF) for carcinogenic contaminants and reference dose (RfD) levels for non-carcinogenic contaminants. The PF and RfD values were obtained from the Integrated Risk Information System (IRIS) where available[1]. When IRIS values were not available, a surrogate value was obtained from the Health Effects Assessment Summary Tables (HEAST) published by EPA, January 1991.

These values were used in separate equations to establish the acceptable risk level. The two formulas provided by NMED for risk assessment calculations were obtained from the Superfund Public Health Risk Evaluation Manual (reference). The risk assessment formulae use a conservative scenario involving direct ingestion of contaminant-containing soil. This assessment method does not consider risks associated with inhalation of airborne contaminants that might be contained in dust from the site. The formulae and the variables are defined on the risk assessment calculation tables in the unit closure plans.

Not all contaminants on the Appendix IX list are classified as controlled substances and have regulatory limits established. Risk-based levels are established for those contaminants where regulatory limits have not been established. Allowable risk levels may be high for some contaminants, which may be subject to other regulatory constraints. Therefore, a summary table was prepared to compare the highest in-place contaminant value to allowable risk levels, and other regulatory limits established by:

Toxic Contaminant Leaching Procedure (TCLP) concentrations,

Land disposal restriction concentrations for waste (CCW) and waste extract (CCWE),

The WQCC standards and MCL limits (whichever is lowest) were multiplied by 20,000 to establish acceptable residual contaminant levels in soils. These values were

[1]Reference dose and slope factors are obtained from the IRIS data base. IRIS provides data based on the current status of research and is updated quarterly. In some cases the RFD or PF has not been established for specific contaminants. When a value has not been established in IRIS, then data from the Health Effects Assessment Summary Table (HEAST) is used as a surrogate value.

used as the lowest regulatory limit values only if they were lower than the risk assessment values[2]. This provides a more conservative approach to establish limit values for soils.

Safe Drinking Water Act, Maximum Contaminant Levels (MCLs), were used to establish limits for ground water contamination[3].

Water Quality Control Commission (WQCC), Water Quality Standards established by the State of New Mexico. This is used to determine allowable contaminant levels in ground-water[3].

The controlling regulatory limit used was chosen by selecting the lowest value for the same contaminant (i.e., TCLP values compared to extract values and totals values compared to risk assessed value and ground-water contaminants compared to MCL or WQCC limits). If the in-place contaminant concentration exceeds the lowest of the values, that contaminant must either be removed or managed in-place to assure adequate protection of human health and the environment for proper closure of the unit.

6.2.4 Closure In-Place (Closure as a Landfill)

The units will be closed as a landfill, and the contaminated materials will be left in place only if it is physically impossible or economically infeasible to remove, treat, or dispose of them.

As presented in previous sections, clean closure will be the method of choice. It is anticipated that site conditions, the levels of contamination, and the extent of contamination will allow for clean closure of most sites. Because of the vast array of possibilities, closure of the unit as a landfill will depend upon the individual site and will not be discussed further herein but will be included in the individual site supplemental plans as required.

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[2]MCL/WQCC values X 20,000 were used as a guideline limit for contaminant concentration limits in soils. This method was suggested through telephone contact with Dr. Bruce Swanton of NMED on August 5, 1991. This number provides a reasonable possible estimate of risk assessed values for comparison with water limit values if found as contaminants in soil.

[3]The lower value of WQCC or MCL were used to establish the allowable contaminant level in ground water.

Sections 6.2.1 and 6.2.2 discuss the clean closure goals, Section 6.2.3 discusses the risk assessment process, and Section 6.3 discusses the methods that will be used to ensure clean closure. If it is determined that clean closure cannot be achieved, and it will be necessary to close the unit as a landfill, a contingency plan for closure in-place, with a post-closure plan, will then be submitted to NMED as part of the individual site supplemental effort contained in Section 6.4.

6.3 Clean Closure Methods

6.3.1 General Site Preparation

The area will be cleared for utilities and a barrier or fence will be erected around the work area to prevent access by unauthorized personnel. Traffic routes for heavy equipment will be provided so that normal traffic patterns will be minimally impacted. A decontamination pad will be constructed. Haul routes will be established. All of these actions will be described in individual supplemental plans.

6.3.2 Removal and Disposal of Inventory

Removal is the preferred alternative to achieve clean closure of each unit. The removed material will be disposed of in a manner consistent with regulations. The removal of materials at each unit will be discussed in the supplements.

6.3.3 Record Keeping

All field activities will be conducted under the direct supervision of a qualified engineer or geologist who will keep detailed field records. Final "as-built" diagrams of closure and structures will be prepared and submitted to NMED in the final closure report. This information will be provided as appendix B.

6.4 Contingency Plan

If it is determined that contaminants will remain in the unit above regulatory and risk assessment levels, closure in-place will be pursued. Closure in-place involves the preparation of a contingency plan that, at a minimum, contains a cap or cover design and details post- closure monitoring activity. Since contingency plans are specific to each site, this information appears in the unit closure plan.

6.5 Health and Safety During Closure

Appendix G of the supplements will contain a site health and safety plan. These will be developed prior to closure activities at each unit. The information contained in appendix G of this document will provide a basis for the site health and safety plan.

6.6 Equipment Decontamination

Each piece of earth-moving equipment that may come in contact with hazardous materials during closure activities will be thoroughly decontaminated before it is returned to normal service. A sound asphalt, concrete, or lined gravel pad will be used to decontaminate equipment exposed to contaminated soils or materials. The size of the pad will be large enough to accommodate the equipment that is used. It will be bermed with a runoff catchment basin so that the wash water can be collected, removed, or treated.

Decontamination pads for heavy equipment will be located adjacent to closure sites or at a central facility. Access should be such that travel distance from the actual work site to decontamination pad is minimized. The actual location will be determined on a site-by-site basis and identified in site supplements. Typically, the decontamination pads for workers will be located at the perimeter of the Exclusion Zone in the Contamination Reduction Zone. Pads should be located in such a manner that normal operations do not pose a threat to surface water, or be located in areas of imminent flooding (i.e., arroyos), or be located in such a manner that they endanger the health and safety of the local environment. Decontamination pads should be located in a manner that causes the least disruption to the surrounding environment, taking into account visual and audible factors as well as exobiological concerns.

The decontamination pad site should be designed in accordance with criteria outlined below. Site preparation includes clearing adequate space to accommodate the equipment used on the site that will be decontaminated. The equipment size may vary from small backhoes, front-end wheel loaders, blade scrapers, to over-the-road, bottom-dump trucks. The specific equipment utilized will be governed by the type and amount of waste to be removed at each site. Additional space will be required to maneuver equipment inside the area without contaminating the surrounding area.

The specific pad design will be a function of contaminants present, equipment used, and area available. The basic design may include

- A prepared earth base, compacted and free of all foreign objects, i.e., roots, sticks, stones, or any other material that might pose a threat to a flexible membrane liner (FML).
- Bermed perimeter to contain rinse water.
- Ramped entrance and exit points for vehicles and equipment.
- A flexible membrane liner capable of withstanding normal operating loads anticipated. The FML should be manufactured of materials compatible with the contaminants it will contain. Key parameters are chemical composition, sunlight exposure, and strength characteristics, both tensile and puncture resistance.
- A sump system capable of collecting rinse water for removal.

Variations could include utilization of gravel sub-base, gravel overlay, geosynthetic felts, pump out systems, and other modifications as necessary.

Contaminated equipment will be cleaned using the following procedures:

- Pressurized hot water wash with non-phosphate detergent
- Potable water rinse
- Steam cleaning (if warranted)
- Collection, testing, and proper disposal of rinsate

6.7 Cost Estimate

The cost estimate for the unit is specific to the site. Cost estimates are provided in the Unit Closure Plan Supplements in this section.

SECTION 7.0

7.0 REGULATORY REQUIREMENTS

7.1 Facility Conditions

7.1.1 Maximum Amount of Inventory

The estimated maximum inventory of hazardous wastes in the units will be presented in this section of the site-specific supplement unit closure plan.

7.1.2 Inventory of Auxiliary Equipment

It is expected that equipment related to piping, valves and concrete structures may require decontamination for proper closure. If the unit is to be clean-closed and put back into service, all equipment will be decontaminated as described in section 6.5. If the unit will be closed as a landfill, then equipment will be disposed of inside the landfill closure.

The equipment and materials for closure operations will be obtained from local sources. The main supply source will be the KAFB Civil Engineering Section.

7.1.3 Schedule For Final Closure

Closure will be completed within 180 days of NMED approval of the final closure plan for each unit unless an extension is granted. External factors, such as weather and delivery schedules of disposal facilities, may affect the actual schedule. If closure cannot be completed within 180 days, KAFB will ask for an extension. All activity will follow 40 CFR 265.112 and 265.113 for time elements, notices, and amendments if significant changes of conditions occur. A closure schedule is provided as required with each of the unit supplements.

Approval by the Administrator of these closure plans constitues completion of closure for the unit. Within 60 days of completion of closure of the unit, and within 60 days of completion of final closure, KAFB will submit by registered mail a certification that the hazardous waste unit has been closed in accordance with the specifications in the approved closure plan. This certification will be signed by both the current or acting operator of the unit at KAFB, and also signed by an independent registered professional engineer.

Documentation supporting the certification will be made available and furnished as requested until KAFB is released by the Administrator for closure completion.

Schedule for final closures will accompy the unit closure plans.

7.2 Removal and Disposal of Inventory

KAFB proposes to close the units by one of two methods:

Clean Closure

- Documentation of contaminant levels below action levels or removal and treatment of contaminated materials as required to attain clean closure. Risk assessments may be used to establish the acceptable levels of certain contaminants that may remain in-place and still achieve clean closure. This includes decontamination of related equipment. The contaminated material will be disposed of as required by the regulations concerning hazardous waste using the Best Demonstratable Available Technology (BDAT). The material may be solidified and buried at an approved and permitted facility or it may be incinerated at a permitted hazardous waste incinerator. The ultimate disposal process depends on the levels and types of contaminants at each individual site.

Landfill Closure

- Leaving contaminated material in place, with related equipment to remain as a landfill closure. This includes covering and capping of the unit following a post-closure monitoring plan and possible treatment of the contaminants if warranted. The contaminated material may be placed in a lined RCRA landfill if necessary.

7.3 Surveying

After the unit is closed, the area will be surveyed by a registered land surveyor. The surveyor will prepare a map indicating the location, dimensions, and elevation of the units and structures to be closed. This survey plat will be submitted to the local zoning authority and will include the location and dimension of hazardous cells with respect to permanently surveyed benchmarks. The plat will be prepared and certified by a professional land surveyor.

The plat will also include a prominently displayed notice to restrict disturbance of the hazardous waste disposal unit in accordance with 40 CFR 265 Subpart G.

7.4 Notice to Local Land Authority

Within 60 days after closure is complete, KAFB will submit a survey plat of the site to NMED. The local land authority and the KAFB Real Property office will also receive copies of the survey.

7.5 Notice in Deed of Property

Within 60 days of completion of all closure activities, a notice will be placed in the property deed indicating that the land has been used to manage wastes and that future use may be restricted from activities that will disturb the closed units. Notice will be made to the local land authority and the director of NMED.

7.6 Certification of Closure

Within 60 days of completion of closure, KAFB will submit a certificate of closure to NMED, signed by the KAFB Commanding Officer and an independent professional engineer who will attest that the closure has been completed in accordance with specifications in the closure plan.

7.7 Post-Closure Permit

Following the completion of all closure tasks and submission of final specifications to NMED, KAFB will apply, if necessary, for the appropriate post-closure certifications and permits. If the unit is closed as a landfill, a post-closure care permit will be required. If the unit is clean-closed, and certification of clean-closure is accomplished, these permits may not be required.

7.8 Amendment of this Plan

The plan described in this report will be amended as necessary according to provisions outlined in 40 CFR 265.112 (c).

7.9 Notification

KAFB will submit supplements to this Base-Wide Closure Plan for each unit at least 180 days prior to the date in which closure operations will begin. If a closure plan is already approved, notice will be given in writing at least 60 days prior to commencement of Final Closure at each unit.

7.10 Time Allowed for Closure

Allowable time constraints outlined in this section (40 CFR part 265.113) will be followed by Kirtland AFB for known units that require closure.

SECTION 8.0

8.0 POST-CLOSURE CARE PLAN FOR LANDFILL CLOSURE (IF REQUIRED)

8.1 Facility Contact

During the post-closure care period, any information regarding the site can be obtained by contacting

Director
Environmental Management Division
1606 ABW/BM
Kirtland AFB, NM 87117-5000
(505) 846-2751

8.2 Ground-Water Monitoring

The monitoring program will be implemented within one year of closure of the site. The level of ground-water contamination (if any) will be identified during the sampling and testing phase of the project. This testing may identify the conditions that will define post-closure requirements for ground-water monitoring. Individual ground-water monitoring systems will be described in detail in each supplement. Ground water monitoring plans for the individual units will be based on conformance with 40 CFR 265.90 through 265.93. Monitoring plans may require the use of alternate monitoring systems depending on individual unit parameters.

8.3 Sampling and Analysis

The ground water monitoring provisions detailed in 40 CFR Subpart F 265.90 – 265.93 will be followed for groundwater monitoring at the specific units.

Initial contaminant concentrations and values will be established from monitoring wells at each unit. Background concentrations and values may be established from either monitoring wells or production wells existing at KAFB. These wells will be located in the general area of each unit but will not be influenced by possible contamination related to releases from the units.

When ground-water monitoring is required, the parameters of pH, specific conductance, total organic carbon, and total organic halogens will be used to monitor contamination of the ground water after the initial sampling. Special conditions at each individual site will also be conducted for unique contaminants peculiar to the site.

Parameters used to establish the suitability of the groundwater as a drinking water supply will be specified in 40 CFR part 265 Appendix III. This list includes the EPA primary drinking water standards for metals, some pesticides, radiation counts and coliform bacteria. For easy reference this list is included below:

Table 8-1 EPA Primary Drinking Water Standards (from 40 CFR Part 265 Appendix III)

Parameter	Maximum Level(MCL)*	NM WQCC Limits*
Arsenic	0.05	0.1
Barium	1.0	1.0
Cadmium	0.005	0.01
Chromium	0.01	0.05
Fluoride	1.4 - 2.4	1.6
Lead	0.05	0.05
Mercury	0.002	0.002
Nitrate (as nitrogen)	10.0	10.0
Selenium	0.01	0.05
Silver	0.05	0.05
Endrin	0.0002	
Lindane	0.004	
Methoxychlor	0.1	
Toxaphene	0.005	
2,4,D	0.01	
2,4,5-TP Silver	0.01	
Radium	5 pCi/l	combined 40 pCi/l
Gross Alpha	15 pCi/l	
Gross Beta	4 millirems/year	
Turbidity	1/TU (surface water only)	
Coliform Bacteria	1/100 ml	

* Units shown in ppm unless otherwise noted

Table 8-2

List of Other WQCC Parameter Limits
Not Covered Under EPA MCL Standards

Parameter	Maximum Level
Aluminum (Al)	5.0 mg/l
Boron (B)	0.75 mg/l
Cobalt (Co)	0.05 mg/l
Molybdenum (Mo)	1.0 mg/l
Nickel (Ni)	0.2 mg/l
Chloride (Cl)	250. mg/l
Copper (Cu)	1.0 mg/l
Cyanide (Cd)	0.2 mg/l
Iron (Fe)	1.0 mg/l
Manganese (Mn)	0.2 mg/l
Phenols	0.005 mg/l
Sulfate (SO_4)	600. mg/l
Total Dissolved Solids (TDS)	1000. mg/l
Zinc (Zn)	10.0 mg/l
pH	between 6 and 9
Uranium (U)	5.0 mg/l
Radioactivity: Combined Radium-226 and Radium-228	30.0 pCi/l
Benzene	0.01 mg/l
Polychlorinated biphenyls (PCB's)	0.001 mg/l
Toluene	0.75 mg/l
Carbon Tetrachloride	0.01 mg/l
1,2-dichloroethane (EDC)	0.01 mg/l
1,1-dichloroethylene (1,1-DCE)	0.005 mg/l
1,1,2,2-tetrachloroethylene (PCE)	0.02 mg/l
1,1,2-trichloroethylene (TCE)	0.1 mg/l
Ethylbenzene	0.75 mg/l
Total xylenes	0.62 mg/l
Methylene chloride	0.1 mg/l
Chloroform	0.1 mg/l
Ethylene diibromide (EDB)	0.0001 mg/l
1,1,1-trichloroethane	0.096 mg/l
1,1,2-trichloroethane	0.01 mg/l
1,1,2,2-tetrachloroethane	0.01 mg/l
Vinyl chloride	0.001 mg/l
PAHs: total naphthalene plus monomethylnaphthalenes	0.03 mg/l
Benzo-a-pyrene	0.0007 mg/l

Parameters used to establish groundwater quality are chloride, iron, manganese, phenols and sodium. These parameters will be used as a basis for comparison in the event a ground-water quality assessment is required under 40 CFR 365.93(d)

Certain units may require the use of alternate monitoring systems. If alternate monitoring systems are used then KAFB will submit a specific ground water monitoring plan prepared and certified by a qualified geologist or geotechnical engineer.

8.4 Emergency Response

All wastes will be removed or covered. Therefore, no emergency response plan will be necessary for this plan. However, KAFB has a well defined and continually exercised emergency and hazardous waste response system that can be implemented in the event of any emergency.

8.5 Financial Requirements

KAFB is a Federal facility. A demonstration of financial plans for post-closure care is not required.

8.6 Personnel Training

Personnel training requirements for these operations will meet the requirements of 40 CFR 265.15. During closure operations, KAFB and contractor personnel involved with the closure operations will be certified, trained and instructed to observe all health and safety procedures (see section 7.3). Uninvolved or untrained personnel will be prevented from entering the working areas. Access to the working areas will be restricted by traffic barricades, signs, or enclosed fences. Site points will be established. Annual retraining will

The following sections included in the unit supplements are specific to the individual site:

8.7 Function of Monitoring Equipment

8.8 Planned Maintenance Activity

8.9 Integrity and Analysis of Final Cover System

SECTION 9.0

9.0 SECURITY

Access to all parts of KAFB is controlled by United States Air Force security personnel. No unauthorized personnel will be allowed into the work area during closure, and access to the site will be restricted. After closure, appropriate measures will be included in each supplemental plan based upon the conditions at the specific site. The following criteria will be used:

- Site must be clearly marked and appropriate danger signs erected.
- Site security must prevent unknowing entry of persons or livestock.
- Surveillance systems will be installed as appropriate to the individual site.
- Access control points will be established as needed.
- Inspection of security system to insure integrity.

SECTION 10.0

10.0 REFERENCES

Albuquerque, City of, 1988 and 1990 Engineering and Planning; Oral Communication

Bjorklund and Maxwell, 1971, Availability of Ground Water in the Albuquerque Area, Bernalillo and Sandoval Counties New Mexico, New Mexico State Engineer Technical Report 21

IRP Phase I Records Search, Hazardous Materials Disposal Sites KAFB, NM Engineering Science, November 1981

IRP Phase II Confirmation/Quantification Stage 1 KAFB, NM Science Applications International Corporation March 1985

Kelley, V. C., 1974, Albuquerque: Its Mountains, Valley, Water, and Volcanoes, N.M. Bureau of Mines and Mineral Resources, Scenic Trips to the Geologic Past No. 9: N.M. Bureau of Mines and Mineral Resources, Socorro, NM

Kelley, V. C., 1977, Geology of Albuquerque Basin, New Mexico, New Mexico Bureau of Mines and Mineral Resources, Memoir 33

National Oceanic and Atmospheric Administration (NOAA), 1988 Local Climatological Data Monthly Summary; Dates 10-88 to 1-78.

N.M. Hazardous Waste Regulations (HWMR-5)

Sims, Ronald et al, 1986, Contaminated Surface Soils In-Place Treatment Techniques

U.S. Soil Conservation Service, 1972, Map 4-R-33714, Normal Annual Precipitation in New Mexico

U.S. Soil Conservation Service, 1972, Map 4-R-33582, Gross Annual Pond Evaporation in New Mexico

U.S. Army Corps of Engineers, 1979, Albuquerque Greater Urban Area, Water Supply Study

U.S. Soil Conservation Service, 1977, Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico

U.S EPA, 1982, Closure of Hazardous Waste Surface Impoundments, Guidance Manual SW873

U.S EPA, 1991, Health Effects Assessment Summary Tables, Annual FY-1991 NTIS No. P891-921199 January 1991

U.S. EPA, 1989, Requirement for Hazardous Waste Landfill Design Construction and Closure, Seminar Publication

U.S. EPA, 1985, Guide for Decontaminating Buildings, Structures and Equipment at Superfund Sites, Report

U.S EPA, 1988, Public Health Evaluation Manual

U.S. EPA, 1985, Remedial Action at Waste Disposal Sites (Revised) Handbook EPA 625

U.S EPA, 1989, Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)

U.S. EPA, 1984, Permit Applicants Guidance Manual for Hazardous Waste Land Treatment, Storage, and Disposal Facilities, Guidance Manual

U.S. EPA, 1986, Test Methods for Evaluating Solid Waste Field Manual, Physical/Chemical Methods

USGS Quality Assurance Project Plan for Remedial Investigation and Feasibility Study at KAFB. Installation Restoration Program Phase II Stage 2, February 15, 1989

USGS Installation Restoration Program Stage 2 Work Plan, KAFB October 1989

USGS Installation Restoration Program Stage 2 Sampling and Analysis Plan, October 1989

40 CFR Parts 261, 265, 267

USGS Installation Restoration Program Stage 2 Interim Technical Information Report Sewage Lagoons, Golf Course Pond, and Golf Course, KAFB September 1990

Woodward, L. A., 1982, Tectonic Framework of Albuquerque Country, N.M.G.S. Guidebook, 33rd Field Conference, Albuquerque Country II

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APPENDIX A

Appendix A

Analytical Results, Summary Tables

(Reserved)

(To be Included in the Specific Unit Supplements Only)

APPENDIX B

Appendix B

Details of Closure Design

(Reserved)

(To be Included in the Specific Unit Supplements Only)

APPENDIX C

Appendix C

Contaminants of Concern

(Reserved)

(To be Included in the Specific Unit Supplements Only)

APPENDIX D

Appendix D

Installation Restoration Program (IRP)
Stage 2 Plan by USGS

Sampling and Analysis Project Locations

This document provides site specific information on sampling locations

(Document included under separate cover)