Realignment of

CANNON AIR FORCE BASE

CURRY COUNTY, NEW MEXICO

Preliminary Draft

Environmental Impact Statement

United States Air Force

December 15, 1989

Air Force
Environmental Planning Division
(HQ USAF/CEVP)

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PRELIMINARY DRAFT

ENVIRONMENTAL IMPACT STATEMENT

FOR

CANNON AIR FORCE BASE

REALIGNMENT

Submitted to:

Headquarters TAC

Washington, D.C.

Draft Environmental Impact Statement
Realignment of Cannon Air Force Base

Responsible Agency: United States Air Force

Action: In response to the recommendations of the Defense Secretary's Commission on Base Realignments and Closures to legislative requirements in the Base Realignment and Closure Act (Public Law 100-526), Cannon Air Force Base is to undergo a realignment of aircraft and personnel. The Base F-111 aircraft count will be increased from the current level of 62 to 108. This will collocate all similar mission F-111 aircraft based in the U.S. at this Base. It is expected that this realignment will increase military personnel from the current level of 3539 to 5201 and increase civilian personnel from 445 to 522. In order to maintain Tactical Fighter Wing efficiencies and combat readiness, increased use of Military Training Routes and the Melrose Range, construction on Base, and creation of the Mount Dora Military Operations Area are proposed actions associated with the realignment.

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Designation: Draft Environmental Impact Statement (DEIS)

Abstract: This statement assesses the potential environmental impacts from the realignment of Cannon Air Force Base, located in Curry County, 7 miles west of the town of Clovis, New Mexico and associated airspace activities in northeastern New Mexico. The realignment will significantly increase airspace activity at the Base and surrounding operational airspace regions. The impacts resulting from the realignment are due to population and noise increases. The Air Force will construct housing units to mitigate the population impact and will reduce noise impacts using established mitigation measures.

Comments on the DEIS should be addressed to Captain Wilfred T. Cassidy at the address noted above. The comment period ends on __________. Comments must be received by _________. A public hearing will be held on ___________. Notice of this hearing will appear in the local media. Captain Cassidy can also be contacted for information on this meeting.

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ACRONYMS AND ABBREVIATIONS

AAFES	Army-Air Force Exchange Service
AC	Acres
ACHP	Advisory Council on Historic Preservation
ACT	Air Combat Tactics
ACFT	Aircraft
ADT	Average Daily Traffic
AF	Air Force
AFB	Air Force Base
AFESC	Air Force Engineering Services Center
AFR	Air Force Regulation
AG	Aboveground
AGE	Aerospace Ground Equipment
AGL	Above Ground Level
AGS	Aircraft Generation Squadron
AHC	Advanced Handling Characteristics
AI	Air-to-Air Intercepts
AICUZ	Air Installation Compatible Use Zone
AIM	Airman Information Manual
AIRFA	American Indian Religious Freedom Act
AMU	Aircraft Maintenance Unit
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
AQMA	Air Quality Maintenance Area
AR	Aerial Refueling Route
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
AWS	Air Weather Service
BASH	Bird Aircraft Strike Hazard
BBER	Bureau of Business and Economic Research
BEA	Bureau of Economic Analysis
CAA	Clean Air Act
CBRC	Commission on Base Realignment and Closure
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CEQ	Council on Environmental Quality
CES	Civil Engineering Squadron
CFR	Code of Federal Regulations
CFT	Combined Force Training
CHABA	Committee on Hearing, Bio-Acoustics and Bio-Mechanics
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CP	Closed Pattern
CRS	Component Repair Squadron
CSG	Combat Support Group

ACRONYMS AND ABBREVIATIONS (Cont'd)

CUZ	Compatible Use Zone
CY	Calendar Year
D/A	Departures/Arrivals
DACT	Dissimilar Air Combat Tactics
dB	Decibels
DEIS	Draft Environmental Impact Statement
DMDC	Defense Manpower Data Center
DNL	Day-Night Average Sound Level
DO	Dissolved Oxygen
DoD	Department of Defense
DPDO	Defense Property Disposal Office
DRMO	Defense Reutilization and Marketing Office
EID	Environmental Improvement Division
EIS	Environmental Impact Statement
EMS	Equipment Maintenance Squadron
ENMU	Eastern New Mexico University
ENT	Ear, Nose, and Throat
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPCOG	Eastern Plains Council of Governments
ERIS	Economic Resource Impact Statement
F	Fahrenheit
FAA	Federal Aviation Administration
FAAH	Federal Aviation Administration Handbook
FL	Flight Level
FTE	Full-Time Equivalent
FY	Fiscal Year
gpm	Gallons per Minute
IFR	Instrument Flight Rules
INM	Integrated Noise Model
I-0	Input-Output
IR	Instrument (IFR) Route
IRP	Installation Restoration Program
MEK	Methyl Ethyl Ketone
mgpd	Million Gallons per Day
MOA	Military Operations Area
mph	Miles per Hour
MSL	Mean Sea Level
MTRs	Military Training Routes
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAF	Non-Appropriated Fund
NAIRFA	Native American Indian Religious Freedom Act
NDI	Non-Destructive Inspection

ACRONYMS AND ABBREVIATIONS (Cont'd)

NE	Not Estimated
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	Nautical Miles
NMANG	New Mexico Air National Guard
NMEID	New Mexico Environmental Improvement Division
NMHC	Nonmethane Hydrocarbons
NMSHPO	New Mexico State Historic Preservation Officer
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSPS	New Source Performance Standard
NWR	National Wildlife Refuges
NZ	Noise Zone
OEA	Office of Economic Adjustment
PACE	Planning Authority for Cannon Expansion
POL	Petroleum, Oil, and Lubricants
PSD	Prevention of Significant Deterioration
PU	Public Use
PVT	Private
RCO	Range Control Office
RCRA	Resource Conservation and Recovery Act
RIMS	Regional Input-Output Modeling Systems
ROI	Region of Influence
SAC	Strategic Air Command
SEL	Sound Exposure Level
SF	Square Feet
SIP	State Implementation Plan
SY	Square Yards
TAC	Tactical Air Command
TFG	Tactical Fighter Group
TFTS	Tactical Fighter Training Squadron
TFW	Tactical Fighter Wing
TGO	Touch-and-Go Events
TOSS	Television Ordnance Scoring System
TPY	Tons per Year
TRNS	Transportation Squadron
TSCA	Toxic Substances Control Act
TSP	Total Suspended Particulates
TTW	Tactical Training Wing
UG	Underground
UPH	Unaccompanied Personnel Housing
USAF	United States Air Force

ACRONYMS AND ABBREVIATIONS (Cont'd)

VFR	Visual Flight Rules
VHA	Variable Housing Allowance
VOL	Volatile Organic Liquid
VFR	Visual Flight Route
VR	Visual Route

EXECUTIVE SUMMARY

The action evaluated in this Environmental Impact Statement (EIS) is the realignment of Cannon Air Force Base, New Mexico. The realignment is the result of the recommendations of the Defense Secretary's Commission on Base Realignment and Closure, from legislative requirements in the Base Realignment and Closure Act (Public Law 100-526), and of U.S. Air Force plans to enhance mission readiness and national security. The realignment of Cannon Air Force Base will involve the transfer of aircraft with the net result that the number of F-111s at the Base will increase by 46 planes. The associated increase in personnel will be from the current level of 3984 to 5723. The numbers of sorties and flying hours are expected to essentially double for a total of 16,500 sorties and 36,000 flying hours per year. All of these flight operations will be at subsonic speeds. In order to maintain operational efficiency and combat readiness under this realignment, on-Base military construction, creation of a new Mount Dora Military Operations Area, continued full use of the Pecos Military Operations Area, increased use of the Melrose Range, increased use of Military Training Routes, and increased aircraft operations at the Base are proposed. Off-Base flight operations will be over low population areas. Provisions of the Act preclude the examination of any alternative actions to realignment. Consequently, this document will only examine alternate methods of carrying out the realignment. Because the Act requires implementation of the realignment, "no action" is not an alternative and is not specifically included. However, Chapter 3.0 presents the environmental conditions associated with the installation and its operations and will serve as the baseline against which the implementation impacts are judged.

This EIS describes conditions with all units currently operational in Chapter 3.0. Chapter 4.0 of this document assesses the impacts of the realignment of the Base and the associated proposed actions needed to meet training needs. While the environmental impacts to Cannon Air Force Base caused by the arrival of F-111 aircraft and associated personnel are within the scope of this EIS, the environmental impacts caused by the departure of F-111 aircraft and associated personnel from other locations are not part of this EIS. Those impacts will be analyzed in separate National Environmental Policy Act (NEPA) documents focusing on impacts and issues at the various departure bases.

Implementation alternatives considered include continued use of existing Military Operations Areas and Base facilities only (i.e., no new construction). These alternatives are not feasible because they would result in degradation of aircrew proficiency and combat readiness. The training requirements needed to meet the F-111 mission necessitate the creation of the Mount Dora Military Operations Area, increased Melrose Range use, increased Military Training Route use and continued full Pecos Military Operations Area use. The alternative to creating a new Military Operations Area is increasing the usage of existing Military Operations Areas. This is not feasible because Military Operations Areas within the allowable 100 nautical mile (nm) distance are currently at their full utilization levels. Investigation of alternative locations for the Mount Dora MOA showed that the proposed location is the optimal choice from both the noninterference with commercial airways and military needs perspectives.

A summary table in Chapter 2.0 presents the environmental impacts of the realignment of Cannon Air Force Base and associated proposed actions. Cannon Air Force Base and the associated military aircraft operational areas are located in northeastern New Mexico. The potentially affected environmental aspects analyzed cover air quality; meteorology; noise; water resources; socioeconomics; airspace management; land use; biological resources, archaeological, cultural, and historical resources; Native American values; and solid wastes, hazardous wastes, and hazardous materials. No significant environmental consequences are expected for any of these environmental aspects except for noise and socioeconomics.

The number of residents exposed to 65 dB or higher noise levels due to the added aircraft operations associated with the realignment would change from 3465 (current) to 4523 (future). The number of these people expected to be highly annoyed would increase from 981 (current) to 1340 (future). Thus, due to the increased aircraft operations at the Base, along military training routes, in the Mount Dora Military Operations Area, and in the Melrose Range, there will be an increase of 359 people who, although already exposed to overflight noise, will experience an increase in the average number of overflights and associated noise. The mitigation of noise can involve sound insulation of dwellings; land use controls, resident relocation, and modified flight tracks for areas significantly impacted.

Significant socioeconomic aspects of the realignment include increases in employment, construction, income, and population. The total employment impact is projected to peak at 3149 in fiscal year 1992 and stabilize at 2789 in fiscal year 1995. The realignment will result in an estimated $50 million in military construction projects. The total annual payroll for all Cannon AFB military and civilian personnel associated with the realignment is estimated at $36 million beginning in fiscal year 1992. The total community population impact is projected to peak at 5440 in fiscal year 1992 and to be 4816 in fiscal year 1995. This population change will have an impact on schools and housing. Schools will be particularly affected by the associated increase in enrollment. The demand for housing is expected to exceed supply. The Air Force will work with the impacted communities to mitigate these impacts by developing new housing construction programs and assisting OEA in addressing school system issues. That is, the Air Force will interface with local communities to implement a build-to-lease housing program under Section 801 of P.O. 98-115. The construction of 700 housing units under this program is planned, which will mitigate shortfalls in housing availability. Plans are in place to construct 300 dormitory units on Base. Also, the Air Force will assist OEA in interfacing with the Department of Education to mitigate issues related to school saturation.

CHAPTER 1.0 - DESCRIPTION OF AND NEED FOR THE ACTION

1.1 INTRODUCTION

The Defense Secretary's Commission on Base Realignment and Closure ("Commission or CBRC") was chartered on 3 May 1988 by the Secretary of Defense to recommend military installations within the United States, its commonwealths, territories, and possessions for realignment and closure. Subsequently, the Base Realignment and Closure Act (Public Law 100-526, 24 October 1988) endorsed the Secretary's Commission and required the Secretary of Defense to implement its recommendations unless he rejected them in their entirety or the Congress passed (and the President signed) a Joint Resolution Disapproving the Commission's recommendations.

The primary criteria used by the Commission for identifying candidate bases was the military value of the installation. However, cost savings were also considered, as were the current and projected plans and requirements for each military service. Lastly, the Commission focused its review on military properties and their uses, not military units or organizational/administrative issues.

On 29 December 1988, the Commission recommended the realignment and closure of 145 military installations. Of this number, 86 are to be closed fully, 5 are to be closed in part, and 54 will experience a change (either an increase or decrease) as units and activities are relocated.

On 5 January 1989, the Secretary of Defense approved those recommendations and announced that the Department of Defense would implement them. The Congress did not pass a Joint Resolution disapproving the recommendations within the time allotted by the Act.

Therefore, the Act now requires the Secretary of Defense, as a matter of law, to implement those closures and realignments. Implementation must be initiated by 30 September 1991, and must be completed no later than 30 September 1995. Thus, this EIS addresses only implementation; the decision to realign Cannon Air Force Base is by law a final one.

This realignment involves moving F-111 aircraft to Cannon AFB such that the count increases from 62 to 108. This will collocate all U.S.-based F-111 aircraft with a similar mission at a single base, improving command and control while enhancing mission effectiveness at a reduced cost. Personnel levels will change from 3984 to 5723. A doubling of sorties/flying hours/training requirements will be associated with the addition of another wing of F-111 aircraft. To accommodate the increased flight training associated with the addition of another aircraft wing, the Mount Dora Military Operations Area (MOA) north of Cannon Air Force Base (AFB) is to be established. Through proposed increased operations for the Base, Melrose Range, and existing Military Training Routes; proposed continued full use of the Pecos MOA; and proposed creation of the

Mount Dora MOA, the operational efficiency and combat readiness will be maintained.

The Base Realignment and Closure Act requires that the implementing actions conform to the provisions of the National Environmental Policy Act of 1969 (NEPA), as implemented by the President's Council on Environmental Quality (CEQ) regulations. In addition, this Environmental Impact Statement (EIS) also follows Air Force Regulation (AFR) 19-2, which implements both NEPA and the CEQ regulations within the Air Force system. However, the Act also modified NEPA to the extent that the environmental analysis need not consider:

(i). The need for realigning or closing a military installation selected for realignment or closure by the Commission;

(ii). The need for transferring functions to another military installation that has been selected as the receiving installation; or

(iii). Alternative military installations to those selected.

1.2 LOCATION OF ACTION

The action encompasses the realignment activities at Cannon AFB in eastern New Mexico, the creation of a new MOA in northeastern New Mexico, the continued full use of the Pecos MOA, the expanded use of the Melrose Range which is west of Cannon AFB, and the associated increased use of existing Military Training Routes (MTRs) to travel to and from these areas. Figure 1.2-1 shows these airspace areas and their relative positions. Figure 1.2-2 shows the MTRs to be used to travel to and from the airspace areas.

Cannon AFB is close to the Texas border in Curry County, 7 miles west of the town of Clovis and 15 miles north of Portales. There were 33,780 people living in Clovis in 1986; Portales' population was 10,180 in that year (Bureau of the Census, U.S. Department of Commerce, County and City Data Book, 1988, May 1988). The Base is located just south of U.S. Highway 60-84 (Figure 1.2-3) in a farming and ranching area. The majority of the land surrounding the Base is productive irrigated farmland or grassland. The major crops are wheat, sorghum, sugar beets, corn, cotton, alfalfa, barley, and peanuts. The land is also used for cattle grazing, both beef and dairy, and Clovis is considered the "Cattle Capital of the Southwest." Portales is the home of Eastern New Mexico University, which provides a variety of educational programs and a rich cultural life to area residents.

Cannon AFB is currently home to the 27th Tactical Fighter Wing (TFW). The primary mission of the 27th TFW is to develop and maintain an F-111 Tactical Fighter capability for day, night, and all-weather combat operations and to provide replacement training of combat aircrews for tactical organizations worldwide. The Base consists of the

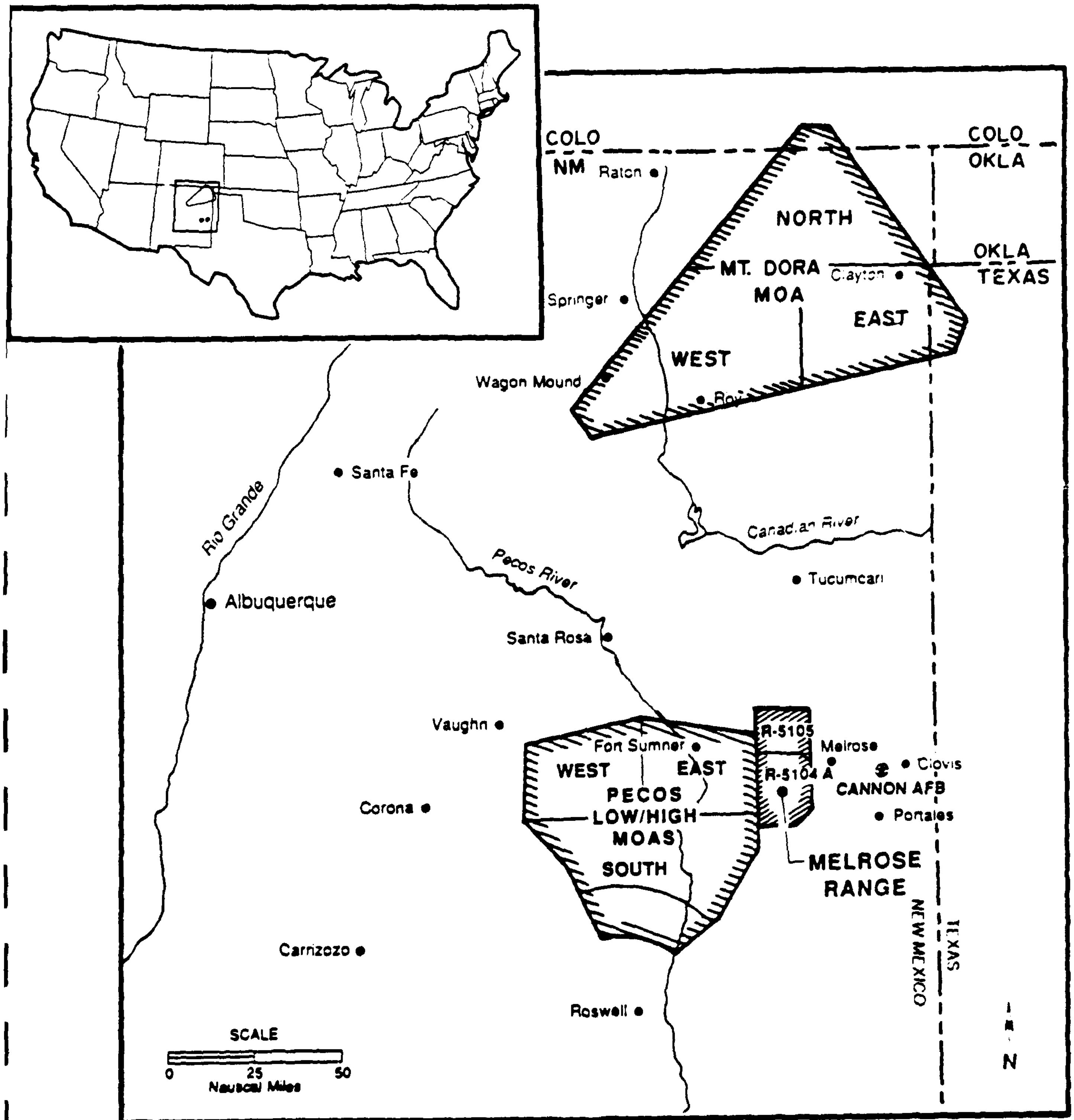


Figure 1.2-1. Location of Airspace Areas Associated with the Realignment

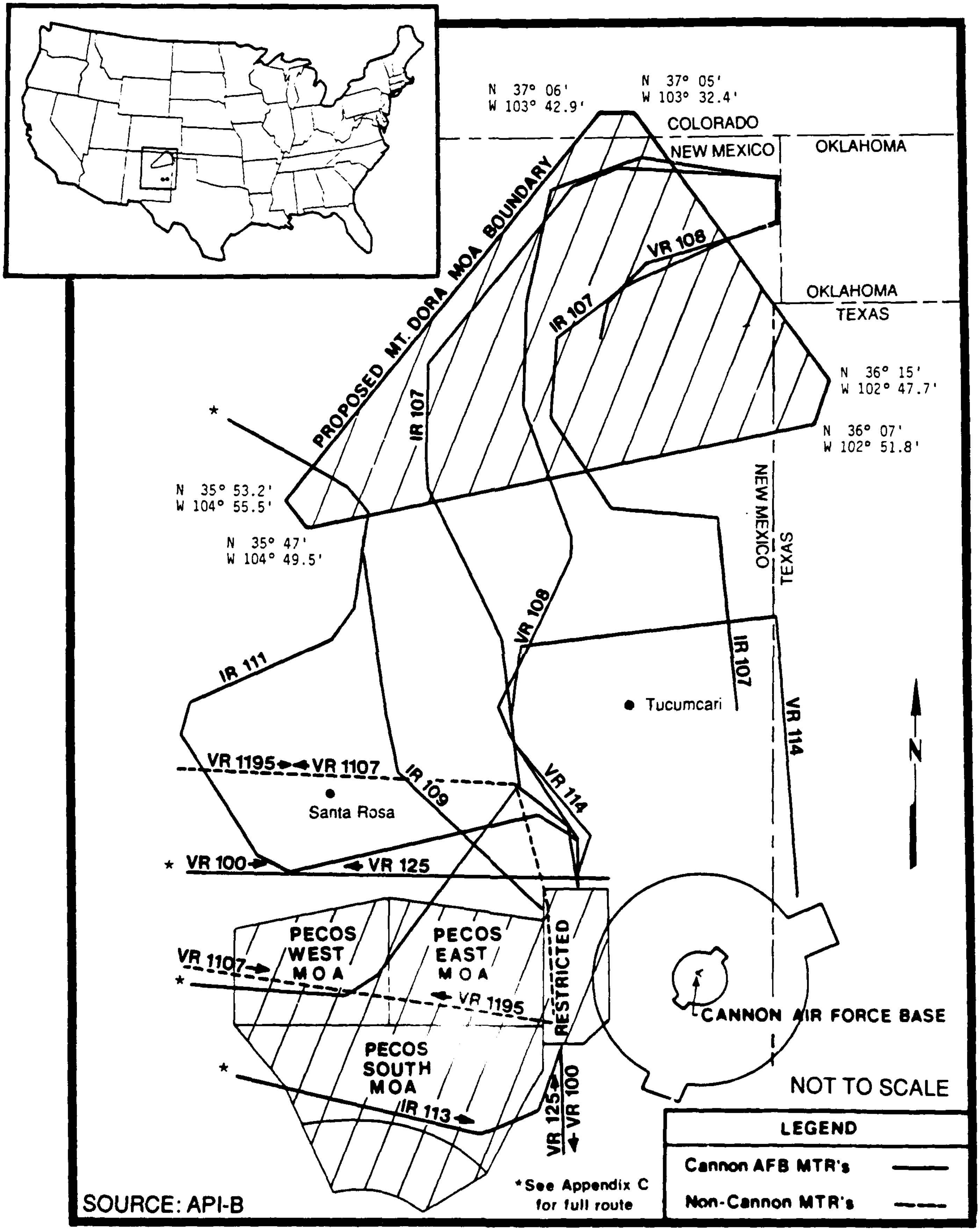


Figure 1.2-2. Location of Airspace Areas Including Associated MTRs.

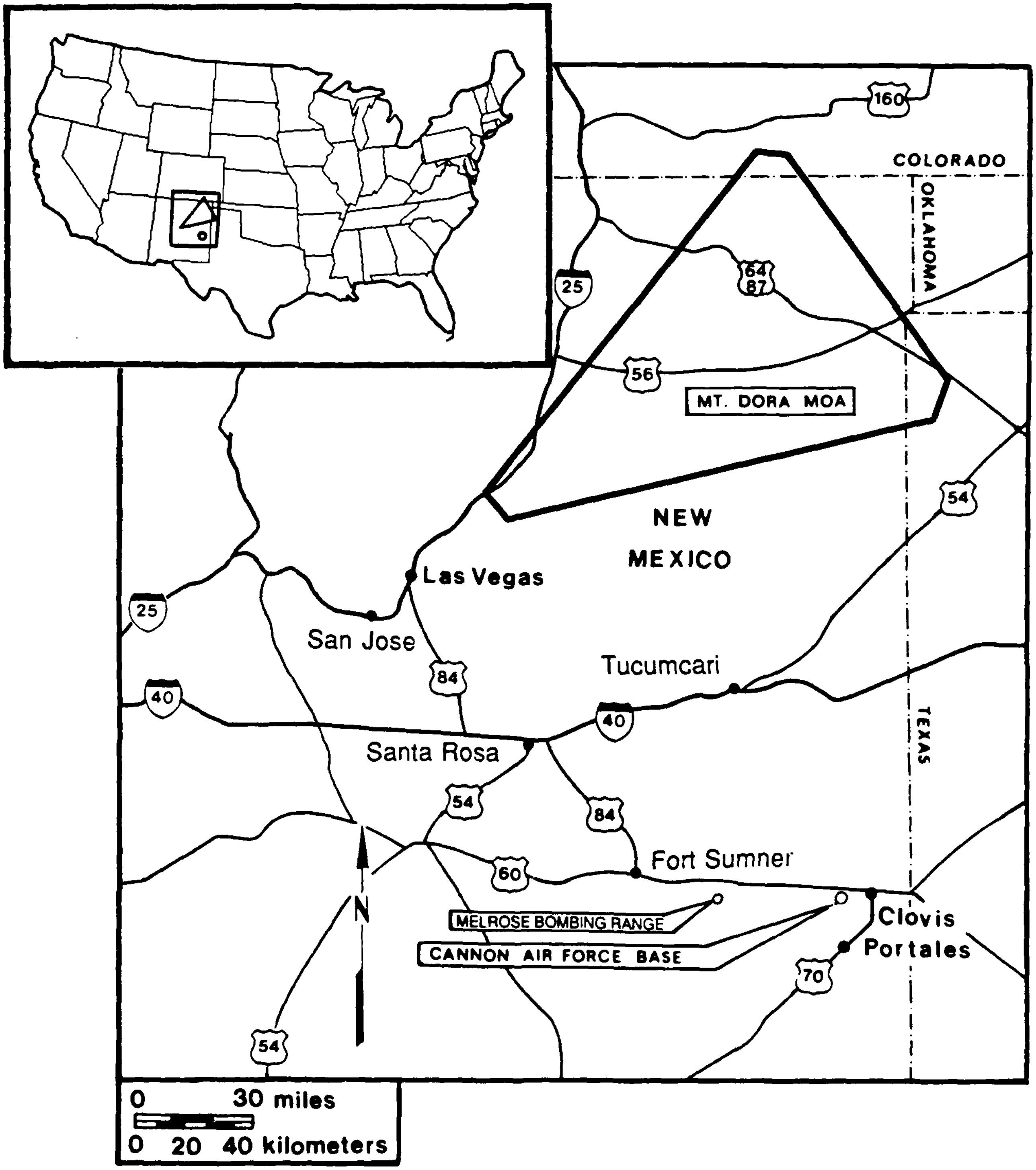


Figure 1.2-3. Location of Cannon Air Force Base

airfield, hangar and maintenance areas for the aircraft, and residential and recreational facilities for personnel (Figure 1.2-4).

The proposed action includes establishing a new MOA north of Cannon AFB. The proposed MOA is located within 113 statute miles [97 nautical miles (nm)] of Cannon AFB. The area underlying the MOA encompasses approximately 5200 square statute miles (3900 square nm). The location of the proposed MOA is shown in Figures 1.2-1, 1.2-2, 1.2-3, and 1.2-5. This semiarid area contains low mountains, plateaus, and plains. The land is used as rangeland for cattle grazing and for agricultural purposes. The Kiowa National Grasslands and Chicosa Lake State Park are in the center of the lower third of the MOA. Also under the MOA is the Capulin Volcano National Monument in the upper northwest and Clayton Lake State Park in the northeast.

Included in the realignment of Cannon AFB is the expanded use of the Melrose Bombing Range, New Mexico. The Melrose Range is located approximately 13 miles southwest of the town of Melrose, New Mexico (Figures 1.2-1 and 1.2-6). This semiarid area is characterized by flat grasslands. The land is used as a target practice area, as rangeland for cattle, and for agricultural purposes.

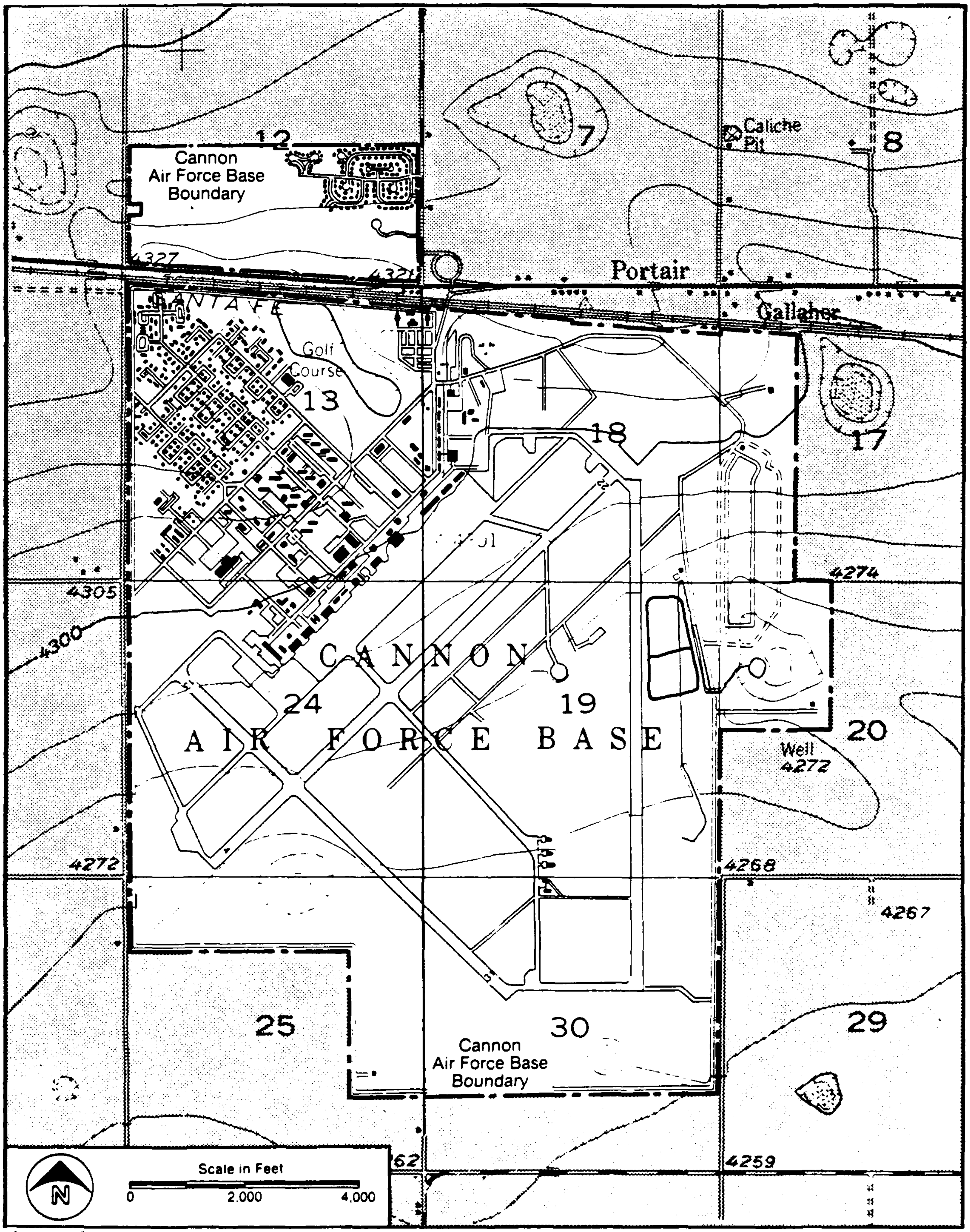
One aspect of the realignment is that the effects of the action on Pecos MOA use will not result in a significant change to current practice. Cannon AFB operations currently utilize the Pecos MOA for training purposes. As shown in Figure 1.2-1, the Pecos MOA is due west of Cannon AFB. Current scheduling of the Pecos MOA is near saturation. While aircraft being realigned to Cannon AFB will almost certainly be scheduled for some use of this existing MOA, no net change in utilization of the MOA is anticipated. The effective impact of this component of the action is considered insignificant.

1.3 SCOPING PROCESS

To make the NEPA process more useful to decision-makers and the public, CEQ regulations require a scoping process. The objective of this process is to determine the scope of issues to be addressed and to identify significant issues related to the action.

As required by NEPA and AFR 19-2, the Air Force contacted federal, state, and local agencies, individuals, and interest groups for their input regarding potential environmental impacts of the realignment of Cannon AFB.

The Notice of Intent to prepare an EIS was published in the Federal Register on 17 February 1989. Press releases, other announcements, and letters were sent to federal, state, and local government civic leaders apprising them of the realignment. Scoping meetings were held on 28-29 March 1989 in Clovis and Portales, New Mexico. The scoping period ran from 17 February 1989 through 1 May 1989.



Adapted from Cannon AFB, August 1983

Figure 1.2-4. Map of Cannon Air Force Base, New Mexico

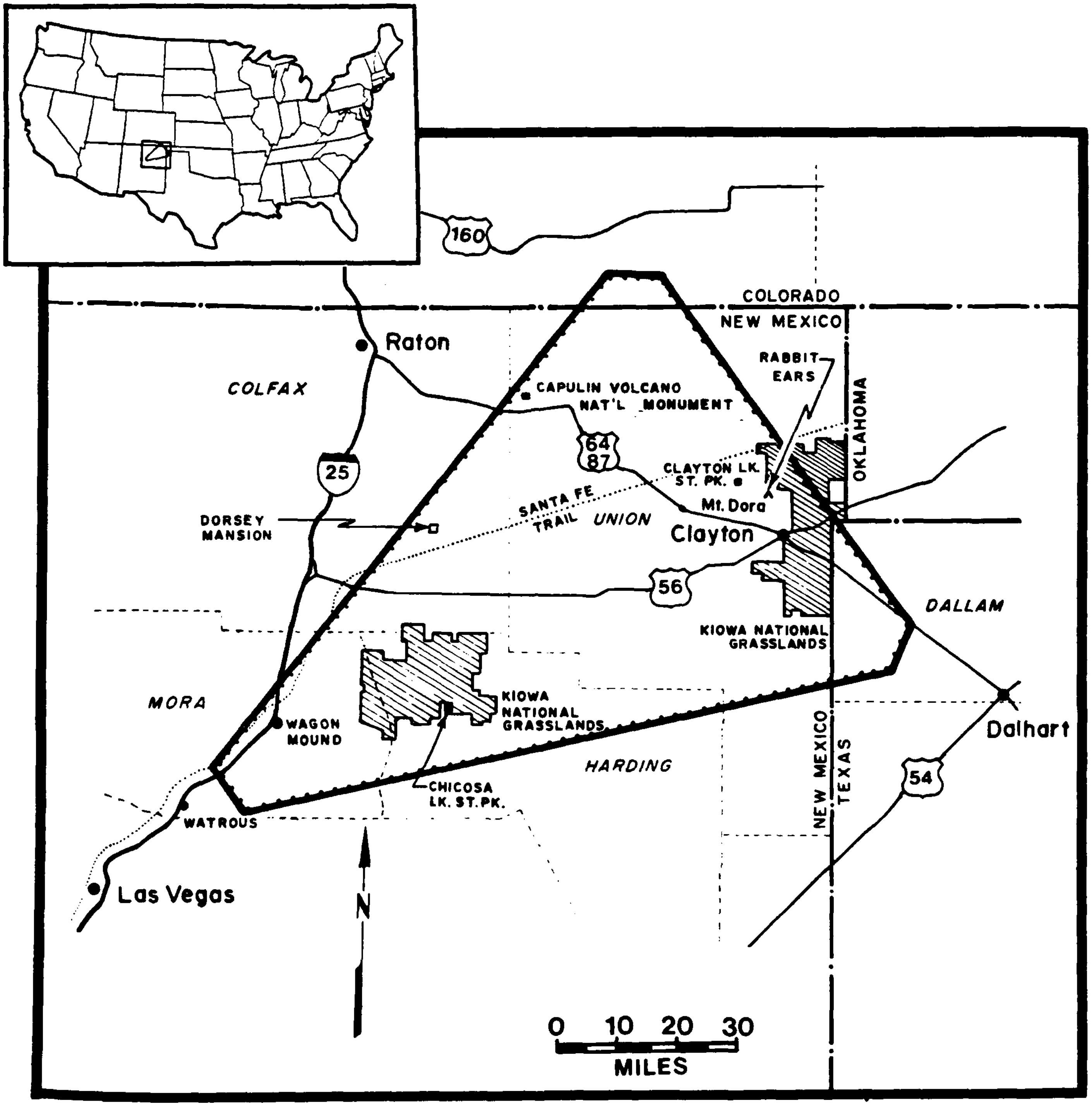


Figure 1.2-5. Proposed Mount Dora Military Operations Area

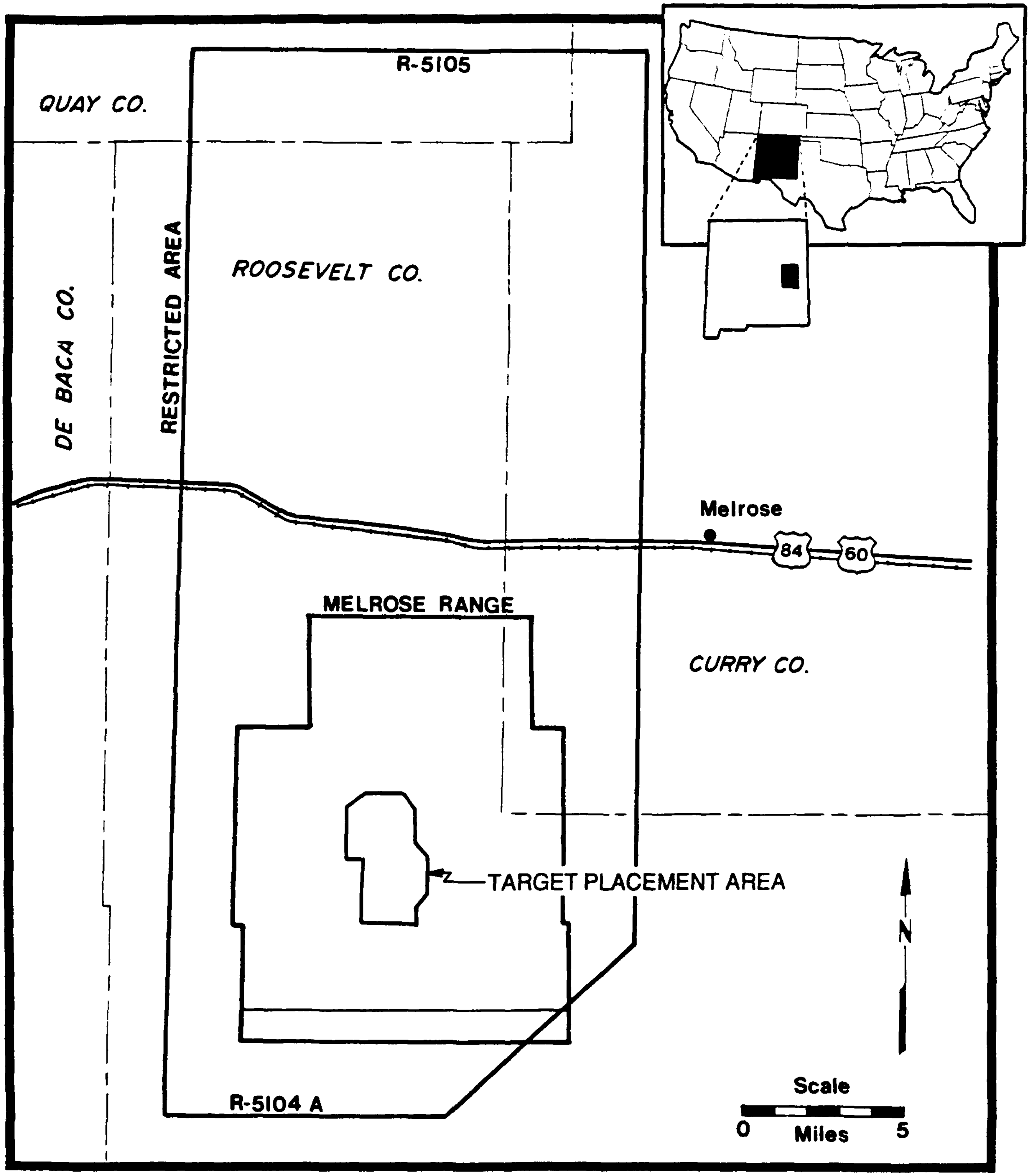


Figure 1.2-6. Melrose Range Operations Area

Potential impacts resulting from activities associated with the increase in aircraft include air quality and noise impacts as a result of the increase in sorties and on-Base construction. Construction will also involve labor requirements and land disturbance. Maintenance of the additional aircraft, especially refurbishing, painting, fuel handling, and fuel storage, will impact waste generation, air quality, and material procurement. The scoping process identified potential impacts associated with the increased personnel. These impacts include: economic effects on the local economy, including employment and increased demands on the infrastructure such as housing, utilities, and public services; sewage and domestic waste disposal; impacts associated with off-Base construction, such as labor requirements and land disturbance; and increased water requirements on the Base and in the community. Potential impacts associated with the new MOA and increased range use include: overflight noise, specifically as it relates to animals, human health and safety, and land use; emissions and air quality; and restricted air space considerations. The net effect on the Pecos MOA use is expected to be insignificant, so no incremental impacts are expected.

1.4 RELEVANT FEDERAL, STATE, AND LOCAL STATUTES AND GUIDELINES

A body of federal, state, and local environmental statutes/guidelines affects the Department of Defense (DOD) activities in the State of New Mexico. Executive Order 12088, "Federal Compliance with Pollution Control Standards," mandates that all federal agencies conform with applicable federal and state environmental legislation, both procedurally and substantively. This section presents the laws that have a direct bearing on the impacts or mitigations of the proposed action.

1.4.1 Air Quality

The increased use of aircraft will result in increased air emissions. The occurrence of site construction activities could also lead to some emissions. These items necessitate study of the impacts on air quality.

The Clean Air Act (42 U.S.C. 7401 et seq.) (CAA) is the principal federal statute establishing policy relative to ambient air quality. The fundamental goals of the CAA are to protect and enhance the nation's air quality and to safeguard public health and welfare. The goals are principally achieved by the National Ambient Air Quality Standards (NAAQS) and the National Emission Standards for Hazardous Air Pollutants (NESHAP). Title I of the CAA directs the U.S. Environmental Protection Agency (EPA) to issue and enforce these regulations.

Primary NAAQS levels were established to protect human health, providing an adequate margin of safety. Secondary NAAQS levels were defined to meet welfare concerns, such as protection of crops and vegetation, protection of materials, effects on transportation, and effects on personal comfort and general well-being. Pollutants of concern to this EIS include carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulate matter.

The CAA also requires each state to develop a State Implementation Plan (SIP). The foremost goal of the SIP is state implementation, maintenance, and enforcement of the NAAQS. The SIP contains the state's plan for regulating new and existing sources of air pollutants such that emission levels are reduced in nonattainment areas so as to reach attainment of the NAAQS within a specified time frame. Nonattainment occurs when the concentration of one or more airborne pollutants exceeds the NAAQS. For areas currently in attainment, the SIP must contain procedures for the Prevention of Significant Deterioration (PSD) of air quality.

After approval by EPA, the SIP empowers the cognizant state agency with the authority to issue rules and regulations for the control of air emissions within the state. In New Mexico, the authority to issue and enforce regulations regarding air pollution rests with the New Mexico Air Quality Bureau. It is a subordinate agency of the Environmental Improvement Division (EID) of the Health and Environmental Department of the State of New Mexico.

A New Source Performance Standard (NSPS) for volatile organic liquid (VOL) storage vessels constructed, reconstructed, or modified after 23 July 1948 (40 CFR Part 60), applies to air emissions resulting from additional fuel storage.

1.4.2 Solid Wastes, Hazardous Wastes, and Hazardous Materials

Solid wastes will be generated as a result of building demolition. Hazardous and nonhazardous solid wastes are regulated under the Resource Conservation and Recovery Act (RCRA) of 1976 and subsequent amendments. RCRA specifically tasked the EPA to establish a "cradle-to-grave" hazardous waste management system. In response, the EPA promulgated regulations governing the generation, transportation, storage, treatment, disposal, and recycling of hazardous waste [40 Code of Federal Regulations (CFR) Parts 260-272]. The regulations also provide for qualified states to manage their own programs, provided that the program meets or exceeds the EPA requirements. The State of New Mexico has such a program.

Other related legislation includes the Toxic Substances Control Act (15 U.S.C. 2601 et seq.) (TSCA) of 1976 and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 as amended. TSCA is primarily aimed at manufacturers and distributors of toxic chemicals, but it also contains specific requirements regarding use, handling, and disposal of certain chemicals posing unusual health risks. CERCLA primarily addresses the cleanup of uncontrolled hazardous waste sites.

The DOD has published an implementing directive, DOD Directive 5100.50, "Protection and Enhancement of Environmental Quality," outlining their policy to comply with all applicable portions of the federal and state regulations.

1.4.3 Aircraft Noise

Federal regulations that govern the control and abatement of noise include the Operational Safety and Health Act of 1970, Noise Control Act of 1972, the Quiet Communities Act of 1978, and the Aviation and Noise Abatement Act of 1979. Local noise ordinances would also apply to the proposed actions.

The NEPA, the President's CEQ Regulations, and the DOD Directive 6050.1, "Environmental Considerations in DOD Actions," govern the regulatory process for assessing environmental effects including military aircraft noise and sonic boom. These processes include the preparation of environmental impact analyses (such as described by AFR 19-2 for Air Force and Air National Guard Activities) and Air Installation Compatible Use Zones (AICUZ) reports.

The EPA, directed by the Noise Control Act of 1972, has published two main documents on noise. One is the Criteria Document entitled Public Health and Welfare Criteria for Noise, and the other is the Levels Document, entitled Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. The latter document has served since 1974 as the primary reference for methods of noise analysis and noise assessment. It does not provide regulatory requirements but provides much information which has been used in the preparation of other local, state, and federal standards or guidelines.

1.4.4 Cultural/Native American

The NEPA of 1969 (PL 91-190), the National Historic Preservation Act (NHPA) of 1966 (PL90-1320), and the American Indian Religious Freedom Act (AIRFA) of 1978 (PL 95-341) serve to give Native American people input into projects that may affect their traditional cultural and religious values.

Section 106 of the NHPA directs federal agencies to take into account the effects of their proposed activities on any historic district, site, building, structure, or object that is included in, or is eligible for, the National Register of Historic Places (NRHP).

The AIRFA of 1978 made it the policy of the United States to protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise their traditional religions. Subsequent to the passage of AIRFA, the Advisory Council on Historic Preservation (ACHP) issued draft guidelines in 1985 that incorporated the requirements associated with AIRFA under Section 106 of the NHPA. Guidelines that implement AIRFA recommend that traditional cultural and religious values of Native American people be included under Section 106 of the NHPA because religion is not segregated from other aspects of Native American society and because places of Native American worship and veneration are cultural landscapes, mountains, lakes, rocks, trees, plants, animals, running water, and other natural features endowed with protective power in Native American religious belief. These draft guidelines are particularly applicable as a result of the inclusion of the proposed Mount Dora MOA.

1.4.5 Biological Environment

Native and naturalized plant and animal populations within the project area have the potential to be affected adversely by the proposed activities (e.g., aircraft noise, engine emissions, etc.). Wildlife and wildlife habitats are protected under numerous federal laws such as the Endangered Species Act, the Bald and Golden Eagle Protection Act, the Migratory Bird Conservation Act, and the Sikes Act. Stream and wetland habitats are protected under the Clean Water Act and Executive Order 11990 (Protection of Wetlands).

The Endangered Species Act directs federal agencies to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of habitat designated as critical for the species.

The Bald and Golden Eagle Protection Act gives special protection to eagle species. The law prohibits the pursuing, shooting, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing of these birds. The Migratory Bird Conservation Act provides for the preservation introduction, and restoration of migratory birds. The law contains most of the same provisions as the Bald and Golden Eagle Act.

The Sikes Act authorizes the Fish and Wildlife Service to work cooperatively with other agencies in the preparation of wildlife management plans for federally-owned lands managed by the Forest Service, the Bureau of Land Management, the Department of Defense, and the Department of Energy.

CHAPTER 2.0 - ALTERNATIVES CONSIDERED INCLUDING THE PROPOSED ACTIONS

2.1 INTRODUCTION

This chapter describes the realignment addition of aircraft and personnel and the associated proposed actions needed to meet training needs for Cannon Air Force Base (AFB) in sufficient detail to allow environmental impacts to be assessed. Provisions of the Base Realignment and Closure Act preclude the examination of any alternative actions to realignment of the Base. The Act requires implementation of the realignment; therefore, the "No Action" alternative is not discussed. The only alternatives to be addressed will be alternative methods of carrying out the realignment which would include meeting associated Base training needs.

Cannon AFB is currently home to the 27th Tactical Fighter Wing (TFW), consisting of two operational squadrons, the 522nd and the 523rd. Additionally, Cannon AFB is home to the 524th Tactical Fighter Training Squadron (TFTS), and the F-111 Fighter Weapons School is located here, with their aircraft assigned to the 524th TFTS. There are 62 primary aircraft assigned to these units, flying approximately 8200 sorties each year for a total of between 17,000 and 18,000 flying hours. As of July 1989, Base-related direct employment was 3984, 3539 military personnel and 445 appropriated-fund civilian personnel (Housing Management Office, Cannon AFB, 1989).

The realignment action calls for Cannon AFB to cover the missions of two F-111 aircraft wings: the 27th TFW, currently located there, and the 474th Tactical Training Wing (TTW). The net addition of 46 new aircraft and associated personnel will activate an Air Division and the 474th TTW. The projected increase in Base-related employment is 1739, 1662 military personnel and 77 civilian personnel (Housing Management Office, Cannon AFB, 1989). The addition of new aircraft and personnel will begin in the fourth quarter of Fiscal Year (FY) 1990 and will be completed in the first quarter of FY92. The realignment action will result in increased use of the Melrose Range, continued full use of the Pecos Military Operations Area (MOA), increased use of existing Military Training Routes (MTRs) associated with these areas, and the Air Force's proposed creation of a new Mount Dora MOA to meet training needs and maintain combat readiness.

Alternatives to the Cannon AFB realignment itself are precluded by law. The only required analysis of alternatives is that associated with reasonable alternative ways to implement the Commission's recommendations [AF Regulation (AFR) 19-2]. Alternative ways to implement the realignment of aircraft to Cannon AFB and associated personnel increases include:

- use of existing buildings, facilities, and support operations, or
- construction and expansion of buildings and facilities.

To meet the additional airspace use demands resulting from the Cannon AFB realignment, the creation of a MOA is being proposed. Alternatives to implementing the creation of a MOA include:

- use of current MOAs as they exist, and
- expansion of the airspace or the usage of existing MOAs.

The increased use of the Melrose Range is an extension of current practice and is consistent with the prior land area expansion of this range (Department of the Air Force Tactical Air Command, April 1985). The current rate of use for the Pecos MOA will be essentially maintained under the action. Implementation alternatives are considered for these aspects of the realignment.

Four of ten MTRs already established by Cannon AFB go to/from/under the proposed Mount Dora MOA. These routes provide access to Pecos MOA, Melrose Range, and other ranges. No new MTRs will be needed to accommodate the added aircraft at Cannon AFB. Existing MTRs will be used to meet the operational needs associated with these new activities. Creating new MTRs when adequate MTRs are available is not consistent with FAAH 7610.4, Special Military Operation. This handbook states routes shall be limited to the minimum number necessary to support operational requirements, as determined by the appropriate military major command; and to the extent possible, routes shall be designed to accomodate the maximum number of users and activities. Creating new MTRs would impact areas that are not presently impacted. Increasing the use of established MTRs that provide access to the proposed MOA is consistent with established FAA procedures (7610.4), and there are no significant impacts caused by the increased usage of these MTRs.

2.2 THE PROPOSED ACTIONS

Implementation of the Commission's action for the realignment of personnel and aircraft to Cannon AFB involves decided actions and proposed actions. The decided actions include:

- the movement of aircraft such that there will be an increase of 46 F-111s at Cannon AFB and
- an approximate 44 percent increase in personnel.

As a result of these decided actions, the following proposed actions are needed to maintain operational efficiency and combat readiness.

- increased aircraft operations for the Base, Melrose Range, and existing MTRs used for traveling to and from the Base, Range, and MOA,
- a military construction program,

- establishment of the Mount Dora MOA, and
- continued full use of the Pecos MOA.

The following subsections discuss these aspects of the decided and proposed actions.

2.2.1 Increase In Aircraft

The action involves locating an Air Division at Cannon AFB. This Air Division will include the 27th TFW, essentially intact, and addition of the 474th TTW. Figure 2.2.1-1 shows the F-111 levels for the 27th TFW and 474th TTW during the 1989 to 1992 period of the realignment. During this period, the 27th TFW will lose 2 F-111s and the 474th TTW will be established. Table 2.2.1-1 summarizes the existing and future numbers of F-111 aircraft, sorties, and flying hours. A sortie encompasses all movements of a single aircraft from take-off to landing.

2.2.2 Increase in Personnel

Base-related direct employment, as of July 1989, was 3984; 3539 were military personnel and 445 were appropriated-fund civilian personnel (Housing Management Office, Cannon AFB, computer output of personnel files, 1 and 3 August 1989). Of these, 1841 military personnel were housed on Base. As shown in Table 2.2.2-1, it is expected that the action will increase military personnel by 1662 and appropriated-fund civilian personnel by 77, an increase of 43.6 percent. The number of military personnel housed on Base is expected to increase by 418. A 700-unit new housing program is being planned to mitigate the population increase. Detailed breakdowns of current and projected personnel by rank and the distribution of personnel on and off Base are provided in the Socioeconomics Section 3.1.4. Figure 2.2.1-1 indicates the time-relationships of the movement of aircraft, the military construction program, and the arrival of personnel in terms of Base-related direct employment.

The increases in regional earnings plus the expenditures for military construction accompanying the realignment are expected to contribute to increases in civilian employment in the area surrounding Cannon AFB. These changes are discussed in detail in Appendix A. As shown in Table A.1-1 of Appendix A, the estimated increases in population (including military and civilian, direct and indirect employees, and their dependents) will range between 2792 and 5440 from FY90 to FY92.

2.2.3 Increased Aircraft Operations

Table 2.2.3-1 shows the additional operational considerations for Cannon AFB. The increased flight operations will all be at subsonic speeds. The projected sortie operations will not require an increase in the number of low-altitude training routes or

Table 2.2.1-1. Current and Future F-111 Aircraft and Flight Operations Data

	Current Conditions	Future Level	Increase
Aircraft	62	108*	46
Annual Sorties:			
Based Aircraft	8,190	16,190	8,000
Transient Aircraft	11,430	11,430	0
Total	19,620	27,620	8,000
Flying Hours:			
Based Aircraft	17,350	35,350	18,000

* The current number of aircraft (62) will be reduced by 2, and 48 aircraft will be brought in, for a total of 108 aircraft.

Note: A sortie encompasses all movements of a single aircraft from take-off to landing.

Table 2.2.2-1. Proposed Changes in Base Personnel Associated with the Proposed Action

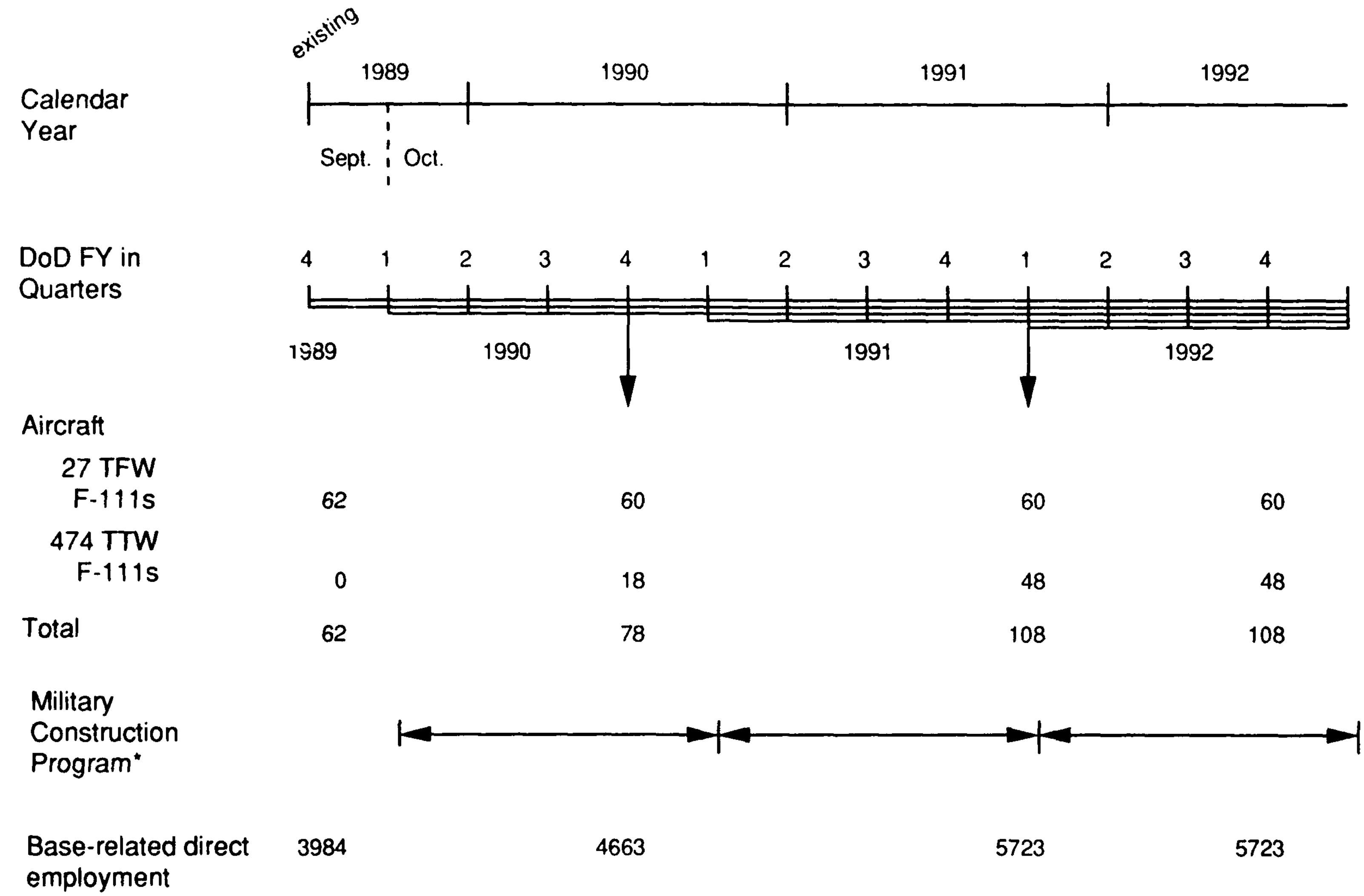
Category	Baseline[1]	Jul-Sep[2] 1990	Oct-Dec[3] 1991	Addition
Military	3539	4188	5201	1662
Officers	378	420	561	183
Enlisted	3161	3768	4640	1479
Appropriated-Fund Civilian	445	475	522	77
Total	3984	4663	5723	1739

Source: Housing Management Office, Cannon AFB, August 1989

[1] Baseline personnel authorizations are for July 1989, prior to any Base realignment actions.

[2] This increase is due to the arrival of the first 18 F-111s.

[3] This increase is due to the arrival of the remaining F-111s.



• For specific FY projects, see Table 2.2.2-1

Sources: Housing Management Office, Cannon AFB, 1989.
Swaney, 1989, personal communication.

Figure 2.2.2-1. FY90 to FY92 Timeline for Military Construction, Aircraft Movement, and Arrival of Personnel

Table 2.2.3-1. Additional Operational Considerations for Cannon AFB, NM (F-111 Training Wing)

	Current	Realignment	Total
Aircraft Authorizations:	62	48	108
Annual Sorties (F-111 Aircraft)	8,190	8,000	16,190
Daytime	7,760 (95%)	7,600 (95%)	15,360 (95%)
Nighttime	430 (5%)	400 (5%)	830 (5%)
Aircraft Movements (F-111)	57,760	55,550	113,310
Closed Patterns	41,540	40,000	81,540

another bombing range, but will require increased use of Melrose Range (Table 2.2.3-2) and associated MTRs (Table 2.2.3-3). The Range and MTRs are in low population areas. The 27th TFW, Cannon AFB is the prime user of the Melrose Range. In addition, Strategic Air Command (SAC) also uses the Range.

The Melrose Range use will require additional flying hours (Table 2.2.3-4). The Melrose Range currently operates at 84 percent utilization during daytime hours. Approximately 1800 hours of down time are needed annually for Range maintenance activities. For nighttime, the Range is operated only when flying occurs, so availability matches utilization. Melrose Range is currently operated from sunrise to sunset, so an increase in Range daylight operating hours is not feasible. However, by adding additional targets and expanding the Television Ordnance Scoring System and by closing half the Range for maintenance while half remains operational, availability will increase some 1800 hours. Expanding nighttime availability at Melrose Range can be accomplished simply by extending nighttime operating hours.

The action will involve a proportional increase in the amount of ordnance used on the Range. The only ordnance currently authorized for use on Melrose Range is inert training munitions.

Use of existing MTRs will be expanded to meet the F-111 operational needs for accessing the MOAs and Range and meeting other operational aircraft movement needs (Table 2.2.3-3). The MTRs which will undergo significant increases in use to access these areas are Instrument Routes (IR) 107, 109, 111, 113 and Visual Routes (VR) 100, 108, 114, 125, 1107, 1195. The increased use of these MTRs will be a function of the projected use of the MOAs and Range discussed above. Section 3.1.5.1 summarizes the Cannon AFB MTRs, and Appendix C provides further details.

2.2.4 Military Construction Program

Additional facilities are needed to accommodate the increase in personnel and aircraft resulting from the realignment. The facilities, described in the military construction program, include airfield pavements, operations facilities, maintenance facilities, support facilities, administration facilities, and personnel support facilities. This program will enable Cannon AFB to upgrade, where appropriate, the existing technology in waste management, water conservation, and wastewater treatment. All construction will be implemented in accordance with the Base Comprehensive Plan and in compliance with environmental permit requirements for construction and operation.

The construction projects proposed for the realignment consist mostly of operations-related and maintenance facilities. The proposed military construction program includes the items shown in Table 2.2.4-1. Figure 2.2.4-1 shows the locations of the construction sites. Each activity presented is based on the FY90, FY91, FY92 Military Construction Project Data generated on 8 March 1989. Although not part of the realignment action, there is a separately funded hospital expansion occurring on the Base.

Table 2.2.3-2. Melrose Range Annual Sorties

	Annual Sorties*	
Current		Future**
5554[a]		8304[b]

Source: Cannon Air Force Base, 27th TFW/DOAM

* 260 days/yr, 1.6 worst month factor, 3 passes/sortie

** Assumes no growth of non-Cannon users. If projected SAC growth occurs, this value will increase to 10,685.

[a] This projected value is a portion of the 5700 scheduled sorties.

[b] This projected value is a portion of the 8450 scheduled sorties.

Table 2.2.3-3. Annual Sorties for the MTRs Associated with the Melrose Range

MTR	Annual Sorties	
	Current	Future
VR 100/125	252	504
IR 113	1200	2400
VR 114	1200	2400
VR 1195/1107*	2200	2500
Totals	4852	7804

Source: Cannon Air Force Base, 27th TFW

* Cannon use assumed negligible (E.D. Harner, 31 October 1989)

Table 2.2.3-4. Melrose Range Annual Flying Hours

	Flying Hours			
	Daytime		Nighttime	
	Available	Used	Available	Used
Current	2163	1812	380	380
Projected	2433	2038*	630	630

* This value assumes the same use efficiency as that which occurs currently (84 percent).

Table 2.2.4-1. Proposed Construction Activity to be Undertaken in Support of the Proposed Action

FY Budgeted	Activity	Scope
1990	Extend north apron, install security lighting	50,000 SY
1990	Construct a Squadron Operations/Aircraft Maintenance Unit (AMU) Facility	24,500 SF
1990	Construct a Weapons and Release Systems Shop/Storage Facility	32,000 SF
1990	Construct one two-bay Small Aircraft (ACFT) Maintenance Dock	18,900 SF
1990	Alter existing primary Electrical Distribution System	NA
1990	Construct Aircraft Maintenance Supply Warehouse	62,900 SF
1990	Add to water supply and distribution systems	NA
1990	Construct one 200-person unaccompanied enlisted personnel dormitory	41,000 SF
1990	Construct a Shop Service Center to distribute incoming property	12,000 SF
1990	Construct a General Purpose Aircraft Maintenance (EMS Fabrication) Facility	25,000 SF
1990	Construct new streets, curbs, gutters, and sidewalks	NA
1990	Upgrade Munitions Complex	NA
	- - - - - - - - - FY90 Total $31M - - - - - - - - -	

Table 2.2.4-1. Proposed Construction Activity to be Undertaken in Support of the Proposed Action (continued)

FY Budgeted	Activity	Scope
1991	Expand sewage lagoon and collection systems	15 Ac
1991	Construct a CRS Accessory Shop Facility and Engine Shop storage	29,000 SF
1991	Construct addition to the south ramp and taxiway	40,446 SF
1991	Construct a Squadron Operations/AMU Facility (continuation of 1990 project)	24,500 SF
1991	Construct a three-bay Aircraft Corrosion Control Facility	39,700 SF
	--------- FY91 Total $17M ---------	
1992	Construct addition to the Field Training Detachment Facility	13,000 SF
1992	Construct one 100-person unaccompanied enlisted personnel dormitory	20,300 SF
1992	Construct an Air Division, Wing, and Group Headquarters Facility	27,100 SF
1992	Construct Aircraft Support Equipment Shop and Storage	22,500 SF
1992	Construct Base Civil Engineering Shops	10,000 SF
	--------- FY92 Total $10M ---------	

SY - square yards
SF - square feet
AC - acres
NA - not applicable
Source: Swaney, R.W., 31 July 1989. Department of the Air Force, HQ TAC/XPP. Personal communication with HQ TAC/DEE.

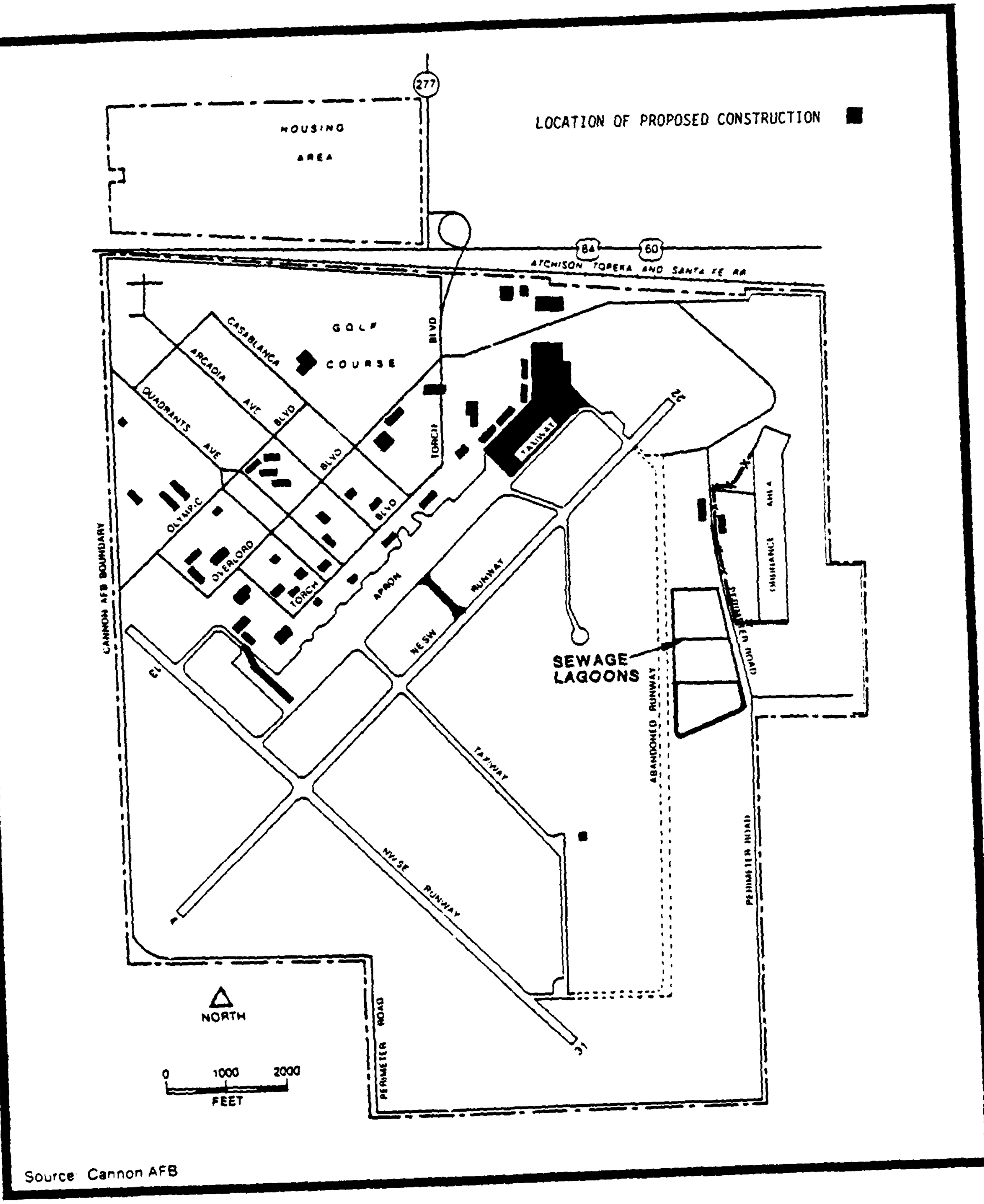


Figure 2.2.4-1. Cannon AFB Construction Program Sites

The construction projects are programmed to begin in FY90 and will not be completed before the first squadron arrives. To accommodate all additional personnel, aircraft, and functional requirements, a Facility Moves-Base Expansion Plan has been developed. This plan seeks to efficiently utilize existing facilities or temporary modular facilities and to minimize moving the same function more than once.

In FY90 the construction program consists of moves for additional space, inclusion of modular buildings for temporary space, moves to support construction of new facilities, and reviews of present space for better utilization. Approximately 25 modular buildings will be utilized for storage, classrooms, and other non-full-time-occupied functions to maximize the use of permanent facilities for work areas. Each unit contains 600 square feet of space. Activities proposed for FY91 and FY92 involve preparation for the second squadron arrival. This phase includes construction of an Air Division, Wing, and Group Headquarters facility, moves needed to support arrival of the second wing, and implementation of an expedient beddown plan.

2.2.5 Establishment of the Mount Dora MOA

To accommodate the increased flight training associated with the addition of another wing of aircraft in the Base Realignment Program, the establishment of the Mount Dora MOA north of Cannon Air Force Base is proposed. Those flight operations will be at subsonic speeds and over low-population areas. The MOA proposal is being coordinated with the Albuquerque Air Route Traffic Control Center (ARTCC) and is being discussed with the Federal Aviation Agency (FAA).

FAA Handbook (FAAH) guidance suggests that such a Special Use Airspace should be established within 100 nautical miles (nm) of the Base of the proponent. The area within 100 nm of Cannon AFB was searched for an already established MOA suitable for conducting additional training sorties. A suitable established MOA was not found; so, the same area was searched for a suitable area in which to establish a new MOA. This resulted in the Mount Dora area being identified. This MOA was judged to be the area best suited to the purpose for the following reasons:

- The area does not interfere with FAA routes.
- The area already has a remote communications transmitter/receiver site that belongs to the controlling ARTCC (Albuquerque).
- The total area is large enough to be subdivided into multiple segments and altitudes to accommodate simultaneous disassociated sorties and missions. Scheduling and using only the necessary levels and subdivisions for the particular missions provides optimum utilization efficiency and joint use.

- The proposed Mount Dora MOA already has low-altitude MTRs of Cannon AFB going through/under it to accommodate flights going to and from the MOA. Those routes have been successfully used for years and have been accepted by the surface population. The base of the proposed MOA at 1500 feet above ground level (AGL) will provide significantly less environmental concern and adverse influence than the MTRs already established therein.

- The majority of the area is in uncontrolled airspace. That means that the airspace has not already been identified or designated for other uses or purposes.

No other areas free of commercial airways and of a suitable size to conduct required air-to-air training were found within 100 nautical miles of Cannon AFB. For this reason, no other alternatives are discussed.

The missions of the 27th TFW and 474th TTW F-111 aircraft in the Mount Dora MOA are:

- Advanced Handling Characteristics (AHC): AHC is training in flying the aircraft to maximize subsonic performance and maneuvers. This training requires excursions through the complete range of maneuverable airspeeds (subsonic) and flight attitudes of the aircraft and is normally performed by a single ship. AHC is performed to familiarize the aircrew with aircraft performance close to the limits of the flight envelope.

- Aerobatic Training: This basic aerial acrobatic training usually involves performance of recognized aerobatic maneuvers, such as loops, rolls, Cuban eight, split S, and combinations of the same. All maneuvers consist of extremes of aircraft pitch and bank attitudes.

- Air Combat Tactics (ACT): This training involves flying and maneuvering the aircraft in the combat arena in defensive as well as offensive maneuvers. ACT may be a single ship, multiple vs single, or multiple vs multiple, usually of the same type aircraft. All maneuvers consist of extremes in aircraft pitch and bank attitudes and a wide range of speed excursions (subsonic).

- Dissimilar Air Combat Tactics (DACT): DACT is training much the same as ACT but involving dissimilar aircraft, i.e., F-111 vs F-15, F-5 vs F-111.

- Formation Training: This involves the practice of flying two or more aircraft in various formation configurations, i.e., close formation, spread or tactical formation, trail, etc. Formation skills are necessary to safely fly multiple ship flights at night, in adverse weather, or to conduct aerial refueling. Formation training in the MOA may consist of two or more aircraft in a flight and two or more flights.

- Instruments/Unusual Attitudes Recoveries/Steep Turns: This involves practice and training in flying the aircraft with reference to instruments alone. Recovery from unusual attitudes is to train in the safe recovery of the aircraft after partial instrument failure, disorientation, or vertigo. Annual instrument check flights are trained for and performed partially in MOA airspace.

- Combined Force Training (CFT): This involves periodic training of combined forces of various types of aircraft from different services in a short-term exercise that exploits the specialized employment of the forces' aircraft. A CFT exercise may use numerous airspace areas, both temporary and permanent. CFTs may involve transport, cargo, fighter, bomber, interceptor, reconnaissance, tanker, Airborne Warning and Control (AWACS), and helicopter aircraft.

The Mount Dora MOA will also accommodate missions of other users such as:

- Air-to-air intercepts (AI)

- Special missions aircraft use, (i.e., cargo/transport/helicopter)

The Mount Dora MOA as proposed would accommodate, in addition to the F-111 primary aircraft, the following aircraft on a frequent basis: F-15, F-16, and A-7. Infrequent use aircraft would be: AT-38, A-10, F-4, F-14, F-18, B-52, B-1, AC/EC/C-130, P-2, P-3, KC-130, KC-135, and KC-10. The projected annual sorties for the MOA are 792 sorties for the 27th TFW/474th TTW and 1036 sorties for other users. The majority of these sorties (80 percent to 90 percent) are conducted above 3000 feet AGL. All Mount Dora MOA operations will be at subsonic airspeeds.

Table 2.2.5-1 gives the proposed annual sortie use for the Mount Dora MOA. It is planned that the Mount Dora MOA will be used between 0830 through 2200 hours each day with occasional use on weekends. The flying day at Cannon AFB averages 14 hours, 0830 through 2230 hours each day, Monday through Friday. The average daylight is 12 hours per day. A doubling of sorties/flying hours/training requirements will be associated with the addition of another wing of F-111 aircraft in the Base Realignment Program.

The closest border of the Mount Dora MOA is 97 nm from Cannon AFB. It is completely within the Albuquerque ATRCC's area and clear of all Victor airways. Victor airways are designated in lieu of other airspace to serve enroute air traffic operations and are predicated upon navigation aids which are suitable for inclusion in the airway system. These airways are aerial "highways" that may be 3 or 4 nm either side of the centerline, depending on navigational aid location or surrounding/adjacent other airspace areas. The vertical limits of Victor airways are generally from 1200 feet AGL up to, but not including, 18,000 feet above mean sea level (MSL) (Airman Information Manual, AIM).

Table 2.2.5-1. Mount Dora MOA Proposed Annual Sorties

Elevation (ft, AGL)	1500	2250	3000	5000
Annual sorties at or above elevation	1828.0	1645.2	1462.4	731.2
Annual sorties at elevation	182.8	182.8	731.2	731.2

Source: Cannon Air Force Base, 27th TFW

Four Jet Routes overlie portions of the proposed Mount Dora MOA, and four 27th TFW MTRs are within or below the proposed MOA. These MTRs will provide the low-altitude training to and from Mount Dora. Table 2.2.5-2 gives the annual sortie use for these MTRs. Jet Routes are established above the Victor airway strata from Flight Level (FL) 180 (18,000 feet) up to and including FL 600 (60,000 feet). The top of the proposed Mount Dora MOA is below the Jet Route system; therefore, it will not interfere with the Jet Route structure.

The proposed Mount Dora MOA overlies approximately 5200 square statute miles and is mostly in uncontrolled airspace. The proposed floor of 1500 feet AGL would allow simultaneous scheduling of underlying MTRs with a minimum of low-altitude restrictions or conflicts. With the base of the proposed MOA at 1500 feet AGL, no adjustments to the base altitude would be required to accommodate clear access to the underlying three public and six private small municipal airports and other general aviation activities.

Three major federal highways pass beneath the MOA: US Routes 64-87 between Dalhart, Texas, and Raton, New Mexico, and U.S. Route 56 between Clayton and Springer, New Mexico. Interstate 25 (I-25) will pass beneath a small portion of the MOA, in the southwest corner, by Las Vegas, New Mexico. It is a common practice for light civil aircraft flying in visual flight conditions or under Visual Flight Rules (VFR) to follow along highways. Such flights along these routes as well as elsewhere beneath the MOA will remain clear of both the terrain and MOA flight operations. VFR aircraft may also fly within the MOA structure on a "see and be seen" basis with military aircraft.

Aircraft in instrument flight conditions or on an Instrument Flight Rule (IFR) flight plan could fly through the MOA airspace if clearance from other IFR traffic is provided by Air Traffic Control (ATC). Otherwise, IFR traffic would circumnavigate the MOA via the established Victor airways around it or the Jet Routes above it. Those factors were considered during the selection process of the Mount Dora MOA airspace.

The Mount Dora MOA will be stratified as follows:

- Mount Dora low - from 1500 feet AGL to, but not including, 11,000 feet MSL.
- Mount Dora high - from 11,000 feet MSL to, but not including, 18,000 feet MSL.

These strata will be subdivided as follows:

- Mount Dora east - in the eastern portion of the MOA, bounded by latitude line N36°30' and longitude meridian W103°45'.
- Mount Dora west - in the western portion of the MOA, bounded by latitude line N36°30' and longitude meridian W103°47'.

Table 2.2.5-2. Annual Sorties for the MTRs Associated with the Mount Dora MOA

MTR	Current Annual Sorties	Proposed Annual Sorties	Cannon Annual Sorties Departing MTR to Ascend to MOA	Annual Sorties Remaining on MTR (beneath MOA)
IR 107	1504	3126	323	2803
VR 108	322	656	68	588
IR 109	948	1937	200	1737
IR 111	949	1938	201	1738
VR 1574/117	24	96	**	**
Total	3723	7657	792	6865

Source: Cannon Air Force Base, 27th TFW

** Assumption: Non-Cannon users of Mount Dora MOA will not be entering the MOA below 5000 feet AGL.

- Mount Dora north - in the northern portion of the MOA, bounded by latitude line 36°30' and CIM 076 radial.

The stratification will permit efficient scheduling and productive joint use of the airspace. The subdivisions will provide additional efficiency in airspace scheduling and joint use. With a top altitude up to, but not including, 18,000 feet MSL, it would be below the Jet Route system.

Four 27th TFW Low-Altitude Military Training Routes are below the proposed Mount Dora MOA (IR-107, VR-108, IR-109, IR-111). These routes can provide low-altitude training to and from Mount Dora MOA missions. All training operations accomplished in the MTRs and proposed MOA would be flown at subsonic speeds.

2.2.6 Pecos MOA Use

The usage of the Pecos MOA is nearly saturated. Utilization of the Pecos MOA averages approximately 1820 sorties annually. The 27th TFW actual use averages approximately 670 sorties annually, and use by other units averages approximately 1150 sorties annually. Due to attrition factors, the current utilization rate of approximately 80 percent is considered saturated. Attrition is caused by adverse weather, aircraft malfunctions, and air aborts. Under the proposed action this full-utilization level will be maintained.

2.3 THE NO-ACTION ALTERNATIVE

Provisions of the Base Realignment and Closure Act (Public Law 100-526) preclude the examination of any alternative actions to realignment of the Base. Consequently, this document will only examine alternate methods of carrying out the realignment. Because the Act requires implementation of the realignment, "no action" is not an alternative and is not specifically included. The alternatives to be addressed will be alternative methods of carrying out the realignment, which would enable meeting associated base training needs.

2.3.1 Increased Aircraft Operations

Increased aircraft operations are needed for flight training. Failure to conduct flight training would degrade aircrew proficiency and combat readiness. As with all military units, personnel in the new wing must be able to train under conditions that will prepare them for the types of military threats they could face in wartime. Thus, the alternative of not increasing aircraft operations is not acceptable.

The increased F-111 use of the Melrose Range is needed to meet the primary mission of maintaining the capability to effectively deliver ordnance while flying at low altitudes over diverse terrain. Currently approximately 5600 annual range sorties are to be flown. Under the action, the annual range sorties will increase by approximately 2700 for a total of approximately 8300 annually. Without the increased training use of the Melrose Range, this capability would be degraded. Aircrews must develop and maintain low-altitude flying skills through regular training. Thus, the no-action alternative for the Melrose Range was determined not to be feasible because failure to use the range for training would degrade aircrew proficiency and combat readiness.

2.3.2 Military Construction Program

Implementation of the realignment without undertaking new facility construction is one alternative for the Base. This was determined not to be feasible because the existing buildings and runways will not accommodate the influx of personnel and aircraft. Expanded facilities will be required to support the additional planes and personnel, and existing maintenance facilities are not sufficient to support the expanded work. Failure to provide additional parking for the operational aircraft would force planes to be parked in an extremely cramped and functionally inefficient configuration, thereby potentially jeopardizing quick emergency response time and adversely impacting the overall national defense of the United States. Lack of adequate aircraft refueling capability would result in mission degradation. The training wing would have to sacrifice mission-essential training requirements, or the operational wing would have to forfeit maintenance requirements, consequently increasing safety hazards. Facility damage and increased exposure to disease-causing organisms would result from failure to expand the sanitary waste collection system. Failure to meet EPA requirements and environmental pollution would occur if the sewage lagoons were not expanded (Air Force, FY90, FY91, FY92, Military Construction Project Data, 8 March 1989).

2.3.3 Establishment of the Mount Dora MOA

An alternative to creating a new MOA would be expanding the use of existing MOAs. This alternative is not feasible because no established alternate MOA within 100 nm (FAAH 7400.2 criteria) of Cannon AFB could accommodate the increased flight activity of the additional aircraft being transferred to Cannon AFB. The closest border of the proposed Mount Dora MOA is 97 nm from Cannon AFB. As discussed below, expanding the usage of the current Pecos MOA, owned by the 27th TFW at Cannon AFB, or Reese MOAs cannot accommodate the increase in training generated by an added wing at Cannon AFB.

The training requirements for MOA-compatible missions are currently 952 sorties per 6 months. The 27th TFW performs 95 percent of its MOA-compatible training in the Pecos MOA. The Pecos MOA is the only such training airspace within 100 nm of Cannon AFB. The remaining 5 percent of MOA-compatible training is accomplished in other MOAs during cross-country flights and deployments. Most Pecos MOA training sorties require daylight hours. Night training requirements are primarily met in non-MOA airspace. Night training in terrain-following, low-altitude navigation, radar bomb scoring, aerial refueling, bombing practice, formation landing approach practice and transition, and instrument approach practice are all done in other types of airspace. A small percentage of night transition training is done in MOA airspace. Some basic formation practice is accomplished in the Pecos MOA by aircrews in their early transition night syllabus training.

As cited in Section 2.2.6, current use of the Pecos MOA is effectively full time. The doubling of sorties/flying hours/training requirements associated with the addition of another wing of F-111 aircraft in the Base Realignment Program, coupled with take-off windows and attrition factors such as adverse weather, maintenance, malfunctions, and air aborts, means that the training sortie requirements from Cannon AFB cannot be fit into daylight use of the Pecos MOA.

Some of the factors that limit mission accomplishment of MOA missions are:

- Mission time lost due to aircraft late delivery and subsequent late entry into training airspace.
- Mission time lost due to unsuitable weather in the working area.
- Mission time lost due to Air Traffic Control delay.
- Mission time lost or preempted due to in-flight emergency or essential equipment malfunction.
- Mission time lost due to nonavailability of the essential other flight member(s) *required for mission accomplishment (e.g., formation practice or dissimilar* aircraft combat tactics).

Evaluation of extending and/or modifying airport operating hours was performed. The beginning of the flying day at Cannon AFB is regulated by its airport opening time of 0830 hours. Manning levels and available personnel work shifts of Air Traffic Services; maintenance work hours; and environmental concerns in the vicinity of the Base and flight routes/areas have established the opening and closing hours of the airport. It is not anticipated that the opening time of the Cannon flying day will be moved earlier than 0830 hours because of the above factors.

The Cannon AFB flying day is divided into two main aircraft launch ("go") periods. Currently the morning go is from 0830 hours through 1200 hours, and the afternoon/evening go is from 1600 hours through 2000 hours. With an average sortie duration of 2.3 hours for Cannon-based F-111s, the duration of the first launch period could be extended to 1330 hours in order to make available additional sorties to the Pecos MOA during daylight hours. The extension of the first daily launch window could produce an additional 10 sorties, approximately 5 of which would have daylight Pecos MOA-compatible missions. The sortie duration and recovery/turnaround time for those additional 10 aircraft would provide no daylight Pecos MOA-compatible missions in the second daily launch period. It should be noted that the 2.3-hour average sortie duration is longer than other Tactical Air Command (TAC) fighter aircraft. Unlimited aircraft resources would be needed to have continuous launches throughout the day without a turnaround period between launch periods. The evening or second launch period from 1700 hours to 2000 hours cannot be commenced earlier because it is determined by the recovery and turnaround/preparation of a portion of the aircraft flown during the first launch period. The second launch period of the flying day would therefore produce no daylight Pecos MOA-compatible sorties. The second launch period of the day could be extended to 2100 hours, but would not provide any daylight sorties to the Pecos MOA. Thus extension and/or modification of airport opening or closing hours and launch periods are not viable mechanisms to increasing the use of the Pecos MOA.

Most non-27th TFW users of the Pecos MOA do not enter Cannon airspace. Non-27th TFW MOA users are valid secondary users that can effectively justify use of the Pecos MOA. Normally, schedulers of Special Use Airspace may not preclude use of the airspace by other authorized users. The 150th Tactical Fighter Group (TFG), NMANG, is a frequent user of the Pecos MOA. The MOA is conveniently located for the Albuquerque-based unit, which has MTRs to and from the MOA. Additional users of the Pecos MOA are F-15s based at Holloman AFB, New Mexico, and F-16s temporarily operating out of Holloman three months per year. If non-27th TFW use of Pecos MOA were eliminated, it would make more Pecos MOA periods available to 27th TFW aircraft. Limiting factors that would still preclude the accommodation of twice the Pecos MOA missions from Cannon AFB are the uncontrollable mission degradations of maintenance, aborts, and adverse weather in the MOA. The complete elimination of Pecos MOA use by non-27th TFW aircraft as an alternative to the establishment of the Mount Dora MOA could not be justified. The non-27th TFW users of the Pecos MOA have an established, valid need to use that airspace. Optimum use of special use airspace is consistent with current directions. Using agencies are encouraged to make their airspace available for the activities of other agencies on a shared use basis. Excluding Holloman AFB from the Pecos MOA is not consistent with current directions. Further, Holloman AFB has been told on several occasions by the Albuquerque ARTCC that no additional airspace is available within 150 NM of Holloman AFB to create an additional MOA for the 49th TFW. Excluding the Holloman AFB aircraft from the Pecos MOA could have a direct negative impact on their mission readiness due to accessibility to training airspace within a reasonable distance. Because of the availability to Cannon AFB of the basically "undeveloped" airspace of the proposed Mount Dora MOA, elimination of Pecos use by non-Cannon users is not considered a valid alternative to the establishment of the Mount Dora MOA.

The only other existing MOAs of significance within 100 nm of Cannon AFB are the Reese MOAs. These MOAs are used from sunrise to sunset, Monday through Friday, for undergraduate pilot training. According to the FAA at Lubbock, Texas (W. Shaffer, personnel communication), these MOAs are fully scheduled throughout each day. The aeronautical charts for these MOAs note them as "high density student training" to alert civil aircraft. Thus the alternative of using these MOAs is not viable due to use and scheduling.

The proposed location of the Mount Dora MOA was made based upon two criteria: an area that is within 100 nm of Cannon AFB, and in a fairly unpopulated location. Coincidentally, established MTRs were already available for entry and exit to the proposed location. The basis for choosing the MOA location must also address civilian and military airspace restrictions and usage. After researching the available airspace within 100 nm of Cannon AFB, the proposed Mount Dora MOA location was selected. Alternate site locations were considered during the initial site search for a new MOA. Locations to the east contain special use airspace that is saturated with student flying and prevents expansion for Cannon AFB aircraft. Locations east through southwest are proliferated with airports and airways. To the west, special use airspace prevents creating a new MOA and expansion is not feasible in the present special use airspace due to established airways. Airways and airports prevent MOA establishment in the northwest and northeast areas. The proposed location is the only location that does not involve established special use airspace or airways.

The Mount Dora MOA area will satisfy the military requirements, while minimizing the effect on nonparticipating aircraft operations. Changes to established airspace configurations such as federal airways, Jet Routes, or airport traffic areas will not be required. The MOA will provide a satisfactory triangular area, completely free of visual routes. The MOA exceeds the minimum equivalent of a 40 nm by 60 nm rectangular area. The majority of the proposed Mount Dora MOA is in uncontrolled airspace and has adequate communications throughout. Alternatives to this location did not provide the same airspace capabilities. The Mount Dora MOA will provide an alternative training area far enough away from the Pecos MOA that an adverse weather system would not likely close both MOAs simultaneously. Furthermore, the Mount Dora MOA would provide essential training and scheduling flexibility.

2.3.4 Pecos MOA Use

The no-action alternative is being proposed for the Pecos MOA. That is, continued use at current levels will be maintained.

2.4 Summary of Impacts

Table 2.4 summarizes the potential impacts associated with the proposed action, discusses the significance of the potential impact and identifies mitigation measures. This table is based on the results presented in Chapter 4. As discussed in Section 2.3, the impact of the no-action alternatives, if implemented, would be unacceptable degradation of combat and operational readiness due to lack of training and needed facility support.

Table 2.4-1. Summary of Comparative Analysis of Impacts From the Proposed Action

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
<u>Base Area</u>:			
<u>Air Quality and Meteorology</u>			
Emissions due to increased F-111G flight operations could potentially cause air quality to exceed applicable standards.	Maximum short-term emissions are not expected to cause air quality in the vicinity to exceed state or federal standards.	None required.	Not significant.
Increased emissions from aircraft ground support activities, including fuel transfer losses, could potentially cause air quality to exceed applicable standards.	At anticipated fuel usage rates, emissions are insignificant compared to emissions from aircraft engines.	None required.	Not significant.
Increased vehicular emissions from the additional Base personnel and a general increase in Base activities could potentially cause air quality to exceed applicable standards.	Maximum short-term emissions are not expected to cause air quality in the vicinity to exceed state or federal standards.	None required.	Not significant.
Extensive military construction will generate fugitive dust from such activities as water well drilling and soil excavation, loading, and hauling.	Fugitive emission levels based on the cumulative area of projects and general construction emission factors are not expected to cause air quality in the vicinity to exceed state or federal standards.	None required.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Base Area:			
Cumulative emissions from all activities associated with the proposed action could potentially cause air quality to exceed applicable standards.	Estimated concentrations do not exceed state or federal standards for CO, NO_2, TSP, and SO_2. There are no applicable standards for hydrocarbon emissions, but impacts are expected to be insignificant due to the intermittent nature of activities which would emit low levels of hydrocarbons.	None required.	Not significant.
Noise			
Additional flight and engine-test operations of the relocated aircraft could cause an increase in long-term noise exposures around the Base.	The number of "highly annoyed" people located off Base is expected to increase from 88 currently to 118.	Sound insulation of dwellings in areas significantly impacted. Land use controls, relocation of residents in high-impact areas, modified flight tracks to avoid residential areas.	Increases in outdoor aircraft noise exposure.
Construction of new facilities on the Base could cause short-term noise impacts in the vicinity.	Increases in noise levels in residential areas from Base construction activities are temporary and minor.	None required.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Base Area:			
Increases in road traffic due to additional personnel on the Base could cause long-term noise impacts in the vicinity.	Increases in noise levels in residential areas from increased vehicular traffic around the Base are not significant relative to noise levels caused by aircraft operations.	None required.	Not significant.
Water Resources			
Increased personnel and Base activity could adversely affect water availability.	*Water resource* use expectations are within previously planned usage levels. A water supply study for Cannon AFB has been commissioned to evaluate the existing supply system and to provide recommendations to meet future demand.	None required.	Not significant.
Potential degradation of water quality.	No adverse impacts expected.	None required.	No adverse impacts.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
<u>Base Area</u>:			
<u>Socioeconomics</u>			
Socioeconomic impacts to surrounding communities.	Significant socioeconomic impacts are expected to result from Base realignment, including increased employment in construction, trades, and services and increases in population. Schools will be affected by the associated increase in enrollment. The demand for housing is expected to exceed supply.	The Air Force will interface with local communities to implement a build-to-lease housing program under Section 801 of P.L. 98-115. The construction of 700 housing units under this program is planned, which will mitigate shortfalls in housing availability. The Air Force will assist OEA in interfacing with the Department of Education to mitigate issues related to school saturation.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Base Area:			
Airspace Management			
Increased sorties conducted within existing Controlled Airspace, Special Use Airspace, MTRs, or the Refueling Route could affect civil use of airspace.	Increased airspace operations from the realignment would not conflict with civil use. However, increasing the number of sorties would proportionately increase the probability of an accident.	None required.	Not significant.
Land Use			
Impacts to prime or unique farmlands.	No prime or unique farmlands are adjacent to the Base. Base realignment is to be done within current Base boundaries and should not directly impact surrounding farmlands.	None required.	Not significant.
Land use impacts surrounding the Base.	Encroaching development into the CUZs north of the Base may be impacted. Detrimental impacts to values and beneficial uses of property may result if development is not controlled.	The AICUZ is intended to provide information to local communities for use in their property development planning.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
<u>Base Area</u>:			
<u>Biological Resources</u>			
Base construction could adversely affect plant resources.	Areas where construction will occur have been disturbed by human activity previously to the point that cultivated species comprise almost all of the vegetation at these locations. The loss of this vegetation is not considered significant to plant communities on the Base. Because of the long-term disturbance of the areas of the Base where construction will occur, the presence of protected species is unlikely.	None required.	Not significant.
Base construction could adversely affect wildlife resources.	Areas where construction is to occur have undergone long-term disturbance. No significant effect to animal communities on the Base is expected. No protected species are expected to occur on the Base because of the lack of suitable habitat and the history of long-term land disturbance.	None required.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Base Area:			
Native American Values			
Impacts to treaty-specified Native American lands, water, other economic resources, or cultural resources.	No treaty-specified Native American lands, water, other economic resources, or cultural resources associated with historic groups in the vicinity have been documented.	None required.	Not significant.
Archaeological, Cultural, and Historical Resources			
Impacts to archaeological, cultural, and historic resources in the area.	No sites eligible for listing in the National Register of Historic Places have been, or are likely to be, identified on Cannon AFB.	If the potential for site disturbance exists, the State may require that a survey be done prior to construction.	Not significant.
Solid Wastes, Hazardous Wastes, and Hazardous Materials			
Waste generation and impacts from construction and operation activities associated with Base realignment.	Wastes generated will be managed in accordance with all applicable state and federal environmental regulations.	None required.	Not significant.

Table 2.4-1. Summary of Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
MOA Area:			
Air Quality and Meteorology			
Emissions due to increased MOA and MTR use could potentially cause air quality to exceed standards.	Pollutant concentrations are insignificant when compared to applicable state and federal standards.	None required.	Not significant.
Ground-level impact of mid-air refueling emissions.	Impacts would be negligible because of the small quantity of fuel lost, distance to the ground, and the flight altitude, which is usually greater than mixing depth.	None required.	Not significant.
Noise			
Noise impacts from flight activity in the MOA airspace.	Of the 6700 people residing under the proposed MOA, approximately 80 would be expected to be "highly annoyed" from aircraft noise.	None required.	Sporadic noise.
Noise impacts from additional flight activity on the MTRs under the MOA airspace.	The number of "highly annoyed" people, out of 6700, is expected to increase from 58 currently to 67 under increased MTR use.	Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
MOA Area:			
Cumulative noise impacts below the proposed MOA.	The total number of "highly annoyed" people is expected to increase from 58 currently to 140, relative to 6700 people residing in the impacted area.	Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.
Noise impacts outside the proposed MOA from low-altitude MTRs.	Out of a population of 2600 persons, the number of people expected to be "highly annoyed" will increase from 525 under current noise conditions to 600 with the addition of operations from the proposed action.	Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.
Water Resources			
Water resource impacts.	No adverse impact is expected since there are no ground-level activities associated with the proposed action.	None required.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
MOA Area:			
Airspace Management			
Impacts to civil use of airspace.	No impact to commercial aircraft is expected. Private aircraft transiting the area would not be hindered but would require greater vigilance.	None required.	Not significant.
Potential incompatibility between non-Cannon MTRs and the proposed MOA.	The potential exists for incompatible airspace use.	Potential incompatibilities would be resolved through scheduling coordination.	Not significant.
Land Use			
Increased flight activity impacts to domestic animals.	A recent review (Mauci et al., 1988) of aircraft overflight effects to domestic animals and wildlife indicates no significant impacts to domestic animals.	None required.	Not significant.
Impacts to recreational and other land uses.	Based on the low number of noise complaints from current operations, and the expected noise levels, significant impacts from the proposed action are unlikely.	None required.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
MOA Area:			
Biological Resources			
Impacts to plant resources, endangered or threatened species.	No adverse impact is expected. No physical disturbance to candidate endangered or threatened species, other plant resources, or sensitive habitat will occur.	None required.	No adverse impact.
Aircraft collisions with endangered or threatened species or other wildlife.	Potential exists for jet collisions with bald eagles, peregrine falcon, whooping crane, and migrating geese. Such occurrences are considered to be of low probability for the eagle, falcon, and crane.	The Air Force will consult with The U.S. Fish and Wildlife Service on actions to reduce impacts to these species.	Not significant.
Impacts to wildlife from jet overflights.	Noise levels will initially provoke startle behavior. No long-term impacts are expected.	None required.	Not significant.
Native American Values			
Impacts to Native American values and concerns.	Because considerable time and distance separate contemporary Native Americans from the proposed MOA, impacts are unlikely.	None required.	Not significant.

Table 2.4-1. Summary of Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
MOA Area:			
Archaeological, Cultural, and Historical Resources			
Impacts to archaeological, cultural, or historic resources.	The only impacts will be related to noise, which will cause no physical disturbance.	None required.	Not significant.
Solid Wastes, Hazardous Wastes, and Hazardous Materials			
Impacts from waste.	No adverse impact is expected since no waste will be introduced to the MOA from flight operations.	None required.	Not significant.
Melrose Range Area:			
Air Quality and Meteorology			
Impacts to local air quality.	All concentrations will be well below applicable state and federal standards.	None required.	Not significant.
Noise			
Noise impacts from TAC increased use of Melrose Range.	For the estimated 84 people residing under the Range noise contours, the number of "highly annoyed" persons will increase from 20 currently to 25.	Low population area overflight. Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Melrose Range Area:			
Noise impacts from TAC, SAC, and others use of Melrose Range.	For the estimated 109 people residing under the Range noise contours, the number of "highly annoyed" persons will increase from 20 currently to 30.	Low population area overflight. Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.
Noise impacts from TAC MTR use associated with the Range.	For the estimated 1180 people residing under the Range noise contours, the number of "highly annoyed" persons will increase from 290 currently to 450.	Low population area overflight. Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.
Noise impacts from combined MTR use associated with the Range.	For the estimated 4022 people residing under the Range noise contours, the number of "highly annoyed" persons will increase from 960 currently to 1150.	Low population area overflight. Sound insulation of dwellings in areas significantly impacted.	Sporadic noise.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Melrose Range Area:			
Water Resources			
Impacts to water resources from increased Range use.	Only nonexplosive or inert munitions are used on the Range, so no significant pollutants are expected. No permanent surface water bodies and only limited continuous running surface water exists on the Range. Groundwater lies sufficiently below the surface such that no impact from surface activities is expected.	None required.	Not significant.
Airspace Management			
Impacts to civil use of airspace.	Current use of the Range complex would increase by 43%, but would not conflict with Victor Airways, Jet Routes, or airports in the vicinity. Increased use of MTRs would necessitate increased vigilance by general aviation aircraft.	None required.	Not significant.

Table 2.4-1. Summary of Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Melrose Range Area:			
Land Use			
Impacts to land use in the Melrose Range.	The Air Force intends to convert crop lands within the Range to the less intensive use of cattle grazing. Impacts of overflights to domestic animals are insignificant. Agricultural activities in the area are not expected to be impacted by increasing the number of sorties into the Range and along MTRs.	None required.	Not significant.
Impacts to Park resources along MTRs.	Based on the expected noise levels, significant impacts are not expected.	Lateral avoidance of Sumner Lake Recreation Area and Gran Quivira National Monument is stipulated by Air Force flight instructions. A minimum AGL clearance of 1000 ft is instructed for flights over Lincoln National Forest.	Not significant.

Table 2.4-1. Summary of Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
<u>Melrose Range Area</u>:			
<u>Biological Resources</u>			
Impacts to plant resources or sensitive habitats.	Incremental increases in localized disturbances to the shortgrass prairie plant species or habitat will be confined to areas of existing ongoing activities of a similar nature.	None required.	Not significant.
Impacts to animal resources.	Incremental increases in localized disturbances will be confined to areas of existing ongoing activities of a similar nature.	IR 113 is located near the Bitter Lake National Wildlife Refuge where there is a heavy concentration of wild fowl. Special Operation Procedures already in existence for this route specify "caution" advisory for flights.	Not significant.
<u>Native American Values</u>			
Impacts to Native American values.	*No adverse impact is expected* since access to the Range by Native Americans is not changing. No incremental impact *is expected.*	None required.	Not significant.

Table 2.4-1. Summary of
Comparative Analysis of Impacts From the Proposed Action (Continued)

Potential Impact	Evaluation of Significance	Mitigations Identified	Residual Impact
Melrose Range Area:			
Archaeological, Cultural, and Historical Resources			
Impacts to archaeological, cultural, and historical resources.	Low site density and many years of previous disturbance indicate that impacts from incremental increases in Range usage are unlikely. MTR usage will not result in a ground-level physical disturbance.	None required.	Not significant.
Solid Wastes, Hazardous Wastes, and Hazardous Materials			
Impacts of waste.	Since the type of ordnance is not changing, no new disposal practice is needed. The disposal of the additional munitions residue will be limited to land disturbance which is not expected to have a significant adverse effect upon the environment.	None required.	Not significant.

CHAPTER 3.0 - DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter describes existing conditions for the environment affected by the action. The focus of the presentation is on information directly necessary for the assessment of impacts or required for contextual purposes. Data and analysis are commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced.

The action may potentially affect three primary geographic areas: (1) the immediate vicinity of Cannon Air Force Base (AFB), (2) the environs of the proposed Mount Dora MOA and the MTRs leading to the Mount Dora MOA, and (3) the environs of Melrose Range and the MTRs leading to this range. The following sections describe the existing environments for Cannon AFB (Section 3.1), Mount Dora MOA (Section 3.2), and Melrose Range (Section 3.3).

3.1 GENERAL DESCRIPTION OF THE BASE AREA

3.1.1 Air Quality and Meteorology

3.1.1.1 Air Quality

Curry County, where Cannon AFB is located, is within the Pecos-Permian Basin Intrastate Air Quality Control Region (AQCR), which is listed in 40 CFR Part 81 as being either in attainment with or unclassified for all National Ambient Air Quality Standards (NAAQS). These standards are listed in Table 3.1.1-1. The Pecos-Permian Basin Interstate AQCR consists of the following counties within the State of New Mexico: Chaves, Curry, De Baca, Eddy, Lea Quay, and Roosevelt. There are no Federal Mandatory Class I Areas located in the vicinity of Cannon AFB. The Pecos Wilderness Area, approximately 100 miles to the northwest, is the nearest Class I Area to Cannon AFB.

The State of New Mexico has designated the counties of Bernalillo, Chaves, Dona Ana, San Juan, and Santa Fe as Air Quality Maintenance Areas (AQMAs). Ambient concentrations of one or more criteria pollutants could exceed standards within the near future, possibly resulting in nonattainment status. Chaves County is the closest AQMA to Cannon AFB and is approximately 40 miles to the southwest. Carbon monoxide is the pollutant of concern within Chaves County.

The New Mexico State Air Quality Improvement Board maintains a monitoring station for particulates in the town of Clovis, which lies approximately 7 miles east of Cannon AFB. Table 3.1.1-2 summarizes data from this station for the years 1985-1988. The nearest location where other regulated pollutants are monitored is Artesia, New Mexico, approximately 120 miles southwest of the Base. Data from this site are also summarized in Table 3.1.1-2. These ambient pollutant concentrations are within NAAQS.

Table 3.1.1-1. State of New Mexico and Federal Ambient Air Standards

Pollutant	Averaging Period	Standard State	Standard Federal
TSP (ug/m^3)	24-hr primary	none	260
	24-hr secondary	150	150
	Annual Arithmetic Mean		
	Primary	none	75
	Secondary	60	60
Ozone	1-hr	0.06 ppm 118 ug/m^3	0.12 ppm 240 ug/m^3
SO_2	24-hr	0.10 ppm 265 ug/m^3	0.14 ppm 365 ug/m^3
	3-hr	none	0.50 ppm 1300 ug/m^3
	Annual Arithmetic Mean	0.02 ppm 55 ug/m^3	0.03 ppm 80 ug/m^3
NO_2	24-hr	0.10 ppm 200 ug/m^3	none
	Annual Arithmetic Mean	0.05 ppm 100 ug/m^3	0.05 ppm 100 ug/m^3
CO	8-hr	8.7 ppm 9.7 mg/m^3	9 ppm 10 mg/m^3
	1-hr	13.1 ppm 15 mg/m^3	35 ppm 40 mg/m^3

Notes:

(1) A NAAQS exists for lead; however, there are no known significant sources of lead emissions in this region and lead emissions from Base activities are expected to be insignificant.

(2) EPA replaced the TSP NAAQS with a PM-10 (particulate matter less than 10 microns in diameter) standard in July 1988. The TSP standard is referenced here because no monitoring data for PM-10 is available. Also, emissions calculations are based on engineering factors which were formulated for TSP emissions and may not be valid for PM-10 emissions calculations.

Table 3.1.1-2. Ambient Monitoring Data From the Cannon AFB Region

Site Name	Pollutant	Averaging Period	Maximum Concentration (ug/m^3) 1985	1986	1987	1988
Clovis	Particulate	24-hour	177	170	118	232
Artesia	Particulate	24-hour	90	121	102	169
	SO_2	24-hour	80	186	212	106
	SO_2	3-hour	424	*	928	451
	NO_2	Annual	*	115	*	*

Pollutant	Averaging Period	Air Quality Standards (ug/m^3) State	Federal
SO_2	24-hour	265	365
	3-hour	1300	1300
Particulate (TSP)	24-hour	260	260

Notes: EPA is no longer using the Total Suspended Particulate (TSP) standard as a National Ambient Air Quality Standard (NAAQS). A new particulate standard, the PM-10 standard, has replaced TSP as the particulate NAAQS. PM-10 signifies particulate matter less than 10 microns in diameter, a size range which is more likely to cause respiratory problems when inhaled. The old TSP standard is referenced here because the monitoring was conducted for TSP. Monitoring data for PM-10 is not available as of yet.

* Data not available due to insufficient data recovery.

Current Cannon Air Force Base air pollution loading consists of emissions from the following sources:

- aircraft ground operations
- heating and power production
- fuel storage, transfers, and spills
- surface coating
- fire fighting training
- aircraft flying operations
- AGE activities
- diesel fuel combustion
- motor vehicles

These emissions are summarized in Table 3.1.1-3.

3.1.1.2 Meteorology

The elevation at Cannon AFB is 4295 feet above mean sea level (MSL). The Base is bordered on the northeast, southeast, and southwest by lower terrain. The general climate for this area is semiarid. The area undergoes the basic climatic trend of four seasons. The downslope warming of air from the mountains tends to modify and temper the air masses which pass over this area from the west and northwest. Winds with a northwesterly component blow downslope and enhance atmospheric ventilation. Winds with a component from the south and east blow upslope and lead to increased cloud formation and precipitation.

The annual mean temperature for Cannon AFB is approximately 58°F (AWS Climatic Brief, November 1986). Average monthly temperatures range from the mid-30s in January to the upper 70s in July. Maximum daytime temperatures in the summer months can reach 90°F or warmer. Hot days, registering 100°F or more, occur only occasionally in the summer months. Minimum temperatures range from the lower 20s in January to the mid-60s in July.

The average annual rainfall in the area of Cannon AFB is 15.2 inches, with the majority occurring in the summer months (AWS Climatic Brief, November 1986). Most of the precipitation for this region comes from sudden thundershowers which form over the mountains and traverse the area. Individual monthly averages vary from 0.4 inches

Table 3.1.1-3. Current Cannon AFB Air Emissions

STATIONARY SOURCES	POLLUTANT TONS/YEAR				
ACTIVITY	CO	HC (NON-METHANE)	NOX	PART	SO)
Aircraft Ground Operations	17.3	5.50	11.9	0.64	2.7
Heating & Power Production	8.74	0.76	42.6	0.63	0.5
Fuel Storage, Transfers and Spill	-	61.5	-	-	-
Surface Coating Emissions	-	15.9	-	-	-
Fire Fighting Training	9.46	5.41	0.07	2.16	0.(
SUB TOTAL	35.5	89.1	54.6	3.43	3.4
NON-STATIONARY SOURCES					
ACTIVITY					
Aircraft Flying Operations	460	160	160	2.41	21.9
AGE Emissions	44.5	6.74	85.0	6.07	1.2
Diesel Fuel Combustion	14.3	2.29	10.4	0.65	1.4
Motor Vehicles	351	37.9	37.6	5.0	1.5
SUB TOTAL	870	207	293	14.1	26.(
TOTAL	906	296	348	17.5	29.4

Notes: All of the above data was derived from the 1988 Cannon AFB Air Pollution Emissions Invent except for the Fuel Storage, Transfers, and Spills figures, and the Diesel Fuel Combustion figur which were retained from the 1987 Air Pollution Emissions Inventory.

in the winter months to 2.5-2.7 inches in July and August. The maximum monthly rainfall of 11.4 inches occurs in July. The maximum daily rainfall is 4.8 inches.

Occasional winter snows result in this area from the upslope movement of moist air from the Gulf of Mexico. Over a 36-year period, annual snowfall amounts up to 19 inches have been recorded several times in this region (AWS Climatic Brief, November 1986). A daily maximum amount of 8 inches has occurred in December and January. The average annual snowfall for this New Mexico region is about 10 to 13 inches. Snow can occur as early as October and as late as May.

Winds in the Cannon AFB area are often gusty and can average 10 mph or greater. Based on a 10-year period, the prevailing surface wind direction at Cannon AFB is from the west (Table 3.1.1-4). These west winds occur primarily from October to May (i.e., 8 months). In the warmer months, the winds tend to be from the south. The annual mean wind speed is approximately 7 knots (8 mph). Monthly averages range from 5 knots (6 mph) to 9 knots (10 mph). The maximum recorded wind gust is 73 knots (84 mph).

The atmosphere around the area of Cannon AFB is generally well mixed. The seasonal and annual average mixing heights can vary from 400 meters in the morning to 4000 meters in the afternoon. The afternoon mixing heights are typically greater during the spring and fall seasons. The morning mixing heights are usually low, due to nighttime heat loss from the ground producing surface-based temperature inversions. After sunrise these inversions break up, and solar heating of the earth's surface causes vertical mixing in the atmosphere.

Dust is frequently entrained into the atmosphere in this region of the country because of gusty winds and the semiarid climate. The Texas Panhandle-eastern New Mexico area is considered the worst area in the United States for windblown dust. Occasionally this windblown dust is of sufficient quantity to restrict visibility. Most of the seasonal dust storms occur in March and April, when the wind speeds are typically high.

3.1.2 Aircraft Noise

This section provides a brief discussion of methods used to assess noise exposures around airbases, including the day-night avera ge sound level (DNL) and the Air Installation Compatible Use Zone (AICUZ) program, followed by their application to the existing environment around Cannon AFB. In general, noise assessments are made for current and future scenarios by estimation of land areas and resident populations within DNL noise contours. Maps of such noise contours are shown as appropriate to these estimations.

Table 3.1.1-4. Monthly and Annual Surface Winds for Cannon AFB, New Mexico

Month	Prevailing Direction [1]	Mean Scalar Speed (Knots)	Max Gust (Knots)
Jan	W	8	60
Feb	W	8	61
Mar	W	9	73
Apr	W	9	59
May	W	8	65
Jun	S	7	64
Jul	S	6	66
Aug	S	5	69
Sep	S	6	70
Oct	W	7	64
Nov	W	7	59
Dec	W	8	67
Annual	W	7	73[2]
Period (yrs)	10	10	10

Source: AWS Climatic Brief, November 1986.

[1] Direction from which wind blows the greatest percentage of the time.

[2] Maximum annual wind gusts for 10-year sampling period.

3.1.2.1 Introduction

The primary quantitative description of noise levels in the vicinity of Cannon AFB is in terms of the DNL, which is the method adopted by the Environmental Protection Agency (EPA), the Department of Defense (DOD), the Federal Aviation Administration (FAA), and various other national and international agencies as applicable for environmental noise assessment purposes. This noise metric is based on measurements or estimations of the average A-weighted sound level over a 24-hour period. All such sound levels occurring within the nighttime period (2200 hours to 0700 local time) are penalized by 10 decibels (dB) to account for additional sensitivity of people to nighttime noise intrusion. A-weighting accounts for the varying acuity of human hearing over a wide range of frequencies. Noise descriptors are defined by American National Standards and are directly correlated to subjective responses such as apparent loudness, speech interference, sleep disturbance, annoyance (such as the number of people who would be expected to be highly annoyed), and the potential for hearing damage. Figure 3.1.2-1 illustrates typical DNL values for various community environments. Figure 3.1.2-2 shows the approximate relationship between DNL values and the percentage of people who would be expected to be highly annoyed (CHABA, 1981).

The assessment of noise exposures around military airbases and civilian airports is performed by means of DNL noise contours. These contours are created by computer models such as the Air Force NOISEMAP program and the FAA's Integrated Noise Model (INM). The former has a large data base of noise levels for military aircraft, whereas the latter is more specifically for civilian aircraft. The noise contours required for both military and civilian airfields are those for DNL values of 65 dB and above, in 5-dB increments (e.g., DOD Inst. 4165.67, 1979; FAA FAR Part 150, 1984). Lower DNL levels may be discussed for other noise issues, such as interior noise or noise of a sporadic nature.

The DOD, EPA, and other agencies consider noise levels in excess of 65 dB DNL as "normally unacceptable" for new noise sensitive land uses (residences, schools, and hospitals) and as "unacceptable" if the DNL value exceeds 75 dB. Between these two levels of DNL, the outdoor noise environment will be intrusive in terms of speech communication and will therefore cause annoyance to some people as illustrated in Figure 3.1.2-2. Indoor noise environments may also be intrusive, such as in speech communication, telephone usage, and ability to listen to TV or radio (as reported in various airport noise studies during 1985 to 1989). These effects can be mitigated by improvement of the sound insulation characteristics of buildings.

The AICUZ program is applied by the Air Force to airbases to determine and give guidance on compatible land uses around the Base. This program describes Air Force concerns regarding both noise and safety, and defines Clear Zones (CZs), Accident Potential Zones (APZs), Noise Zones (NZs), and height and obstructions criteria for the vicinity of the Base. The Noise Zones are defined by reference to the DNL noise contours discussed above. Each designated area has detailed compatible land use criteria related to a distinct range of noise levels and specific accident potential. These designated areas are identified as Compatible Use Zones (CUZs).

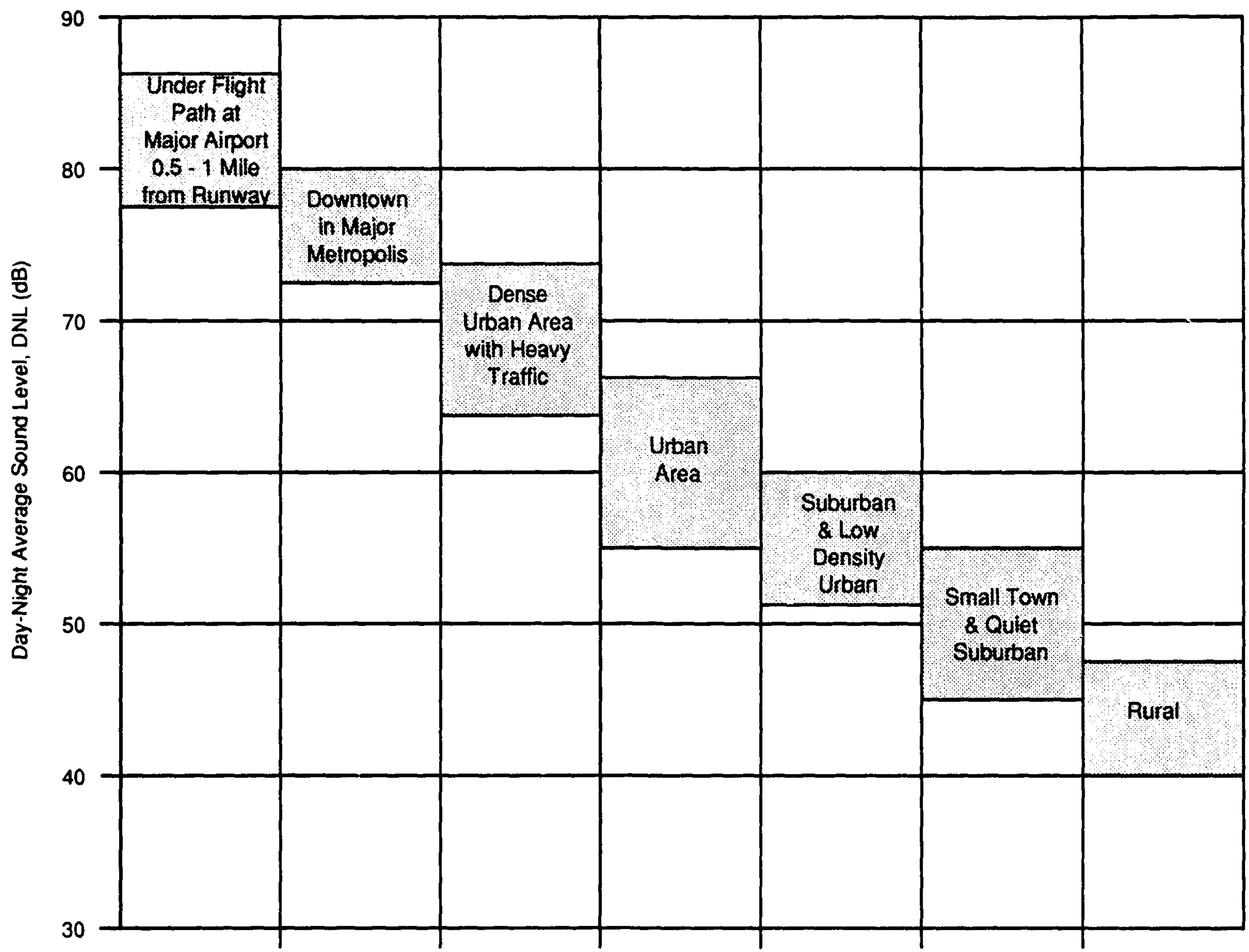
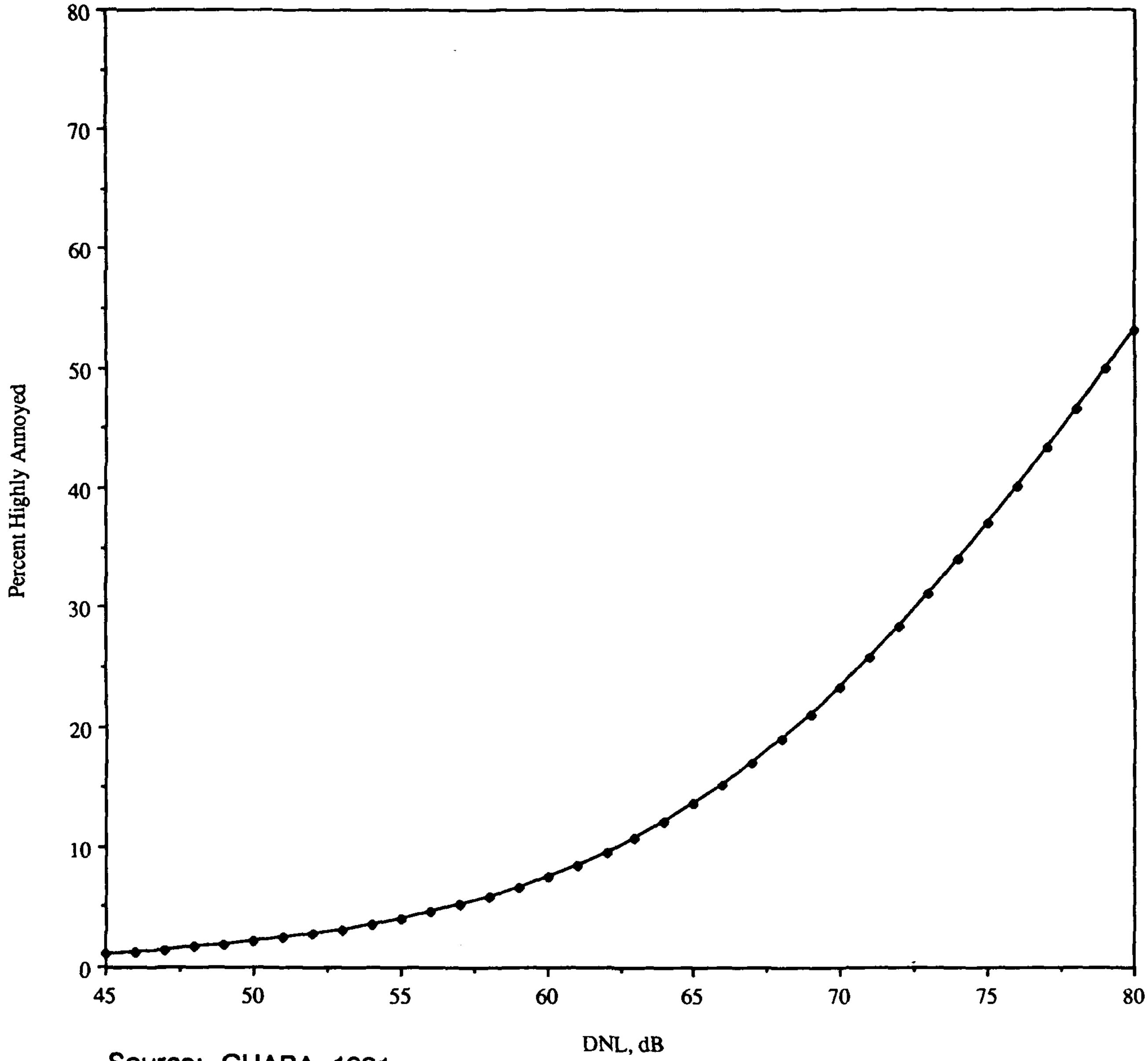


Figure 3.1.2-1. Typical DNL Values for Various Community Environments



Source: CHABA, 1981

Figure 3.1.2-2. Relationship between DNL values and Percent of Exposed People who are Expected to be "Highly Annoyed"

3.1.2.2 Existing Noise Levels

Noise exposures in the vicinity of Cannon AFB are a combination of local ambient noise from road traffic and occasional railroad traffic (in and near Clovis) and noise from the Base aircraft operations, which occur sporadically during each active day at the Base.

The principal user of Cannon AFB is the 27th Tactical Fighter Wing which has 62 F-111D aircraft at the Base and performs about 8200 sorties per year from the Cannon runways. Each sortie comprises one takeoff and landing, and may also include closed-pattern training maneuvers such as touch-and-go exercises. On an average busy day at Cannon AFB, 31 sorties and approximately 157 closed-pattern go-arounds are flown at the Base. Of these, on average, about 1.5 sorties and 4.5 closed patterns are flown during 2200 hours to 0700 hours. In addition to these based F-111D aircraft, other (transient) users of Cannon AFB include A-4, A-6, A-7, A-10, C-9, C-120, C-130, C-141, DC-9, F-4, F-14, F-16, T-37 and T-38 aircraft. These additional operations total about 43 takeoffs and landings and about 17 closed patterns on an average busy day, none of which typically occur at nighttime.

Table 3.1.2-1 summarizes those average busy-day operations in terms of the departures and arrivals, and closed pattern (CP) operations using each runway at Cannon AFB. The "busy-day" concept is used by the Air Force to represent the typical active-day operations at air bases, such as over 264 active days per year rather than 365 calendar days. The busy-day operations at Cannon AFB are therefore those over an entire 12-month period, divided by 264 active days.

These operational data have been described in detail by Cannon AFB personnel for the purpose of developing noise exposure contours. These have been compiled as an input data file to the NOISEMAP computer program by the Air Force Engineering Services Center (AFESC) at Tyndall AFB. NOISEMAP is a computer program developed by the Air Force for environmental noise analysis purposes. The program requires flight operation on each runway to be described in terms of aircraft type, flight track flown, altitude, power setting and aircraft speeds used, and the numbers of such flights during daytime (0700 hours to 2200 hours) and nighttime (2200 hours to 0700 hours). Other aircraft operations which cause localized noise emissions are those of aircraft and engine maintenance (ground run-up) tests. At Cannon AFB, these are conducted using four run-up test pads, one Grade II noise suppressor test cell, and one hush house facility for F-111D testing. These operational facilities and their usage are also defined in the NOISEMAP database for Cannon AFB. Afterburner power, which generates higher noise levels during takeoff than normal military (takeoff) power, is used during about 25 percent of the F-111D departures from Cannon AFB. This is included in the NOISEMAP analysis.

These operational details are used by the NOISEMAP program, which calculates noise levels at points on a regularly spaced grid of up to 100 by 100 points surrounding the runways. The noise levels are calculated in terms of DNL or other specified metrics and are input to a contouring program which generates the contours.

Table 3.1.2-1. Average Busy-Day Operations on Cannon AFB Runways, 1988

Aircraft	Runway								Total ops.
	04		22		13		31		
	D/A	CP	D/A	CP	D/A	CP	D/A	CP	
F-111	14.6	37.6	35.3	94.0	3.6	6.2	7.9	19.6	218.8
T-38	9.2	8.3	31.9	2.8	1.9	1.7	4.8	4.3	64.9
A-4	2.2	1.3	4.1	3.3	0.4	0.3	1.2	0.7	13.5
F-14	0.4	0.2	6.9	4.8	0.0	0.0	0.0	0.0	12.3
F-4	2.0	0.4	4.7	1.0	0.4	0.1	1.0	0.2	9.8
T-37	1.5	1.0	4.9	0.0	0.3	0.2	0.9	0.5	9.3
Other	3.6	0.5	14.4	2.0	0.1	0.1	0.3	0.1	21.1
TOTAL	33.5	49.3	102.2	107.9	6.7	8.6	16.1	25.4	349.7

D/A is the total number (sum of departures and arrivals) using the runway.
CP is the total number of closed-pattern operations using the runway.

From this grid analysis, contours of equal noise exposure, expressed as the day-night average sound level, DNL, are generated by a contouring program and superimposed on land-use maps to assess noise impact and define incompatible land uses within each contour area. The noise contour analysis for military (and civilian) airfields is normally required to generate noise contours at 5-dB increments from DNL 65 dB to the highest level which encompasses incompatible land use (such as residential structures).

Noise contours for existing operational levels of aircraft activity at Cannon AFB are shown in Figure 3.1.2-3, and land uses within each contour level are described in Table 3.1.2-2. In general, the current noise impact area enclosed by the DNL 65 dB contour is predominantly used for agricultural purposes with less than 5 percent of the total enclosed land area being residential. There are no schools or civilian hospital facilities within the DNL 65 dB contour around Cannon AFB. Field surveys of the contour areas indicate that there are 137 dwellings within the DNL contour with approximately 363 resident occupants. Most of the noise-impacted dwellings are to the north of and along Highway 60. Many of these, especially within the DNL 70 dB contour, are of mobile or trailer home construction. At the higher DNL contour levels, the surveys indicate a total of 43 dwellings within the DNL 70 dB contour and nine dwellings within the DNL 75 dB contour. Resident population estimates are, respectively, 114 people and 24 people within these contour levels. Only one abandoned and unoccupied structure lies within the DNL 80 dB contour.

It should be noted that the land areas and populations listed for each DNL contour are those for the entire area within the contour line, and include land and populations within the next higher DNL contour. Thus, the 363 residents within the DNL 65 dB contour include those 114 people noted to reside within the DNL 70 dB contour. Similarly, the 114 people within the DNL 70 dB contour include the 24 residents within the DNL 75 dB contour. Using the relationship between DNL values and percent of people exposed to noise who would be expected to be "highly annoyed," as shown in Figure 3.1.2-2, the total number of residents estimated to be in this category is 88 persons of the 363 persons currently exposed to levels above DNL 65 dB.

On-Base housing at Cannon is estimated to have about 1320 occupants, most of whom reside between the DNL 65 dB and 70 dB contours. These are not included in the estimate of "highly annoyed" persons, since they comprise Air Force personnel and their families who are believed to have a different attitude to military aircraft noise than that of the general population.

These estimates of exposed and "highly annoyed" residents for current aircraft operations at Cannon AFB are used in this EIS as a baseline upon which to evaluate increases in noise impact due to the action. Similar estimates are given later in this document for the land areas under the proposed Mount Dora MOA, the low-altitude Military Training Routes, and the Melrose Range.

Single-event noise levels, such as those experienced directly below an aircraft flight path during takeoff or landing, are listed in Table 3.1.2-3 for the F-111D aircraft. While these noise levels, which are expressed in Sound Exposure Level (SEL,

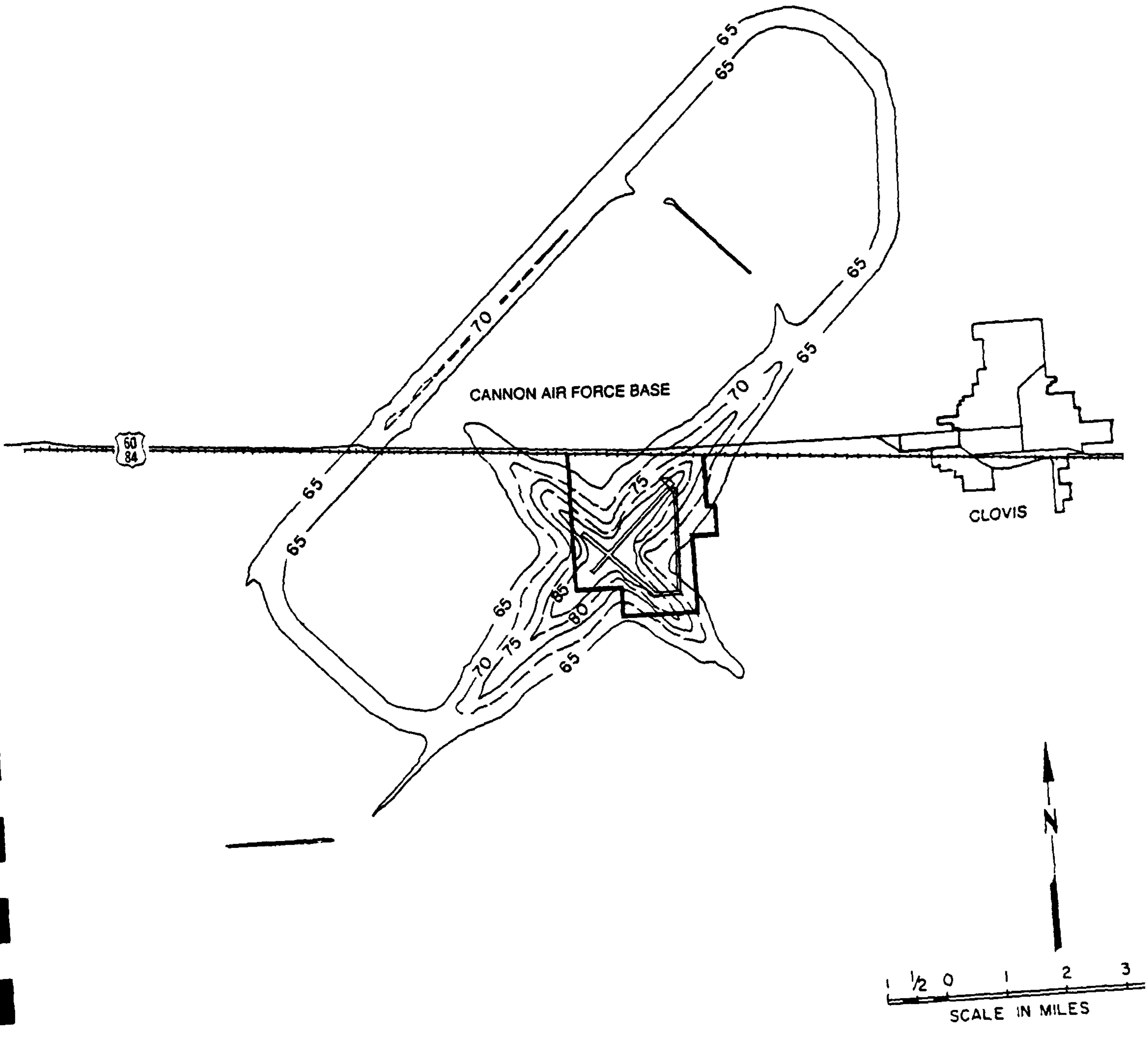


Figure 3.1.2-3. DNL Noise Contours for Cannon AFB Based on Yr 1988 Operations

Table 3.1.2-2. Land Use Within Cannon AFB Noise Contours (Existing 1988)

Land Use Impacted	Day-Night Average Sound Level, DNL (dB) 80	75	70	65
Total Land Area (sq. mi.)[1]	11.4	20.5	35.1	98.8
No. of Dwellings (Outside Base)	0	9	43	137
No. of Residents[2]				
Outside Base	0	24	114	363
Within Base	0	0	0	1323
Percent of Land Area				
Residential	0	<1	<3	<5
Commercial	0	<1	<2	<3
Agricultural	(100)	(98)	95	92

[1] Includes Cannon AFB land area of 5.9 square miles.

[2] Based on count of number of dwellings multiplied by persons per household for Curry County.

Note: The land areas and populations are those for the entire area within each contour line and include those within the next higher DNL contour.

Sources: Bureau of Census, 1988. City and County Databook. U.S. Department of Commerce, 1988.

Cannon AFB, New Mexico, 1988. Economic Resource Impact Statement (ERIS).

Table 3.1.2-3. Single-Event Noise Levels (Sound Exposure Level, dB) Caused by F-111D Aircraft at Various Altitudes Above Ground Level

Power Setting	Altitude (ft above ground level) 500	1000	2000	4000
Takeoff (without afterburner)	111	105	99	93
Approach	106	101	95	89

Notes:

1. Maximum A-weighted sound levels are approximately 5 to 8 dB less than the referenced sound exposure levels.
2. These noise levels are derived from Omega 10 and NOISEMAP computer programs which use a reference NOISEFILE database for each type of aircraft.
3. Afterburner power on takeoff increases noise levels by about 15 dB for the F-111D.

Source: Mohlman, 1983.

dB) are high relative to other typical noise levels from road or rail traffic, they would not cause any physical damage to people or structures. Typical reactions would be those of speech interference and annoyance by exposed people. Indoor noise levels would be about 20 to 30 dB lower than the outdoor levels listed in Table 3.1.2-3, and would also cause speech interference effects such as disruption of conversation, listening to radio or television, and telephone use. The noise impact of current aircraft activity is therefore of a sporadic nature, depending on the number of overflights of any specific receptor during a given time period.

The sound exposure level values shown in the table are the A-weighted sound levels, in dB (a), which would be caused by a single overflight and measured by a special instrument called an Integrating Sound Level Meter. This instrument measures the sound throughout the time period containing the highest 10 dB of the noise. The resulting measurement (SEL) is therefore not only the maximum sound level that occurs, but also contains an adjustment (increase) caused by the duration of the noise. The values shown in the table are based on many measurements of SEL values for the F-111D aircraft, which have been analyzed by the Air Force and compiled in computer files for use with the NOISEMAP computer program.

3.1.3 Water Resources

3.1.3.1 Surface Water

Cannon AFB is located in a region which has a semiarid climate. The average annual precipitation is about 16 inches (Section 3.1.1.2, Meteorology), most of which occurs during summer thunderstorms. Winters are relatively dry, with an average annual snowfall of 13 inches in a typical year. The mean annual lake evaporation rate in the vicinity of Cannon AFB is estimated to be 69 inches per year. Lake evaporation rate is used to estimate evapotranspiration rate and represents the upper limit of water loss from the hydrologic cycle by atmospheric conditions. There is a large potential deficit (53 inches) in precipitation (average annual precipitation minus mean annual lake evaporation) for the Cannon AFB area.

Cannon AFB is on a southeastward-sloping regional plateau known as the Southern High Plains. The Southern High Plains are bounded on the north by the Canadian River, which lies approximately 60 miles north of Cannon AFB. The eastern and western sides of the Southern High Plains are bounded by escarpments which rise above the surrounding area. Cannon AFB is located near the center of this plateau where the topography is typified by flat, featureless terrain having almost no relief. Characteristically, the High Plains have a smooth and gently sloping or undulating surface on which scattered, normally dry, flat-bottomed depressions are the dominant relief feature. The land surface elevations at Cannon AFB range from 4327 feet above MSL at the northwest corner of the Base to about 4260 feet above MSL at the southeast corner. The land surface of the Base generally slopes to the east and southeast, consistent with the regional slope. The dominant surface features in the area around Cannon AFB are small temporary lake basins known as playas (William Matotan and Associates, 1985). A playa (Playa Lake) at the southwest corner of Cannon AFB collects the majority of the stormwater runoff from the Base. There are two wastewater stabilization lagoons on Base. The lagoons have a combined surface area of 32 acres and are operated in series. The treated effluent from the lagoons is channeled to an adjoining on Base playa. Final effluent disposal is by a combination of evaporation, infiltration, and sale to a local farmer for irrigation purposes. The wastewater treatment system does not need 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.

Regional drainage in Curry County is predominantly to the southeast and the east. Stream drainage is poorly developed because of the low annual rainfall and the minimal relief. The drainage patterns consist of long shallow valleys, locally termed "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. 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 before it has a chance to run off. In areas not drained by the draws, the playa lakes serve as low-point collection areas for surface runoff. The playas have no surface outlet, and any water they collect is eventually lost to evapotranspiration and infiltration (William Matotan and Associates, 1985).

3.1.3.2 Groundwater

There is no permanent surface water on the High Plains near Cannon AFB; therefore, water supplies for irrigation, industrial, and domestic purposes are obtained exclusively from groundwater.

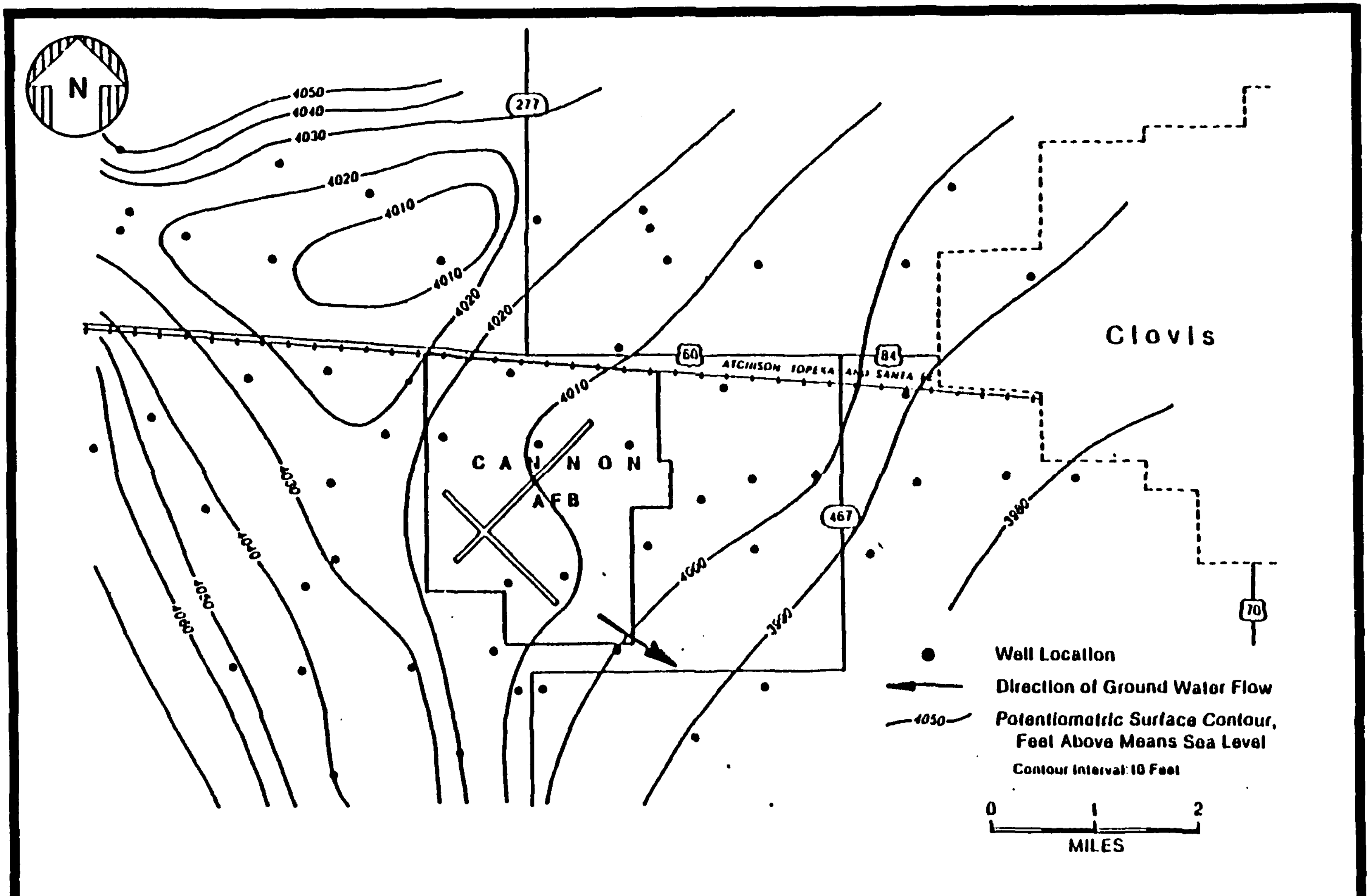
Groundwater occurs under unconfined conditions at Cannon AFB. The Base is underlain by a portion (locally called the Ogallala aquifer) of the regionally important High Plains aquifer developed in the unconsolidated sediments of the Ogallala Formation. The High Plains Aquifer is the major, and in some places (e.g., eastern New Mexico) the only, source of potable water. The aquifer occurs in eastern New Mexico, western Texas, parts of eastern Colorado and Wyoming, parts of western Kansas and Oklahoma, and most of Nebraska, extending into southern South Dakota. The Ogallala Formation, which is Pliocene in age (approximately 10 million years old), consists of clay, silt, fine to coarse-grained sand, gravel, and caliche. For the most part, the Ogallala Formation is unconsolidated; however, in many places such as Cannon AFB, the formation is capped, just below the soil horizon, by a stratum of caliche. This caliche consists of sediments which have been cemented together by calcium carbonate. This caliche layer plays a significant role in not only the erosional and weathering processes of the High Plains but also in the process of aquifer recharge. Because it is highly resistant to erosion, it forms a caprock across the High Plains preventing significant infiltration, as well as erosion from wind and water. The High Plains area covers 32,000 square miles in eastern New Mexico and western Texas. The plateau is bounded on the north by the Canadian River, 60 miles north of Cannon AFB, and extends west to the Mescalaro escarpment east of the Pecos River. The eastern boundary is marked by topographic breaks east of Amarillo. The southern boundary is less well defined, merging without a sharp topographic break into the Edwards Plateau in west Texas (Darton, 1905).

The Ogallala Formation overlies an eroded surface of much older rocks, which are Triassic in age (138-240 million years old). These beds, known as Triassic red beds, form the base of the High Plains aquifer. The aquifer consists of the saturated sediments above the top of the Triassic red beds. The aquifer thickness ranges from zero, where the Ogallala Formation wedges out against older rocks, to as much as 560 feet in some parts of Curry County. However, the upper 50 feet of sediments are comprised of silty sands with zones cemented by calcium carbonate (caliche). These caliche zones lower the permeability and amount of infiltration of surface water through the near-surface sediments; however, the extent and lateral continuity of the caliche zones beneath the AFB are unknown. The amount of potential surface recharge to the aquifer (locally identified as the Ogallala aquifer) below the AFB is quite low due to the low annual rainfall coupled with high rates of evapotranspiration and the presence of caliche in the upper 50 feet of sediments. The major source of recharge to the Ogallala aquifer in the Southern High Plains area is precipitation that falls on the land surface north of the Canadian River. Also, the Canadian River valley acts to isolate the Ogallala aquifer to the north. The surface recharge in the New Mexico and Texas area of the Southern High Plains has been estimated to be about 1.0 inches per year (EPA, Drastic, April 1987). Thus, it is not likely that recharge to the Ogallala aquifer could occur on or near Cannon AFB, and the degree of interconnection between the ground surface and the aquifer is very low due to: (1) very low annual rainfall, (2) high evapotranspiration, (3) resulting low soil moisture in the vadose zone which extends over a soil interval approximately 250 feet thick, and (4) the presence of the caliche zones in the upper 50 feet of sediments.

Groundwater below Cannon AFB generally flows in an east and southeast direction. The slope of the water table is relatively flat at 7 to 15 feet per mile. This inclination corresponds with the regional dip of the Ogallala Formation which is 10 to 15 feet per mile in the area around Cannon AFB. Beneath Cannon AFB, the water table is more static than the surrounding areas up-and-down gradient. Localized flow patterns occur where groundwater withdrawals cause depressions to form in the water table. This effect is shown northwest of the Base where groundwater pumping for agricultural uses has lowered the water table locally (Figure 3.1.3-1).

Surface elevations on the Base range from 4330 feet above MSL at the northwest corner to 4260 feet at the southeast corner. The water table below the Base ranges in elevation from 4020 feet to 4000 feet above MSL towards the southeast. Therefore, depth to water ranges from 310 feet to 260 feet towards the southeast corner of the Base.

Water in the Ogallala aquifer is recharged solely by infiltration of precipitation falling on the High Plains. Since average annual rainfall is about 15 inches and estimated recharge to the aquifer is estimated at about 1 inch per year, the groundwater resources



SOURCE: Installation Restoration Program Phase II –Stage I Draft, Radian Corp., March 1986

Figure 3.1.3-1. Groundwater Elevation in the Vicinity of Cannon AFB, New Mexico

Table 3.1.3-1. Anticipated Useful Service of Water Wells, Cannon AFB Based on 1985 Study

Well	Elevation of Red beds (MSC)	Static Water Level (MSC)	Pumping Water Level (MSC)	Pump Setting (MSC)	Submergence (Ft)	Anticipated Years of Useful Service
1	3912	4008	3976	3956	20	14.3 (1999)
2	3933	4011	3968	3937	31	22.1 (2007)
3	3906	4006	3988	3924	64	45.7 (2030)
4	3925	4019	3975	3977	-2	- - - -
5	3903	4016	3999	3925	74	52.9 (2037)
7	3950	4014	3974	3958	16	11.4 (1996)
8	3904	4013	3984	3932	52	37.1 (2022)

Source: William Matotan and Associates, Inc., 1985.

in the Ogallala have been susceptible to depletion. Withdrawals (pumping for irrigation, industry, and domestic use) of large amounts of water from the Ogallala have reduced the water in storage, a process called water mining (U.S. Geological Survey, 1965). Groundwater levels in the vicinity of Clovis and Portales declined 1 to 2 feet per year in the decade preceding 1972 (Galloway, 1972; and Taylor and Pitt, 1972). Water levels in the wells at Cannon AFB have declined an average of 1.2 feet per year (William Matotan and Associates, 1985). Well No.7, which is pumped more than the other Cannon wells, exhibits the greatest rate of decline: 1.9 feet per year from the period of 1967 to 1985. Well No.1 exhibits the largest decline in water level: 39 feet over the period from 1942 to 1984.

A water well master plan survey conducted in 1985 (William Matotan and Associates, 1985) determined the anticipated useful life of the water wells at Cannon AFB. The results of that study, shown in Table 3.1.3-1, assume that the average daily rate of water use will steadily rise to 1.6 million gallons per day at the year 2000 (1984 water use was 1.3 million gallons per day). Of this use, approximately 300,000 gallons per day will be consumed by an increase in Base population of 2000 people (500 families of 4 persons each). The assumed per capita consumption is 150 gallons per day. The Base population as of September 1988 was 2609 (Cannon AFB ERIS FY88).

In the area around Cannon AFB, the quality of the water from the Ogallala is typically hard, approximately 185 mg/L as calcium carbonate; it commonly contains 2.2 mg/L of fluoride and 350 mg/L total dissolved solids (Galloway, 1972). Analyses of water samples taken from Cannon AFB wells were performed in 1985. Sampling locations and analytical results are shown in Appendix D. Fluoride at Cannon AFB ranges from 1.4 to 2.6 mg/L in untreated well water, and total dissolved solids range from 385 to 478 mg/L.

Groundwater is the sole source of water for the Cannon AFB water system. The Base water system consists of wells, pumping stations, treatment facilities for disinfection and fluoridation, storage, and a distribution system. The existing Base water system provides all of the water for Cannon AFB and provides service only within the Base boundaries. The service area includes aircraft operation and maintenance, Base housing, recreation facilities (golf course), and general Base operation and maintenance. Irrigation accounts for approximately 25 percent of on-Base water use in the peak day summer demands. Base water is supplied by seven wells developed in the Ogallala aquifer. The well depths vary from 357 to 415 feet, with capacities from 200 to 765 gallons per minute (gpm). Water pumped from the wells is stored in reservoirs prior to treatment and distribution (William Matotan and Associates, 1986). In 1984, these wells produced approximately 467 million gallons at an average daily rate of 1.3 million gallons (William Matotan and Associates, 1985).

The extent and location of groundwater contamination resulting from past hazardous materials disposal and spill are discussed in Section 3.1.8. The ongoing Installation Restoration Program (IRP) addresses these issues. No direct evidence was found to indicate that migration of hazardous contaminants exists beyond the immediate area of disposal or spill. A low potential for contaminant migration exists at Cannon AFB, due primarily to: (1) depth to groundwater, (2) low precipitation, (3) high evapotranspiration rate, and (4) the occurrence of a very low permeability caliche layer under most of the Base.

3.1.4 Socioeconomics

Tables 3.1.4-1 and 3.1.4-2 present information that is relevant to understanding current Base activities and to evaluating the potential impacts from realignment on socioeconomic characteristics of the region surrounding Cannon AFB. Table 3.1.4-1 shows current and projected appropriated-fund civilian (civil service) and military personnel by rank. Table 3.1.4-2 shows the current and projected distribution of these personnel on and off Base. This section provides a summary description of regional socioeconomic characteristics. More detailed data are included in Appendix A, Section 1.

3.1.4.1 Population, Employment, and Earnings

Population - Cannon AFB

Cannon AFB employed 3984 military and appropriated-fund civilian personnel in July 1989 (Housing Management Office, 1989a). Funding for these positions is budgeted by the Air Force and appropriated by the U.S. Congress. Table 3.1.4-1 shows the current numbers of personnel as well as the projected numbers of personnel associated with the realignment. Total Base-related population, including dependents, has been estimated to be between 15 and 20 percent of the total population of Curry and Roosevelt counties. This estimate was based on current employment data from the Housing Management Office supplemented by data from the Cannon AFB Economic Resource Impact Statement (ERIS).

According to the Housing Management Office at Cannon AFB, 1841 military personnel are living in government-controlled housing. Table 3.1.4-2 shows the current and projected numbers of personnel living on and off Base.

Population - Region of Influence

For the purpose of analyzing the socioeconomic impact of the realignment of Cannon AFB, the region of influence (ROI) consists of Curry and Roosevelt counties. The definition of the ROI was based on discussions with staff of the Office of the Secretary of Defense, Office of Economic Adjustment, and on identification of the regional existing trade area formed by the cities of Clovis in Curry County and Portales in Roosevelt County. An estimated 98 percent of Cannon AFB personnel who live off Base reside in Curry County, and an estimated two percent live in Portales. Very few personnel live in the unincorporated areas of Roosevelt County (Housing Management Office, Cannon AFB, 1989, *personal communication*).

Table 3.1.4-1. Current and Projected Appropriated-Fund Civilian and Military Personnel by Rank

Rank	Current Number	Expected Increase	Projected Number
Civilian[1]	445	77	522
Military			
Officers	378	183	561
Enlisted Personnel	3161	1479	4640
Total Military	3539	1662	5201
Total Personnel	3984	1739	5723

[1] Civilian personnel employed directly by the government.

Source: Housing Management Office, 1989a, 1989b. (Current numbers reflect personnel assignments as of July 1989.)

Table 3.1.4-2. Distribution of Military and Appropriated-Fund Civilian Personnel On and Off Base

	On Base			Off Base			
	Military		Total	Military		Civilian[1]	Total
	Single	Married		Single	Married		
Current	830	1011	1841	290	1408	445	2143
Projected	1248	1011	2259	402	2540	522	3464
Increase[2]	418	--	418	112	1132	77	1321

[1] Appropriated-fund civilian personnel funded directly by the government.

[2] Assumes construction of 300 new dormitory units, with double occupancy for personnel rank E-3 and below.

Source: Housing Management Office, August 1989b.

The total estimated population in the ROI as of 1 July 1987 was 60,600. This estimate represents a 0.70 percent annual compound rate of increase over the 57,714 population reported in the 1 April 1980 Census for the combined counties of Curry and Roosevelt. Most of this growth has occurred through natural increases in the existing population rather than inmigration. In 1980, Curry County had a population of 42,019, and Roosevelt County had a population of 15,695 (Table 3.1.4-3). The growth of the population of Curry County has fluctuated over the period and actually declined slightly in 1983. However, the growth in Roosevelt County has been steady between 1980 and 1987. As reflected in Table 3.1.4-4, the populations of Curry and Roosevelt counties are projected to increase at average annual rates of 0.62 and 0.12 percent, respectively, between 1990 and 1995 (Bureau of Business and Economic Research, University of New Mexico, 1989).

In 1980, the population of Clovis was 31,194 and the population of Portales was 9940. The 1986 estimated population of Clovis increased to 33,780, a 1.34 percent average annual compounded rate of growth over the 1980 population. Meanwhile, the 1986 estimated population of Portales increased to 10,180, a 0.40 percent average annual compounded rate of growth from its 1980 level.

Employment - Cannon AFB

Cannon AFB is the single largest employer in Curry County. As stated above, the estimated July 1989 appropriated-fund employment at the Base was 3984, consisting of 3539 military personnel and 445 appropriated-fund civilians (Housing Management Office, 1989a, as shown in Table 3.1.4-1). Other civilian jobs are created on Base but are not budgeted by the Air Force or funded through Congressional appropriations. Primary sources of these jobs are self-supported eating and recreational facilities on Base, the Commissary, the Base Exchange, and private retail businesses on Base. Still other civilian jobs are represented by the employees of contractors that have obtained service, operational, or construction contracts from the Base (ERIS, Cannon AFB, New Mexico, FY88).

Employment - Region of Influence

The annual average civilian employment (by place of residence) was 21,934 for the two-county ROI in 1988 (see Table A.1-2). Curry County's average employment for 1988 was 15,178, or approximately 69 percent of total annual employment for the ROI. Annual average employment in the ROI peaked in 1986 at 22,999 and declined in each of the following two years. Employment in the ROI grew at an average annual compound rate of 0.58 percent between 1980 and 1988.

Nonagricultural wage and salary employment covered by job insurance (by place of work) is shown in Table 3.1.4-5. The figures declined 12.7 percent in 1987 (the latest year for which data are available), from 16,734 in 1986 to 14,669 in 1987. Major

Table 3.1.4-3. Baseline Population Trends Within the Region of Influence

	Census 1980	Estimates 1986	1987	Average Annual Compound Growth Rate (Percent)
Region of Influence				
Curry County	42,019	43,300	43,600	+0.53[1]
Roosevelt County	15,695	16,800	17,000	+1.15[1]
Total	57,714	60,100	60,600	
Selected Cities				
Clovis	31,194	33,780	NA	+1.34[2]
Portales	9,940	10,180	NA	+0.40[2]

[1] The rate is based on the 1 April 1980 Census figure and the 1 July 1987 estimate.

[2] The rate is based on the 1 April 1980 Census figure and the 1 July 1986 estimate.

N/A = Not Available

Sources: Current Population Reports, U.S. Bureau of the Census, March 1988.
Bureau of Business and Economic Research, University of New Mexico, 1989.

Table 3.1.4-4. Baseline Population Projections Within the Region of Influence

		Projections				
	1987	1988	1989	1990	1992	1995
Region of Influence						
Curry County	___1	44,100[2]	44,500[2]	45,000	45,600[3]	46,400
Roosevelt County	-__1	17,000[2]	17,000[2]	17,000	17,000[3]	17,100
Total		61,100	61,500	62,000	62,600	63,500
Selected Cities[4]						
Clovis	34,200	34,700	35,200	35,600	36,600	38,100
Portales	10,200	10,300	10,300	10,300	10,400	10,600

[1] See estimates on Table 3.1.4-3.

[2] The annual compound rate of growth implicit in comparing the 1 July 1987 Census estimate with the 1990 projection from the Bureau of Business and Economic Research (BBER), University of New Mexico, was used to project county population for 1988 and 1989.

[3] The county population projections for 1990 and 1995 were taken from the BBER. The county projections for 1992 were made based on an assumption of a constant annual compound rate of growth between 1990 and 1995.

[4] The annual compound rate of growth implicit in comparing the 1980 Census figure with the 1 July 1986, Census estimate was used to project population of selected cities for 1987 through 1995.

Sources: Current Population Reports, U.S. Bureau of the Census, March 1988.
Bureau of Business and Economic Research, University of New Mexico, 1989.

Table 3.1.4-5. Wage And Salary Employment[1] Annual Averages in the Two-County Region, 1987

Ownership and Industrial Sector	Curry County	Roosevelt County	Total
Private Ownership			
Agriculture, Forestry, and Fish	232	110	342
Mining	0	28	28
Construction	668	111	779
Manufacturing	625	297	922
Transportation, Communications, and Utilities	628	247	875
Wholesale Trade	488	286	774
Retail Trade	3,037	884	3,921
Finance, Insurance, and Real Estate	637	133	770
Service	1,899	574	2,473
Other	45		45
Total Private Ownership	8,259	2,670	10,929
Government			
Federal[2]	871	124	995
State	311	565	876
Local	1,358	511	1,869
Total Government	2,540	1,200	3,740
Total Covered W&S Empl.	10,799	3,870	14,669

[1] Employment covered by job insurance and based on place of work.

[2] Cannon AFB employment not included.

Source: Covered Wages and Employment, Quarter 1, 1986 - Quarter 4, 1987, Economic Research and Analysis, New Mexico State Department of Labor.

industries by employment in the two-county area are retail trade (which accounted for 26.7 percent of total employment in 1987), government (25.5 percent), and services (16.9 percent). Other important industries are manufacturing; transportation, communications, and utilities; construction; finance, insurance and real estate; and wholesale trade. The decline in employment from 1986 to 1987 was felt in each of these major industries, except for the government sector, where overall there was a small increase in employment (see Table A.1-3). Particularly significant employment losses were reflected in construction (approximately 25 percent) and retail trade (approximately 20 percent).

The Bureau of Economic Analysis reported 2084 full-time and part-time farm employees (by place of work) in the ROI in 1987 (Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce, 1989). Farm employment has remained relatively stable between 1982 and 1987, and has accounted for between 7.4 and 8.2 percent of total employment.

Earnings - Cannon AFB

As summarized in Table 3.1.4-6, the total payroll disbursed to military and appropriated-fund civilian personnel at Cannon AFB in FY88 was almost $77.3 million. Payroll disbursements to nonappropriated-fund and other civilian workers on Base totaled $3.2 million in FY88. The average annual payroll for military members and appropriated-fund civilians was $19,403 in FY88 (ERIS, 1988).

Earnings - Region of Influence

Total nonagricultural wages and salaries (by place of work) for jobs covered by job insurance, excluding Cannon AFB, were just over $212.5 million in the two-county ROI in 1987 (see Table A.1-5). Approximately 72.7 percent of these wages and salaries were earned in Curry County. Annual mean wages in the ROI were $14,488 in 1987. Earnings through the federal, state, and local government accounted for 32.9 percent of the total wages and salaries in this region. Other leading sources of earnings were retail trade (18.4 percent); services (15.1 percent); transportation, communications, and utilities (7.9 percent); and manufacturing (7.7 percent).

3.1.4.2 Housing

Of the 3539 military personnel assigned to Cannon AFB in July 1989, 1841 were living in government-controlled housing and the remaining 1698 were living in community housing (Table 3.1.4-7). Adding the 445 appropriated-fund civilian personnel to the total community housing requirements results in a total of 2143 Base-related personnel living in the community in July 1989 (Table 3.1.4-2). Government-controlled housing includes 761 family units located on Base and 250 four-bedroom houses located north of the Base across Highway 60/84. Unaccompanied personnel living on Base reside in one of the ten dormitory buildings (SAIC, 1989).

Table 3.1.4-6. Payroll Disbursed to Cannon AFB Employees (Fiscal Year 1988)

Category	Dollars
Military	
Residing On Base (estimated)	$27,649,211
Residing Off Base (estimated)	40,069,833
Total Military Payroll	$67,719,044
Appropriated-Fund Civilian	
General Schedule/Federal Wage/Other	$ 9,544,264
Nonappropriated-Fund and Other Civilians[1]	$ 1,508,948
Private Business On Base	277,000
Civilian NAF/BX	1,441,161
Total Nonappropriated-Fund	$ 3,227,109
Total Annual Payroll	$80,490,417

[1]Not included elsewhere.

Source: Economic Resource Impact Statement, Cannon AFB, 1988.

Table 3.1.4-7. Distribution of Military Personnel in Community and On-Base Housing, Cannon AFB, July 1989

Housing Category	Enlisted	Officer	Total
On-Base Housing:			
UPH[1]	830	0	830
Family	862	149	1011
TOTAL	1692	149	1841
Community Housing:			
UPH	199	91	290
Family--2 Bedrooms or Less	902	71	973
Family--3 Bedrooms or Less	368	67	435
TOTAL	1469	229	1698
ALL HOUSING FOR MILITARY	3161	378	3539

[1] UPH denotes unaccompanied personnel housing.

Sources: Housing Management Office, 1989b; distribution by bedroom count derived from Housing Management Office, 1989c.

Of the 1698 military personnel living in community housing in 1988, approximately 46 percent of the officers and 27 percent of the enlisted personnel owned their own homes (Housing Management Office, 1988). Therefore, the majority of the people living off Base were occupying rental property. Homes were available for sale and rental units were vacant in both the Clovis and Portales housing markets in the summer of 1989. For example, there was an average of 175 homes on the market each month from January through July 1989 in Clovis. Since there was an average of 50 transactions completed each month over the same period, an average of approximately 125 homes were available for sale for buyers in that market (Clovis Board of Realtors, 1989b). The Clovis Multiple Listing Service's reports for April and June 1989 showed that the average vacancy rates for rental units were 13.5 percent and 17.1 percent, respectively (Clovis Board of Realtors, 1989c). Assuming a slightly lower average vacancy rate for Portales because of the student population, the estimated vacancy rate for the Clovis-Portales housing market was between 10 and 15 percent, representing approximately 280 rental units (SAIC, 1989).

3.1.4.3 Community Services

Community Services in the City of Clovis and Curry County

Clovis residents are served by police, fire, ambulance, road maintenance, airport, waste, library, and recreational services provided by the city. The cost of waste water and solid waste is borne by user fees. Water is supplied directly to residents in and adjacent to the city by a private company (Moss, 1989; Clifton, 1989; and Garrett, 1989; personal communication). Wastewater and water services are discussed in the following section on utilities.

The city employs 57 police officers, 32 fire officers, and 31 ambulance officers (Clovis City Budget Fiscal Year 1988-1989). Additionally, the fire department can call on mutual aid agreements with Cannon AFB and the county, in case of need. City response to fire and emergency medical calls extends to county residents within 10 miles of the city. Approximately 84 percent of fire calls and 76 percent of emergency medical calls are attributed to city residents (Cooper, 1989, personal communication). Based on a 1989 projected city population of 35,200 (see Table 3.1.4-4), there is one police officer for every 618 city residents. Assuming a reduction in the number of officers proportionate to the percentage of calls made outside the city limits, there is one fireman per 1310 city residents served, and one ambulance officer per 1494 city residents served.

A variety of municipally funded recreation facilities is available. City facilities and programs are coordinated with those of the school district and of Play, Inc., a nonprofit organization which operates two outdoor pools (a year-round facility is planned) and youth sports programs (Grandy, 1989, personal communication). Voters have recently approved construction of a new library (Moss, 1989; Clifton, 1989; and Garrett, 1989; personal communication).

Curry County is responsible for county roads; provides sheriff, jail, and drug enforcement services; and collects taxes for the city, state, and schools. Currently, jail capacity is inadequate to meet city and county needs. Plans for a new building have not been approved by voters, and the overflow is housed in the Roosevelt County jail (Bonney, 1989, personal communication).

Community Services in the City of Portales and Roosevelt County

Portales residents are served by police, fire, emergency medical services, recreation, solid waste, and road maintenance services. A municipal airport will soon be available for use. In addition to recreational services provided by the city, residents may participate in a variety of cultural activities provided by Eastern New Mexico University, which is located in Portales. User fees cover the cost of wastewater, solid waste, and water services; wastewater and water services are discussed in the following section on utilities.

The city employs 20 police officers, 9 fire officers, and 8 emergency medical personnel. City response to fire and emergency medical calls extends to county residents within 10 miles of the city (Shafer, 1989; Obrey, 1989a, personal communication). Approximately two-thirds of fire and emergency medical calls are attributed to city residents, and the other one-third of calls are from county residents (City of Portales, 1989). Based on a 1989 projected population of 10,300 (see Table 3.1.4-4), there is thus one police officer for every 515 city residents, approximately one fire officer per 1720 city residents served, and approximately one emergency medical officer per 1930 city residents served.

Roosevelt County is primarily responsible for county roads and for sheriff and jail services. The county jail, built within the last few years, houses inmates for the city of Portales and also the overflow for Curry County and Clovis. Capacity is more than adequate to meet current needs (Dictson, 1989, personal communication).

Medical Services

Two general hospitals serve the study area. These are Clovis High Plains Hospital, located in Clovis, and Roosevelt General Hospital, located in Portales. Summary data for the two hospitals and for Cannon AFB Hospital are included in Appendix A (see Table A.1-8). The civilian hospitals provide a total of 152 licensed hospital beds (excluding 57 nursing home beds), to serve a projected 1989 population in the two-county ROI of 61,500 (see Table 3.1.4-4), yielding a ratio of 1 bed per 405 people. Clovis High Plains Hospital provides a full range of specialty services except for neonatal care. The hospital has adequate capacity to serve current needs. No problems in local recruiting of hospital staff have occurred except for critical nursing areas such as intensive care (Lineberry, 1989, personal communication). Roosevelt Hospital provides community hospital services and general surgery, including some specialty services. Hospital officials believe that capacity is adequate for current needs and could accommodate 30 percent growth without stress (Timmons, 1989, personal communication). Physicians are available locally to cover the range of medical needs, although their numbers per specialty are limited. Patients are referred to hospitals in Lubbock or Amarillo, Texas, each about 2 hours away, or to Albuquerque, about 4 hours away, if specialty services are not locally available (Brewer, 1989, personal communication).

Medical care, including prescriptions and testing, is also provided by the Base hospital. Medical services are provided free to military retirees and the dependents of active duty and military retirees, in addition to active duty personnel. Approximately 2500 military retirees and their dependents, living in the Cannon AFB area, are eligible for these benefits at the AFB. Hospital statistics indicate that the average waiting time for most services provided on Base is well within AF standards (Cannon AFB Hospital, 1988).

Specialty services not provided on Base include orthopedics; dermatology; ear, nose, and throat (ENT); urology; cardiology; and ophthalmology. Agreements are in place with several military facilities to serve the needs of active duty personnel for services that are not available at Cannon AFB (Brewer, 1989, personal communication). Military retirees and dependents may use civilian services when needed services are not available at the military hospital, and they are assisted with costs through the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). Eligible persons living in the Cannon zip code zone must first seek service at Cannon AFB hospital for inpatient care. In 1987, CHAMPUS assisted an average of less than 5 inpatients per day from the Cannon zip code area, indicating that military retirees and dependents generally rely on services provided by the military (CHAMPUS, 1989).

Plans for construction of additional Base health facilities for the expected increase in administrative and outpatient needs have been approved. The current hospital staff will be expanded from 250 to 290-330, and approximately 30,000 square feet of additional floor space will be constructed. No additional inpatient facilities are planned (Orille, 1989, personal communication).

3.1.4.4 Utilities

Four types of utilities are affected by Cannon AFB: water supply, wastewater treatment, electricity, and natural gas. Overall, utilities maintain a large reserve in the two-county ROI. The Base impacts these utilities through direct use and through demand in surrounding communities. Cannon AFB provides its own water from wells, treats its own wastewater, and does not rely on community utilities for these services. Rural residents also handle their own water and sewage treatment needs.

Water for Clovis and Portales is pumped from the Ogallala aquifer. The New Mexico-American Water Company supplies water to Clovis. Pumping capacity has a 70 percent reserve (Schaffer, 1989, personal communication). Portales city government runs its own water supply system with over a 100 percent reserve. There is ample reserve for expansion.

Portales and Clovis each have their own wastewater treatment systems. The Clovis system has a capacity of 4 million gallons per day (mgpd). The current load is 3.2 mgpd. This is a relatively low reserve (Becker, 1989a, personal communication). Portales is operating at its 1 mgpd capacity. Much of the wastewater is from industrial users. Additional domestic sewage could be handled, since it would dilute the industrial wastewater.

Electricity is supplied to the entire region by the Southwestern Public Service Corporation through a multi-state grid. The company supplies roughly 50,000,000 kilowatt hours to Cannon AFB every year (Martin, 1989, personal communication). This is only .03 percent of the electricity supplied by the utility. All military-related uses consume less than 1 percent of the utilities' output. The company maintains a large reserve-generating capacity.

Gas is supplied to the two-county ROI by the Gas Company of New Mexico. New Mexico and nearby Texas have large gas reserves. Pipelines serving the ROI operate at only partial capacity, leaving a large reserve. The Base is a major consumer, using 13.5 percent of the gas supplied to the two-county area.

3.1.4.5 Education

Clovis Municipal School District

Clovis Municipal School District operates 12 elementary schools, 3 junior highs, and 1 high school, with a total 40th-day enrollment during the 1989-90 school year of 7875 students, including kindergarten (prorated as full-time equivalents) and special students (Clovis Municipal School District, 1989b). Students are allocated to schools on a neighborhood basis and divided into elementary (grades 1-6), junior high (grades 7-9), and high school (grades 10-12) (Mitchell, 1989, personal communication). Overall enrollment has decreased nearly 2 percent for the 1988-89 school year after a small increase each year since the mid-1980s. Past and projected enrollment, including kindergarten and special students, and aggregated by elementary, junior high, and high school levels, is shown in Tables 3.1.4-8 and 3.1.4-9, respectively.

A total of 1735 student dependents of Cannon AFB personnel, representing approximately 22 percent of total student enrollment, enrolled in Clovis schools during the school year 1989-90 (kindergarten students are prorated as full-time equivalents) (Clovis Municipal School District, 1989b). The Clovis district is the only district in the study area with a sufficiently large percentage of federally connected students to qualify for PL-874 Federal Education Impact Funds. School districts are entitled to receive PL-874 funds in lieu of property taxes based on the attendance and place of residence of federally connected pupils enrolled. Distinctions made between "A" students, who reside on Base with a military parent, and "B" students, who live off Base, affect the amount of payment received. For the 1988-89 school year, the district received a total of $733,925, representing $745.22 per "A" student and $43.55 per "B" student. Records for 1989-90

Table 3.1.4-8. Clovis Municipal School District Enrollment, 1985-86 to 1989-90[1]

	Grades					
School Year	Special Students[2]	Kindergarten[3]	1-6	7-9	10-12	Total
1985-86	262	335.5	3725	1835	1482	7639.5
1986-87	303	350	3770	1825	1578	7826
1987-88	342	339.5	3846	1792	1627	7946.5
1988-89	342	325	4012	1750	1598	8027
1989-90	327	347.5	3977	1689	1534	7874.5

[1] 40th-day count.

[2] Includes special and prekindergarten education.

[3] Full-time equivalent.

Source: Clovis Municipal School District, 1989a; 1989c.

Table 3.1.4-9. Projected Enrollment Without Realignment: Clovis Municipal School District 1990-91 and 1991-92[1]

	Grades					
School Year	Special Students[2]	Kindergarten[3]	1-6	7-9	10-12	Total
1990-91	346	351	4043	1654	1547	7941
1991-92	366	354	4110	1620	1560	8010

[1] Projections were estimated assuming that each grade group grows at the same average annual percent growth rate observed from 1985-86 to 1989-90, calculated using Table 3.1.4-8 (special students at 5.70 percent/year; kindergarten at 0.88 percent/year; 1-6 at 1.65 percent/year; 7-9 at -2.05 percent/year; 10-12 at 0.87 percent).

[2] Includes special and prekindergarten education.

[3] Full-time equivalent.

indicate that 981 "A" and 754 "B" student dependents of military personnel are enrolled in Clovis schools (Clovis Municipal School District, 1989b). State officials project receipts of $701,543 for "A" students for the 1989-90 school year. No funds are expected for "B" students, due to reduced appropriations by Congress (Lopez, 1989, personal communication). The school district does not benefit directly from PL-874 payments, 95 percent of which are considered by the state in calculating the state equalization guarantee that provides the overwhelming proportion of school operational funds (Morgan, 1989).

Over 96 percent of the Clovis Municipal School District's operational funds are derived from state sources (refer to Appendix A, Table A.1-9). Most of the funding is provided by the state equalization guarantee, a formula established by the New Mexico School Finance Act of 1974, under which funding is determined by calculating "program units." Factors used to determine program units include the number of full-time equivalent students in membership on the 40th day of school, the grade level (different weights are given according to grade, early childhood, bilingual, and special education students), and school district size (Morgan, 1989).

School districts may levy general obligation bonds, which must be approved by voters, to finance new construction and capital improvements. Bonding capacity is limited to 6 percent of the assessed valuation of property within the district (Morgan, 1989). As of 30 June 1988, the Clovis district had $5 million in outstanding principal, which represents 2.2 percent of the possible 6 percent bonding capacity (New Mexico State Department of Education, no date).

Plans are currently being made for construction of a new elementary school for a minimum of 500 students; land has been purchased in the northeast section of the city where a population shift is occurring. The decision to construct is independent of the Cannon AFB expansion, although the latter may affect the timing of construction. School officials do not expect problems with financing. Additionally, a decision is to be made in the fall of 1989 on whether to change from the current system to a new middle school system that would remove sixth graders from the elementary to a middle school of sixth to eighth graders and place ninth to twelfth graders in the high school (Mitchell, 1989; Purvis, 1989, personal communication).

Portales Municipal School District

Portales Municipal School District operates four elementary schools, one junior high, and one high school, with a total enrollment for the 1989-90 school year of 2639, including kindergarten (prorated as full-time equivalents) and special students (Overby, 1989a, personal communication). Each school serves specific grades; thus, enrollment is city-wide rather than neighborhood-based. Overall enrollment has been exceptionally stable for the past 5 years, with only a small increase in students each year. Growth has occurred primarily in the lower grades; however, kindergarten enrollment appears to have slowed in the past year (Portales Municipal School District, 1989; Overby, 1989b, personal communication). Past and projected 40th-day enrollment is shown in Tables 3.1.4-10 and 3.1.4-11, respectively.

Currently, there are only 29 federally connected students in the Portales schools, and the school district does not qualify for PL-874 funds. As in Clovis, the overwhelming proportion of operational funds are derived from the state (see Table A.1-10). As of June 30, 1988, the district had an outstanding principal of $445,000 in bonded debt; this represents 3 percent of the possible 6 percent bonding capacity (New Mexico State Department of Education, no date).

Eastern New Mexico University

The Eastern New Mexico University (ENMU) Clovis campus and Portales campus serve different student needs and are funded separately. The main campus, located in Portales, offers 4-year undergraduate programs and also graduate programs. The Clovis campus, which serves a community college role, offers 2-year undergraduate classes. ENMU Clovis works closely with the Base to facilitate the transfer of credits for military personnel. Approximately 25 sections of ENMU courses are taught on the Base. Additionally, the college offers an accelerated 9-week mini-term to accommodate military needs. Total annual full-time equivalent (FTE) enrollment is 1350. Headcount for the last spring semester was 2989; 460 students were active duty military, primarily enlisted men. Unofficial estimates are that an additional 100 students are military dependents (Gurley, 1989, personal communication). These data indicate that approximately 19 percent of students are related to Cannon AFB activity.

Current military enrollment at ENMU Portales is lower than at the Clovis campus. Spring enrollment headcount showed 91 undergraduate active military students out of a total undergraduate enrollment of 2481, and 5 military out of a total 71 graduate students. These numbers represent approximately 4 percent of undergraduate and 7 percent of graduate students. Data on military dependent enrollment were not available (Holt, 1989, personal communication).

3.1.4.6 Public Finance

New Mexico local governments receive operating funds from state distributions, local taxes and charges for services, and federal revenues. A key feature of the New Mexico tax system is the reliance of local jurisdictions on revenues from the state. The overwhelming proportion of state revenue is from the state-wide gross receipts tax. A percentage of this tax is retained by local governments; a higher percentage is retained by the state and subsequently redistributed. Considering gross receipts funding alone, Clovis received $4,703,595, or 64 percent, of its 1988 General Fund revenues from this source; Portales received $2,126,686, or 68 percent (New Mexico State Department of Finance and Administration, 1988).

Table 3.1.4-10. Portales Municipal School District Enrollment, 1986-87 to 1989-90[1]

	Grades					
School Year	Special Education	Kindergarten[2]	1-6	7-9	10-12	Total
1986-87	91	115	1219	581	466	2472
1987-88	79	116.5	1240	584	490	2509.5
1988-89	77	116.5	1250	626	465	2534.5
1989-90	84[3]	104	1331	604	516	2639

[1] 40th-day count.

[2] Full-time equivalent.

[3] Projected 80-day count.

Source: Portales Municipal School District, 1989; Overby, 1989a, personal communication.

Table 3.1.4-11. Projected Enrollment Without Realignment: Portales Municipal School District 1990-91 and 1991-92[1]

	Grades					
School Year	Special Education	Kindergarten[2]	1-6	7-9	10-12	Total
1990-91	82	100.5	1371	612	534	2699.5
1991-92	80	97	1412	620	552	2761.0

[1] Projections were estimated assuming that each grade group grows at the same average annual percent growth rate observed from 1986-87 to 1988-89, calculated from Table 3.1.4-10 (special education at -2.63 percent; kindergarten at -3.30 percent; 1-6 at 2.97 percent; 7-9 at 1.30 percent; and 10-12 at 3.46 percent).

[2] Full-time equivalent.

Other main revenue producers for local communities are federal grants and revenues, local service or use charges, and property taxes. For the city of Portales, service charges account for a larger percentage of revenue than property taxes. For the city of Clovis, service charges contributed more to revenues than property taxes in 1986-87 and slightly less in 1987-88. The state constitution provides that rates of up to $20 per $1,000 of net taxable property value may be imposed for general purposes without approval of the electorate; the proportion for municipal and county jurisdictions is $7.65 and $11.75, respectively (New Mexico State Department of Taxation and Revenue, 1989).

A detailed breakdown of revenue sources for the cities of Clovis and Portales is presented in Appendix A (Tables A.1-11 and A.1-12). Table 3.1.4-12 shows per capita revenue and expenditure figures for these cities for 1986-87 and 1987-88. The cities estimated expenditures of $7,839,768 and $3,779,078, respectively, for 1988-89. Per capita expenditures are $226 for Clovis based on a projected 1988 population of 34,700 (see Table 3.1.4-4). Portales projects a $367 per capita expenditure on population of 10,300 (Table 3.1.4-4) for the same period (New Mexico State Department of Finance and Administration, 1988). Per capita county revenues and expenditures are included in Table A.1-13 in Appendix A.

The ability of local governments to issue debt is subject to rules established by the New Mexico state constitution, generally through limitations on the amount of debt jurisdictions may have, expressed as a percentage of taxable property values (New Mexico State Department of Taxation and Revenue, 1989). Thus, the cities of Clovis and Portales have a limit of 4 percent of assessed property value on the amount of debt they are able to levy. Both cities are financially sound, with relatively small debt obligations. Both have available their full General Obligation bonding capacity. Currently, Portales has $2,369,319 available; Clovis has $8,117,569 available. The amount available in future years will vary with the assessed value of property.

3.1.4.7 Transportation

The highway network in the vicinity of Cannon AFB consists of U.S., state, city, and county roads. The nearest interstate highway, I-40, is located approximately 50 miles to the north of Clovis. Figure 3.1.4-1 shows the general orientation of the road network in the study area. Maps showing the principal streets of the city of Clovis and details of the Cannon AFB interchange are included in Appendix A. Also included in Appendix A is a detailed description of the status of each of the major roads that carries Base-related traffic.

Three U.S. highways (U.S. 60, U.S. 70, and U.S. 84) account for the majority of the through-traffic in the county. As shown in Figure 3.1.4-1, these three highways enter Clovis from the East on a combined alignment. U.S. 70 branches off to the southwest in the center of town and U.S. 60/84 continues west as a four-lane divided highway. Cannon AFB is located adjacent to U.S. 60/84, approximately 6.75 miles west

Table 3.1.4-12. Per Capita Revenues and Expenditures, Cities of Clovis and Portales, New Mexico

City	1986-87 Actual	1987-88 Actual	1988-89 Budgeted
Clovis			
General Fund Revenues	$7,225,128	$7,338,013	$6,994,709
General Fund Expenditures	$6,367,039	$7,089,341	$7,839,768
Estimated Population	33,780[1]	34,200[2]	34,700[3]
Per Capita Revenues	$214	$215	$202
Per Capita Expenditures	$188	$207	$226
Portales			
General Fund Revenues	$2,980,891	$3,127,143	$3,624,397
General Fund Expenditures	$2,775,751	$2,981,538	$3,779,078
Estimated Population	10,180[1]	10,200[2]	10,300[3]
Per Capita Revenues	$293	$307	$352
Per Capita Expenditures	$273	$292	$367

[1] Estimate for 1986 (refer to Table 3.1.4-3).

[2] Projection for 1987 (refer to Table 3.1.4-4).

[3] Projection for 1988 (refer to Table 3.1.4-4).

Source: New Mexico State Department of Finance and Administration, Local Government Division, 1987; 1988.

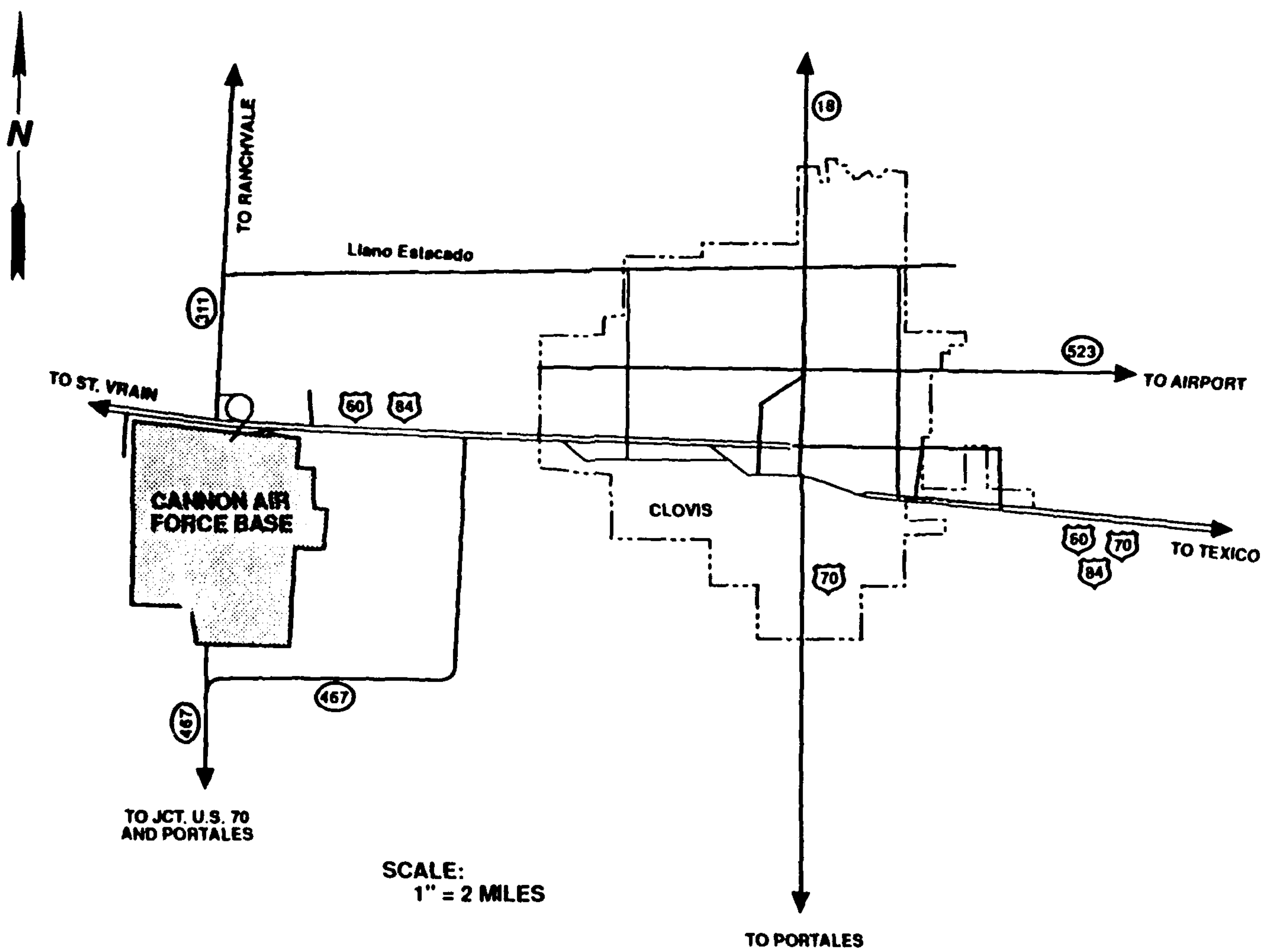


Figure 3.1.4-1. Road Network in the Cannon AFB Area

of the city center. Connecting highways include state roads 311 and 467, two-lane roads in the immediate vicinity of the Base, and 7th Street, where traffic through the city is most concentrated.

In general, the road network in the vicinity of the Base appears to have adequate reserve capacity to accommodate increased traffic. U.S. 60/84 carries almost 1300 vehicles per day on the section between Clovis and the Base (City of Clovis, 1986); approximately 40 percent reserve capacity is available during the peak traffic hour. A possible problem area is the Base interchange on U.S. 60/84. Although insufficient information was available to perform a detailed capacity analysis for the interchange, a preliminary analysis indicates that the maximum hourly capacity of 1500 vehicles may be approached under current conditions. During peak traffic periods, vehicles currently back up on the westbound exit ramp, waiting to enter the Base main gate, located south of the highway. However, the queue does not appear to extend back on to U.S. 60/84.

Traffic along SR-311 and SR-467 is relatively light, averaging under 2000 vehicles per day (Dick, 1989, personal communication). Reserve capacity for these roads is at least as high as for U.S. 60/84. Within Clovis, the traffic diffuses through the city street network, such that impacts to streets other than 7th Street are minimal. Along 7th Street, a four-lane divided urban arterial through its intersection with Main Street, maximum average daily traffic was 12,737 in 1986. City officials report no significant traffic congestion problems (Becker, 1989b, personal communication). County roads carry relatively little traffic because of the sparse population.

3.1.4.8 Socioeconomic Aspects of Aircraft Operations in the Vicinity of Cannon AFB

Resident population within the DNL 65 dB noise contour consists of an estimated 1323 people living in Base housing and an estimated 363 people in Curry County (refer to Table 3.1.2-2 for details of this distribution).

3.1.5 Airspace Management and Land Use

3.1.5.1 Existing Cannon Air Force Base Airspace Areas

The existing airspace environment at Cannon AFB consists of four basic elements. These include (1) Controlled Airspace directly related to the control of military and civil air traffic in the area, (2) Special Use Airspace, which consists of Restricted Areas and a MOA for military flight training, (3) MTRs used for low-altitude, high-speed flight training, and (4) an Aerial Refueling Route to support military flight operations. The following discussion describes the use of each of these elements in relation to Cannon AFB and civil use of this airspace. Military flight safety is also addressed for the Cannon airspace.

Controlled Airspace

Controlled Airspace includes a control zone, transition area, airport traffic area, and approach control area, all of which are basic to all military and civil airports where radar and control tower air traffic control services are provided. These areas serve in concert with each other to help ensure the safe passage of aircraft operating to or from an airport or transiting through airspace surrounding the airport environment. Such aircraft are subject to the air traffic control rules and Federal Aviation Administrative (FAA) Regulations governing the use of these areas.

Controlled Airspace associated with Cannon AFB is depicted in Figure 3.1.5-1. The control zone and airport traffic area each encompass a 5-statute-mile radius of the airfield from the surface up to 3000 feet above ground level (AGL) and 14,999 feet MSL, respectively. This provides control of air traffic in the immediate vicinity of the Base. The transition area encompasses an area within a 23-statute-mile radius of the Base (plus extension for instrument approach procedures) to contain Instrument Flight Rules (IFR) operations at Cannon, Clovis, and Portales between 700 feet AGL and 14,999 feet MSL. The Cannon approach control area is a larger, irregular expanse of airspace from the surface to 16,000 feet MSL within which all aircraft may be provided radar air traffic control services. This applies to all aircraft, whether they are operating to or from one of the three airports, or simply transiting through the area.

Approximately 118,000 combined military and civil air traffic operations were conducted throughout the Controlled Airspace in 1988. This includes multiple practice takeoffs and landings at Cannon AFB by individual sorties.

Special Use Airspace

Special Use Airspace includes Restricted Areas and MOAs, which are designated by the FAA specifically for the conduct of military activities. This airspace is defined in terms of lateral and vertical limits, as well as times of use, to meet military requirements, and at the same time, minimize conflicts with competing airspace users. Restricted Areas are designated for activities such as aerial gunnery and air-to-ground weapons delivery. Nonparticipating aircraft (civil and nonscheduled military) are restricted from entering this airspace when it is active, unless cleared by air traffic control. MOAs are designed for activities such as air combat maneuvers and intercepts. Nonparticipating aircraft are not restricted from use of this airspace. Visual Flight Rules (VFR) aircraft may transit below 18,000 feet MSL with caution as necessary to remain clear of military aircraft. The FAA separates Instrument Flight Rules (IFR) aircraft from military operations when routing aircraft through MOA airspace.

Special Use Airspace in the Cannon AFB environment consists of Restricted Areas R-5104A/B and R-5105, and the Pecos MOA. The airspace management of the Melrose Range is discussed in Section 3.3.5.1.

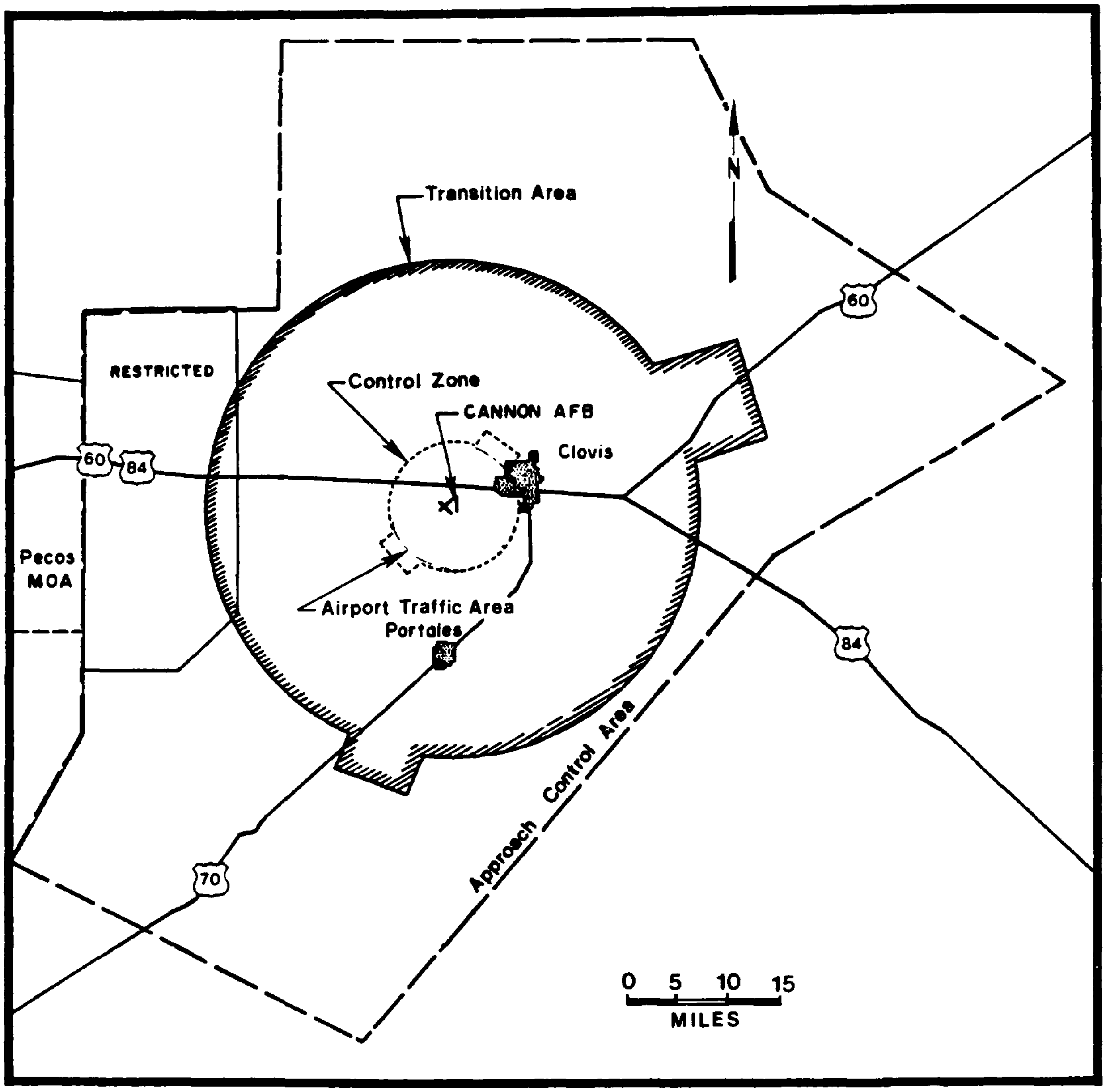


Figure 3.1.5-1. Controlled Airspace, Cannon Air Force Base

The Pecos MOA is located 35 statute miles west of Cannon AFB and is subdivided laterally and vertically as shown in Figure 3.1.5-2 and Table 3.1.5-1 for concurrent flight operations. There are no ordnance deliveries in the MOA and it is used primarily for air-to-air tactics. Current use of the Pecos MOA is approximately 1820 annual sorties for Cannon AFB and other scheduled users.

Military Training Routes

Military Training Routes (MTRs) are airspace corridors approved by the FAA and military for conducting low-altitude training flights at speeds in excess of 250 knots below 10,000 feet MSL. Two types of MTRs associated with Cannon Special Use Airspace are (1) Instrument Routes (IRs) flown under Instrument Flight Rules, which can be flown in instrument or visual weather conditions, and (2) Visual Routes (VRs) flown under Visual Flight Rules, which can only be flown under visual conditions. MTRs are nonrestrictive in that nonparticipating aircraft can fly within them while exercising caution. MTR hours of operation can vary from specific time periods to continuous, as published on aeronautical charts.

There are 10 different MTRs that enter or exit the Pecos MOA and Restricted Areas as depicted in Figure 3.1.5-3. Eight of these MTRs are scheduled by Cannon AFB and are used for low-altitude flight training requirements in conjunction with other training in the MOA or Melrose Range. The Cannon MTRs have a combined annual use of nearly 6400 sorties. The other two MTRs (VRs 1107/1195) are scheduled by Kirtland AFB and their combined use is approximately 2200 sorties per year by A-6s, A-7s, and FA-18 aircraft.

The following summary of Cannon AFB MTRs indicates the published width and floor of each route, as well as specified restrictions for which an aircraft will climb and/or maneuver around to avoid airfields, towns, ranches, and other such sensitive areas underlying the MTR. Details of each MTR such as originating and scheduling activities, hours of operation, route description, terrain following operations, and special operating procedures are found in Appendix C.

IR 107 has a width of 7.5 nm either side of centerline and a 100-foot AGL floor. Flight restrictions along this route include 1500 feet AGL vertical or 3 nm lateral for all charted airfields; 1000 feet AGL and 1 nm for ranches; and 2 nm for Kenton State Park, Capulin Volcano National Monument, a ranch near Quay and the village of House, New Mexico, near the Melrose Range. The Bell Ranch Complex is avoided by 1000 feet AGL and 1.5 nm, and the Tesquite Creek area is specified for lateral avoidance.

IR 109 has varying widths from 1 to 5 nm either side of centerline with a 100-foot AGL floor. Flight restrictions along this route include 1500 AGL or 3 nm for charted airfields and 2 nm for the towns of Guadalupita, Ocate, House, and Naranjos, New Mexico. A 1000-foot AGL or 1 nm avoidance area is also specified along the Yeos Creek beneath the Pecos MOA.

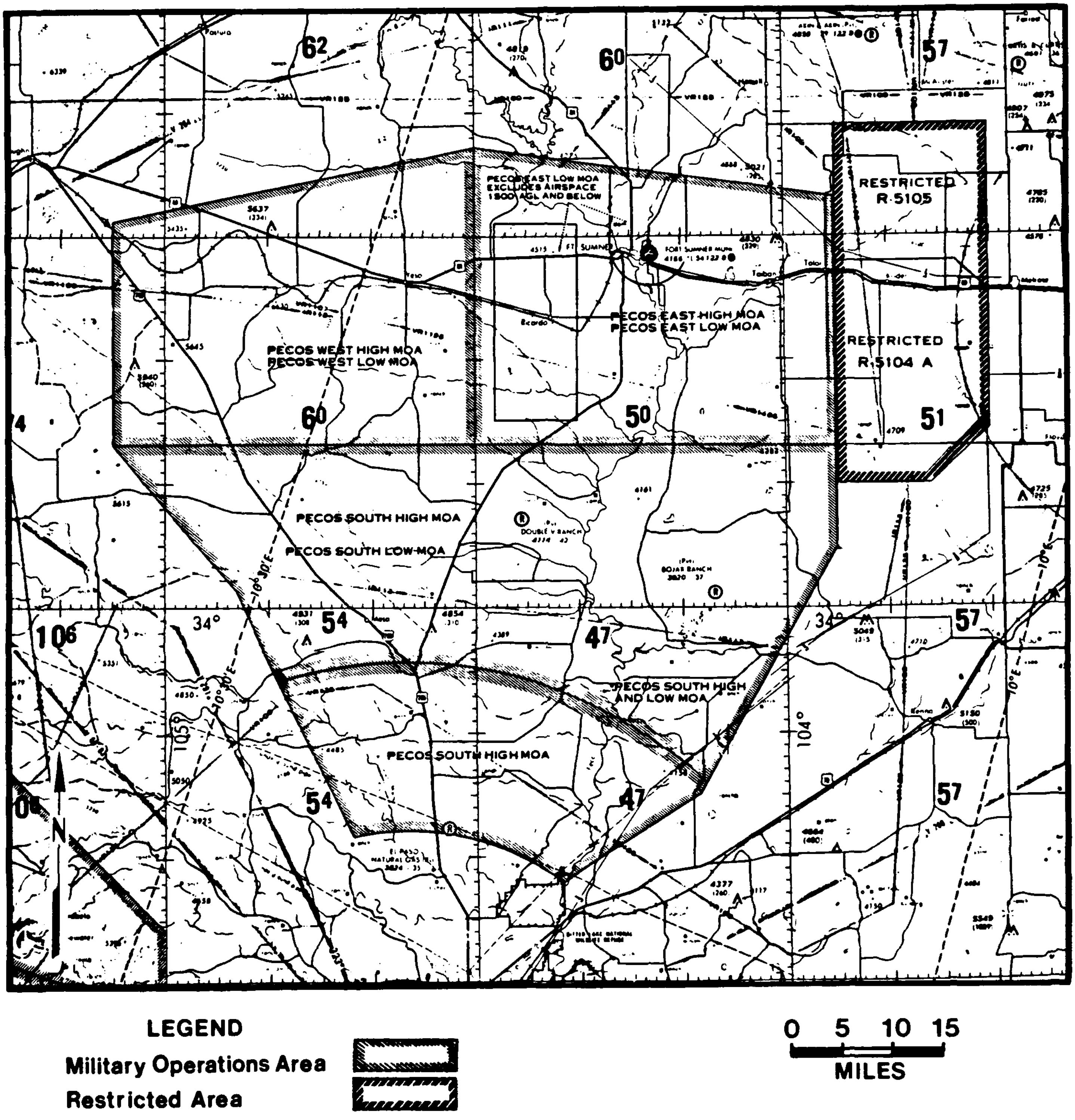


Figure 3.1.5-2. Special Use Airspace, Cannon Air Force Base

Table 3.1.5-1. Pecos MOA Operating Altitudes

MOA Name	Floor Altitude	Ceiling Altitude
Pecos East High	11,000 ft MSL	17,999 ft MSL
East Low	500 ft AGL[a]	10,999 ft MSL
Pecos West High	11,000 ft MSL	17,999 ft MSL
West Low	500 ft AGL	10,999 ft MSL
Pecos South High	11,000 ft MSL	17,999 ft MSL
South Low	500 ft AGL	10,999 ft MSL

[a] A portion of the Pecos East Low MOA excludes altitudes 1500 feet AGL and below.

MSL - Mean Sea Level
AGL - Above Ground Level

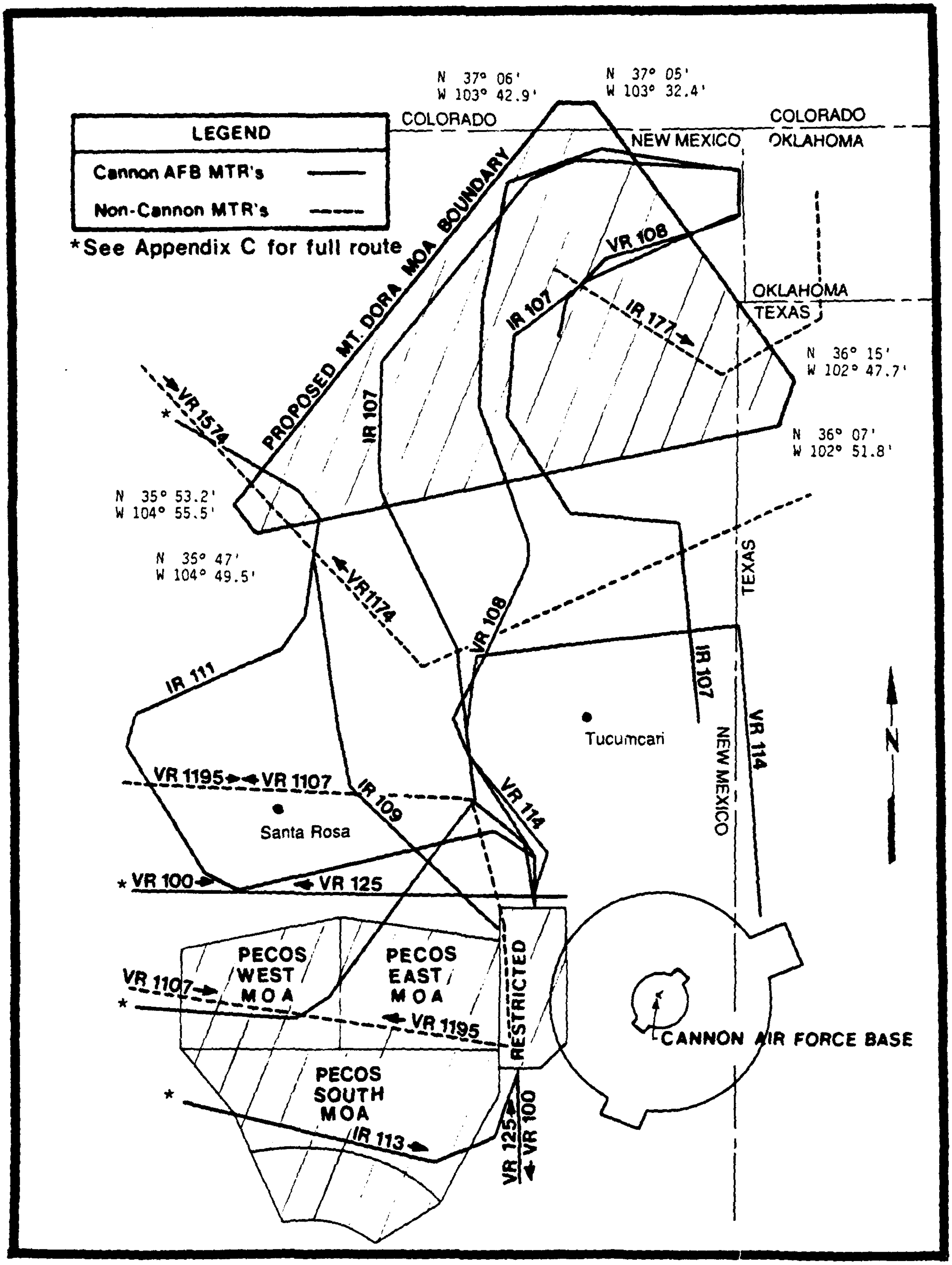


Figure 3.1.5-3. Military Training Routes

IR 111 has varying widths from 4 to 6 nm either side of centerline and a floor of 100 feet AGL. Restrictions along this route include 2 nm for the towns indicated above for IR 109, and 1000 feet AGL and/or 1 to 3 nm, as specified, for 7 different ranches, a truck stop, the towns of South San Ysidro and Pastura, and Interstate 25. IR 113 varies from 4 to 5 nm in width either side of centerline and has a floor of 100 feet AGL. All charted airfields are avoided by 1500 feet AGL and 3 nm with a restriction of 1000 feet and/or 1 to 2 nm, as specified, around 6 different ranches, the towns of Duran, Willard, Vaugh, and Claunch, and the Sumner Lake Recreational Area. This route description includes the caution of a heavy concentration of waterfowl in the area of the Bitter Lake National Wildlife Refuge.

VR 100 and VR 125 reverse each other a[illegible] vary in width from 1.5 to 28 nm either side of centerline and can be flown as low as practical to the surface. Charted airfields are avoided as previously stated. These routes avoid the Gran Quivira National Monument by 3 nm and 9 different ranches by 1000 feet AGL an[illegible]/or 1-3 nm, as specified for each. A 1000-feet AGL restriction exists over the Lincoln National Forest. A number of towers and powerlines are also specified for avoidance by 100-295 feet AGL along this route. VR 108 has varying widths from 5 to 20 nm either side of centerline with a floor of 100 feet AGL. Besides the standard restriction around charted airfields, there is a 1 nm avoidance area around Mosquero and 2 nm area around Capulin Volcano National Monument, Bell Ranch, Quay, Kenton State Park, 2 specified ranches, and House, New Mexico. An area around Tesquite Creek is also designated for avoidance.

VR 114 varies in width from 10 to 20 nm either side of centerline with a floor of 100 feet AGL. Mosquero is avoided by 1 nm. Quay and a house north of Melrose Range is avoided by 2 nm. Two specified ranches have restrictions of 1000 feet AGL or 1 nm. There are also restrictions of 100-300 feet AGL over several towers and powerlines. VR 1107 and VR 1195 are non-Cannon MTRs which vary in width from 15 to 30 nm either side of centerline with floors of 100 feet AGL. Restrictions along these routes include 3 nm and/or 1500 feet AGL around Ft. Sumner Airport, Double V Ranch airfield, Santa Rosa Airport and the Sumner Lake Recreational Area. A 2 nm restriction exists south of Ricardo. A 1500-foot AGL restriction also exists over an area which includes Ricardo and points south of Ricardo and Sumner Lake.

The above MTRs are grouped into those associated with aircraft movement to and from the Base/Mount Dora MOA (IR 107, VR 108, IR 109, and IR 111) and those associated with aircraft movement to and from the Base/Melrose Range (VR 100, IR 113, VR 114, VR 125, VR 1107, and VR 1195).

Aerial Refueling Route

Cannon AFB is the scheduling agency for Aerial Refueling Route (AR) 602. Aerial refueling is conducted on this route between the published altitudes of 19,000-29,000 feet MSL (Flight Levels 190-290) in support of aircraft operating in the Cannon AFB Special Use Airspace. Approximately 200 refueling missions are conducted annually in AR 602 with a varying number of aircraft being refueled during each mission.

Civil Airspace Use

Cannon AFB airspace is configured such that there is very little conflict with civil aviation throughout this area. As discussed previously, the Controlled Airspace serves both military and civil interests with air traffic control services provided by Cannon AFB. The low-altitude airways (below 18,000 feet MSL) circumnavigate the Pecos MOA and Restricted Areas, and the high-altitude Jet Routes overlie these areas; therefore, no conflict exists between Special Use Airspace operations and civil traffic on the airway system. The Pecos MOA overlies Fort Sumner Municipal Airport; however, a 1500-foot AGL floor over this area accommodates civil operations at this airport. Aircraft at two small private airfields beneath the Pecos MOA may operate below the 500-foot AGL floor or fly unrestricted through the MOA. Civil aircraft operating through AR-602 airspace are under control of the Albuquerque Air Route Traffic Control Center (FAA) and are separated from the refueling operations. MTR operations are normally conducted within 300-500 feet AGL. Civil aircraft may either fly unrestricted within these MTRs or at altitudes above the military operations.

Flight Safety

Flight safety addresses Class A mishaps and bird-aircraft strikes that have occurred in the Cannon AFB area, including the Base airfield, MOA, Range, and Cannon MTRs.

A Class A mishap is one in which a fatality occurs or $500,000 or more in damage is incurred. Of the four Class A mishaps that have occurred in the Cannon AFB area in the past 2 years, two involved F-111s with one mishap in the Melrose Range and one at the airfield. The other two mishaps involved an A-7 in the Range and a T-38 at the airfield. The Tactical Air Command F-111 mishap rate for FY89 was 2.34 Class A mishaps per 100,000 flying hours. Based on the one F-111 mishap at Cannon AFB in FY89 and the actual flying hours during that year, the Class A mishap rate per 100,000 hours was calculated to be 5.24 (D. Harner, personal communication, 1989).

Bird strikes are a potential hazard to flight safety, particularly at the lower altitudes. Over 95 percent of all reported Air Force bird strikes occur below 3000 feet AGL, with most of these occurring around the airfield environment or during some aspect of low-altitude training (USAF, 1987).

The Air Force has implemented the Bird Aircraft Strike Hazard (BASH) program to identify known or potential bird-strike hazards and to establish precautionary measures to reduce risks to pilots and aircraft, as well as to birds. During FY89, 21 bird strikes were reported in and around the MOA and Range, and another 12 occurred in the general area surrounding Cannon AFB. Only one bird strike has been reported on the MTRs transiting the area of the proposed Mount Dora MOA. The reported number of bird strikes involved various types of aircraft, and no information is available on the number associated with Cannon AFB F-111s (D. Harner, personal communication, 1989).

3.1.5.2 Land Use

Clovis, New Mexico, with an estimated population of 33,780, is the largest city within the support area of the Base. Clovis is the county seat of Curry County and acts as the commercial center for eastern New Mexico and western Texas. Curry County is a member of the Eastern Plains Council of Governments (EPCOG), a regional planning agency which coordinates land use planning. Curry County has a total land area of 897,000 acres with 837,200 acres designated as farmland; 133,700 acres of this are considered prime farmland (Henningson, Durham and Richardson, Inc., 1981a). Land surrounding the Base is classified as irrigated farmland of statewide importance. The principal crops include corn, grain, sorghum, wheat, barley, oats, alfalfa, cotton, and various vegetables. In addition to farms used for crop growing, there are several large cattle ranches scattered throughout the area.

EPCOG classifies Clovis as one of the primary growth centers in its seven-county region. The proximity of Clovis and Cannon AFB means that land use of either will impact the other. Clovis planning area boundaries are shown in Figure 3.1.5-4. The planning area boundary is delineated by a 5-mile extraterritorial area around the city of Clovis. The city has planning jurisdiction over the subdivision of land in the 5-mile extraterritorial area, but the city's land use controls and zoning ordinances do not apply outside the city limits. The county government is in the process of developing a master plan and zone ordinance that, when enacted, would regulate land uses in the extraterritorial area. The general land use for the city of Clovis as of 1980 is presented below (Henningson, Durham and Richardson, Inc. 1981b):

Vacant	1460 acres
Developed	6860 acres
Total	8320 acres

As of 1981, the 20-year planning period predicted Clovis population to grow by 47 percent and require an additional 7255 acres for urban development (Henningson, Durham and Richardson, Inc. 1981b). The land in the vicinity of Clovis and around Cannon AFB is primarily in private ownership. At present, approximately 85 percent of all land within the Clovis planning area (54,000 acres) is available for urban activities.

Portales, New Mexico, a city of 11,000, is located 15 miles south of Cannon AFB and is the county seat for Roosevelt County. The economy of Portales is geared mainly to agriculture. Portales's population is predicted to increase to 20,000 by year 2000, which will require an additional 1000 acres for the expected growth (Henningson, Durham and Richardson, Inc. 1981b).

The U.S. Air Force has designated Compatible Use Zones (CUZs) around Cannon AFB. Figure 3.1.5-5 displays the CUZs and land uses around the Base. For a description of CUZs, see Section 3.1.2. The CUZs provide recommendations for compatible uses in areas subject to noise and accident hazards. The local communities or county governments are responsible for adopting appropriate land use controls to

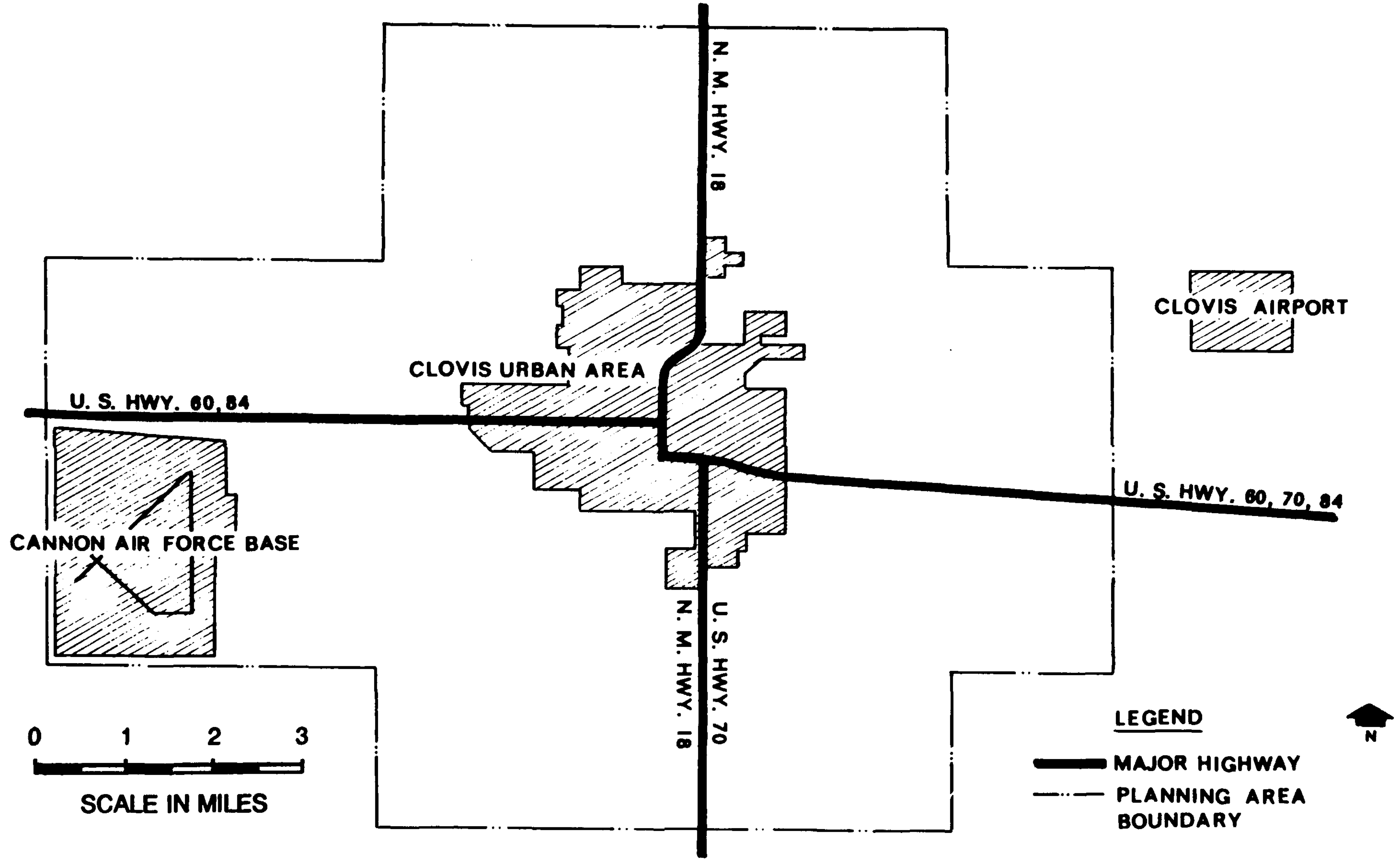


Figure 3.1.5-4. The Clovis Planning Area Boundary

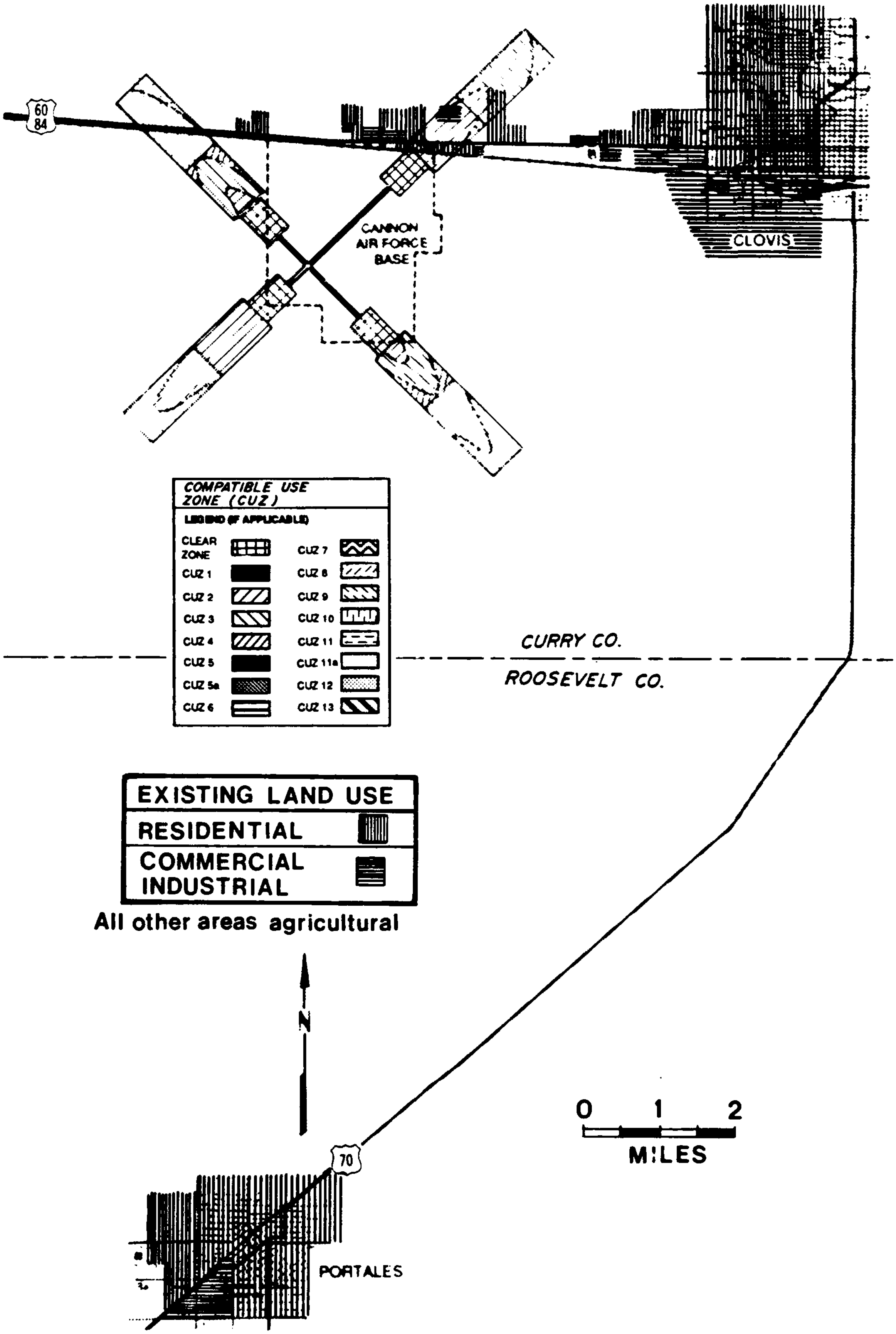


Figure 3.1.5-5. Existing Land Use in Relation to Cannon AFB Compatible Use Zones (CUZs)

prevent incompatible development. There are currently no land use or zoning controls for restricting the type and amount of construction in the proximity of Cannon AFB. Figure 3.1.5-5 shows that incompatible development of land use has occurred in the northeastern CUZ grouping.

3.1.6 Biological Resources

The information presented in this section was obtained through a survey of biological literature and contacts with local experts in field biology. Onsite field studies were not considered necessary to support this analysis.

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

3.1.6.1 Plant Resources

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

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

The following plants are candidate species for the Federal List of Endangered and Threatened Wildlife and Plants and are found within a 50-mile radius of Cannon AFB: chatterbox orchid (Epipactus gigantea), spiny aster (Aster harridus), Whittmans milkvetch (Astragalus witmanil), dune unicorn plant (Proboscidea sabulosa), and the tall plains spruce (Eupjorbia strictior). The dune unicorn plant is also on the state endangered plant species list (Knight, 1989, personal communication). No federally protected endangered plants are known to be present on the Base.

3.1.6.2 Wildlife Resources

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

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

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

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

As determined by the regional office of the U.S. Fish and Wildlife Service, two federally listed endangered animal species, the bald eagle and peregrine falcon, are known to inhabit the area within a 50-mile radius of Cannon AFB (Peterson, 1989, personal communication). The New Mexico Department of Game and Fish also indicated that the federally endangered Mississippi kite, Baird's sparrow, and the black-footed ferret may also occur in the vicinity of the Base (Sandoval, 1989, personal communication). The federal- and state-protected species are listed in Table 3.1.6-1.

Within Curry County, the only state-protected bird that is likely to occur is the Mississippi kite. In New Mexico, since the early 1960s, this kite summers regularly and breeds in the Clovis region. The birds frequent areas around Portales, Roswell, and Hobbs, including golf courses at Cannon AFB. Two other state-protected birds within Curry County that occur less than regularly, but where regular occurrence is likely in recent time, are the McCown's longspur and Baird's sparrow. No information is available on the McCown's longspur in New Mexico; however, Baird's sparrow occurs mainly in autumn during migration in the eastern plains and southern lowlands. Migrants appear as early as the first week of August and move further south by November. The species

Table 3.1.6-1. Federal- and State-Protected Animals Potentially Occurring In the Vicinity of Cannon AFB (Curry County)

Common Name	Scientific Name	Federal Status	State Status[3]
<u>Birds</u>			
Mississippi kite	<u>Ictinia mississippiensis</u>		Endangered (group 2)[2]
Baird's sparrow	<u>Ammodramus bairdii</u>		Endangered (group 2)[2]
Bald eagle	<u>Haliaeetus leucocephalus</u>	Endangered[1]	Endangered (group 2)[2]
Peregrine falcon	<u>Falco peregrinus</u>	Endangered[1]	Endangered (group 1)[2]
<u>Mammals</u>			
Black-footed ferret	<u>Mustela nigripes</u>	Endangered[2]	Possibly Extinct[2]

[1] Source: Peterson, 1989, personal communication.

[2] Source: Sandoval, 1989, personal communication.

[3] Endangered (group 1): Species whose prospects of survival or recruitment within the state are in jeopardy.

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

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

seems to have declined in abundance throughout its range in the Southwest due to the loss of shrubby shortgrass habitats.

State-protected birds known to occur infrequently are the bald eagle and the peregrine falcon. The bald eagle migrates and winters from the northern border of New Mexico to the Gila, lower Rio Grande, middle Pecos, and Canadian valleys. It is seen occasionally in summer and as a breeding bird, with nests reported in the extreme northern and western parts of the state. Winter and migrant populations appear to have increased with reservoir construction. The peregrine falcon is widely distributed but population numbers are low. The American subspecies breeds statewide in New Mexico, but mainly west of the eastern plains.

The only mammal protected by the State of New Mexico and occurring less than regularly in Curry County is the black-footed ferret. No population information is available on the black-footed ferret in New Mexico.

3.1.7 Native American Values, Archaeological, Cultural, and Historical Resources

3.1.7.1 Native American Values

While New Mexico hosts several reservations and pueblos, no treaty-specified Native American land, water, or other economic resources lie in Curry County. No extensive or significant cultural resources associated with historic groups are documented. Except as otherwise indicated, this discussion is based on information in HDR Sciences (1981).

Native American groups with historic ties to the area include the Mescalero Apache, the Jicarilla Apache, and the Comanche. These groups and their ancestors have not occupied the area for more than 100 years (Lintz et al., 1988). The nearest treaty-specified Native American land is the Mescalero Indian reservation. This is located 136 miles southwest of the Base.

Sacred sites of these peoples are usually found along rivers, canyons, and draws. Rock art is found on cliffs along water courses. Settlements often lie within canyons and draws. Burials are located in caves, rock shelters, or under slabs of sandstone near settlements. Established trails and ceremonial rock cairns are also considered sacred areas.

The land occupied by Cannon AFB neither resembles the areas most likely to contain significant cultural resources, nor have significant cultural resources been discovered during survey (Trierweiler, 1988). Cannon AFB is located in a large, relatively flat area well away from streams. In addition, much of Cannon AFB has already been disturbed by construction and Base operations.

Aboriginal habitation sites of the Puebloan peoples are not found around Cannon AFB. The Comanche, Apache, Jumano, and earlier groups that used this area generated sites that are typically dense but with no stratigraphic depth. Sites associated with historic Indians are expected along perennial streams. The area around Cannon AFB is unlikely to contain any extensive or significant sites of the historic Indian period, and none were located on the Base during an archaeological survey (Trierweiler, 1988).

Sacred sites of the Comanche, Apache, and related peoples are generally associated with rivers, canyons, and draws. Rock art sites are found to the north of Cannon AFB, in the Canadian River valley, but none have been located on the Base. Graves associated with historic Indian groups are typically found in caves, rock shelters, or under slabs of sandstone. Cannon AFB and its immediate environs are unlikely locations for either graves or rock art because the physical features usually associated with burials and rock art are not present. The mobile Apache and Comanche cultures considered established trails and, more specifically, ceremonial rock cairns or shines, as sacred areas. Detection and preservation of these features is complicated because of long disuse and extensive Euro-American disturbance of trails and associated markers. Also, the substantial temporal and spatial separation of surviving Native American groups from Curry County may have dissipated tribal knowledge of sacred sites and features.

3.1.7.2 Archaeological, Cultural, and Historical Resources

Numerous cultural resource surveys have been conducted in the vicinity of Cannon AFB, although only one significant study has taken place on the Base itself (Trierweiler, 1988). Much useful information abstracted here is contained within studies focused on the Melrose Range, located to the west of the Base (Lintz et al., 1988; URS Consultants, 1989). This literature constitutes the information base for this brief review.

The majority of Cannon AFB itself has been urbanized or subjected to extensive disturbance. A class III cultural resource inventory in 1988 (Trierweiler, 1988) surveyed 388 acres of the Base (10.5 percent) in six separate and noncontiguous parcels. These plots were less disturbed than the remainder of the Base. Four archaeological sites and two isolated occurrences were recorded. The archaeological sites consist of two prehistoric stone tool scatters and one historic Euro-American site older than 50 years. The historic site is probably associated with early aviation.

The historic site consists of old foundations and debris from the 1920s and 1930s. This site probably results from the operations of transcontinental air transport. The function of the site is unknown. Military use of Cannon AFB began in 1942. Some buildings of this period remain, but their historical significance is unknown (Williams, 1989, personal communication).

The Air Force is currently negotiating a blanket consultation agreement with the New Mexico State Historic Preservation Bureau (Richards, 1989, personal communication; Williams, 1989, personal communication). This agreement will outline a protocol for identifying projects with potential for disturbing cultural resources and informing the New Mexico State Historic Preservation Officer (NMSHPO) of the intended activities. The NMSHPO will then decide on the need for a survey on a case-by-case basis.

3.1.8 Solid Wastes, Hazardous Wastes, and Hazardous Materials

3.1.8.1 Introduction

The extent and magnitude of soil and groundwater contamination, and the location of wastes, have been under investigation at Cannon AFB since 1982. This ongoing program, the Installation Restoration Program (IRP), addresses these issues for sites identified as past hazardous material(s) disposal and spill sites.

This section documents (1) the types of hazardous materials that are currently on the Base, where they are stored, how they are used, and (2) the location and status of waste sites and disposal areas that have been identified at Cannon AFB.

3.1.8.2 Hazardous Materials Currently Used and Stored at the Base

The activities at Cannon AFB generate potentially hazardous wastes. These activities include maintenance of aircraft, aircraft corrosion control, vehicle maintenance, and ground-support equipment maintenance. Other waste-generating activities include grounds maintenance, munitions storage and disposal, medical services, and laboratory operations (including photo development, nondestructive inspection, and fuels analysis). Wastes generated in maintenance activities include spent solvents, waste oils, contaminated fuel(s), and greases removed from the equipment. Waste from corrosion control operations include paint chips, waste paint, spent solvents, and spent strippers. Solvents from maintenance and paint strippers include trichloroethane, methyl ethyl ketone, toluene, PD-680, and a phenolic-based carbon remover (Hazardous Materials Technical Center, 1987). Soap, detergent, and small amounts of PD-680 waste are generated by aircraft washrack activities.

The hazardous wastes generated at Cannon AFB are subject to regulation under the Resource Conservation and Recovery Act (RCRA) of 1976 and the 1988 amendments. The Base also generates waste oil products that are not currently regulated under RCRA, and other wastes that are hazardous due to explosive nature, ignitability, or EP toxicity. Cannon AFB is currently operating under interim status in accordance with 40 CFR 265. A RCRA Part B permit application was submitted to the New Mexico Environmental Improvement Division (NMEID) on 7 February 1985, with updates in 1985, 1986, and 1989. The permit application is under review by NMEID.

Hazardous waste is managed in a two-stage operation at Cannon AFB. The first stage of hazardous waste management involves the accumulation and temporary storage in accumulation or satellite accumulation points. The second stage is the long-term storage (up to 1 year) of hazardous waste at the Defense Reutilization and Marketing Office (DRMO) facility. Table 3.1.8-1 identifies the locations where hazardous waste(s) are stored on Base. The waste is stored in the DRMO facility while arrangements are made for disposal. The used oils are stored in 55-gallon drums and in 5000-gallon aboveground tanks. Prior to 25 November 1985, the used oils were stored in a 20,000-gallon underground tank located at Facility 4028.

There are eight groups or operations (see Table 3.1.8-2) that generate hazardous wastes on Cannon AFB. A brief description of each follows:

Equipment Maintenance Squadron (EMS)

The EMS shops generate the largest quantity of hazardous waste at Cannon AFB. Waste paint-related materials are the most abundant type of hazardous waste generated.

The Wheel and Tire Shop uses two large parts-cleaning vats, which generate approximately 540 gallons of used PD-680 and 420 gallons of waste Turco Stripper per year. The PD-680 is not considered a hazardous waste. However, the Turco Stripper is approximately 50 percent tetrachloroethylene.

The Corrosion Control Shop generates the largest amount of hazardous waste at Cannon AFB (2400 gallons per year). The waste is a mixture of methyl ethyl ketone (MEK), toluene, paints containing lead and chromium, and various strippers and lacquers. The shop uses a "waterfall" air-filtration system in the paint booth to filter paint particles from the air. This system is cleaned weekly, and the water is discharged into the storm sewage system (600 gallons per week).

The AGE Shop and Inspection Shop use Mirachem Degreaser-100 as an equipment and floor cleaner. Waste cleaner is discharged into oil/water separators. Each shop uses approximately 55 gallons per month of this degreaser. Through information obtained from DEEV personnel (HMTL, 1987), this product was found to be a nonhazardous, biodegradable, water-soluble degreaser.

The Aircraft Washrack is located at Facility No. 165. All aircraft cleaning operations are conducted at the washrack. Between one and four aircraft are cleaned per day at the washrack during the warmer months. Wastes generated include PD-680 (3600 gallon per year) and aircraft cleaning compound (1700 gallon per year). The aircraft cleaning compound is mixed with water in a holding tank in a 1 to 8 ratio prior to application. The PD-680 and aircraft cleaning compound are flushed down the washrack drain into an oil/water separator. The effluent from the separator is discharged to the storm drainage system. The material collected by the oil/water separator is removed periodically and processed through DRMO.

The EMS generates approximately 1200 gallons of waste oils and hydraulic fluids a year.

Table 3.1.8-1. Location of Hazardous Waste Storage Facilities on Cannon AFB

<u>Treatment, Storage, and Disposal Facilities</u>

1. DRMO Storage Building (Bldg. 226)
2. Landfill, #5, Cell #3
3. EOD Thermal Treatment Pit (Melrose Range)

<u>Accumulation Points</u>

1. EMS - Corrosion Control Shop (Bldg. 199)
2. CRS - Component Repair Squadron (Bldg. 681)

<u>Satellite Accumulation Points</u>

1. EMS - Munitions Shop (Bldg. 2112)
2. CRS - Avionics Branch (Bldg. 620)
3. TRNS - Vehicle Maintenance Shop (Bldg. 375)
4. CES - Paint Shop (Bldg. 357)

Source: HMTC 1987.

Table 3.1.8-2. Location of Operations that Generate Hazardous Waste on Cannon AFB

Equipment Maintenance Squadron (EMS)	
Aerospace Ground Equipment (AGE) Shop	Bldg. 186
Inspection Shop	Bldg. 184
Wheel and Tire Shop	Bldg. 194
Corrosion Control	Bldg. 196
Non-Destructive Inspection (NDI)/Soap Laboratory	Bldg. 593
Munitions Paint Shop	Bldg. 2112
Machine Shop	Bldg. 680
Component Repair Squadron (CRS)	
Battery/Electric Shop	Bldg. 185
Avionics Shop	Bldg. 620
Fuel Systems	Bldg. 196
Propulsion Branch (Jet Engine Shop)	Bldg. 680
Pneudraulics Shop	Bldg. 680
Engine Test Cell	Bldg. 2330
Aircraft Generation Squadron (AGS)	
522nd Aircraft Maintenance Unit (AMU)	Bldg. 121
523rd AMU	Bldg. 119
524rd AMU	Bldg. 194

Table 3.1.8-2. Location of Operations that Generate Hazardous Waste on Cannon AFB (Continued)

Transportation Squadron (TRNS)	
Refueling Maintenance	Bldg. 326
Vehicle Maintenance	Bldgs. 335, 375, 379
Special Purpose	Bldg. 379
Combat Support Group (CSG)	
Photography Laboratory	Bldg. 600
Auto Hobby Shop	Bldg. 494
Civil Engineering Squadron (CES)	
Fire Department	Bldg. 130
Paint Shop	Bldg. 357
Entomology Shop	Bldg. 212
Power Production Shop	Bldg. 120
27th TFW Hospital-Cannon (HOSP)	
Army-Air Force Exchange Service (AAFES)	
Service Station	Bldg. 368

Source: HMTC 1987.

Component Repair Squadron (CRS)

Parts cleaning solvents make up the largest volume of hazardous waste generated by this squadron. Used oils are generated by CRS at a rate of approximately 1300 gallons per year. Approximately 1900 gallons of Jet Fuel (JP-4) are generated per year.

The Avionics Shop generates 120 gallons of Freon 113 per year from a cleaning operation. The Freon 113 is composed of 1,1,2-Trichloro-1,2,2-Trifluoroethane.

The Battery/Electric Shop generates about 10 waste lead-acid batteries per month and 540 gallons per year of used synthetic oil.

The Propulsion Branch (Jet Engine Shop) uses several vats of different parts-cleaning chemicals. The hazardous wastes generated are fingerprint remover and carbon remover. The former has a flash point of 100°F, and the latter is corrosive and contains a chromate solution and dichlorobenzene. These "spent" chemicals account for about 6 gallons of waste per year.

The Pneudraulics Shop, Fuel Systems Shop, and Engine Test Cell generate used oils and/or jet fuel.

Aircraft Generation Squadron (AGS)

The AGS has three Aircraft Maintenance Units (AMUs) that generate a total of approximately 1200 gallons of used oils and 13,200 gallons of used jet fuel per year. The fuel is either reused or turned over to the Fire Department for fire training exercises, and the used oils are stored until a saleable quantity is accumulated.

Transportation Squadron (TRNS)

The three TRNS shops generate approximately 5100 gallons of used oil and about 100 gallons of hazardous waste per year.

The Vehicle Maintenance Shop generates a mixed paint-related waste similar to the type that Corrosion Control generates.

The Refueling Maintenance and Special Purpose Shops generate used oils and used jet fuel.

Combat Support Group (CSG)

The Photography Laboratory generates approximately 1800 gallons of mixed photo developing chemical waste per year. This waste is discharged into the sanitary sewer after processing. The solution is processed through a silver recovery unit prior to disposal to remove the silver, which is sold for recycling.

The Auto Hobby Shop generates approximately 1500 gallons of used oil per year. The used oil is stored in three underground tanks prior to being sold for recycling. The shop uses Safety-Kleen Corporation, a solvent service, as its source of parts-cleaning solvent, thus eliminating the problem of disposal of "spent" solvents. This service collects and recycles the "spent" Safety-Kleen solvent.

Civil Engineering Squadron (CES)

The Fire Department and the Entomology Shop could possibly release hazardous substances into the environment through the burning of contaminated jet fuel during the fire training exercises or during the application of herbicides and pesticides.

The Paint Shop generates mixed paint-related waste. The Power Production Shop generates used oils.

27th TFW Hospital-Cannon

The hospital generates about 1400 gallons of developing chemical waste per year. The waste is processed for silver recovery and then discharged into the sanitary sewer. Biological wastes are incinerated at the hospital incinerator.

Army-Air Force Exchange Service (AAFES)

The AAFES operates a service station that generates used oils and "spent" solvents. The used oil is stored in an underground tank and sold for recycling. The solvent is maintained by the Safety-Kleen Corporation.

Oil/water separators are one of the primary sources of industrial wastewater at Cannon AFB. There are 21 oil/water separators located at various industrial shops and washracks to provide pretreatment of the industrial wastewater. The majority of oil/water separators are connected to the sanitary sewer system; however, several discharge to the storm drainage system and those in remote areas discharge to a leaching field. An inventory of all oil/water separators, including location, date of installation, approximate capacity, and discharge receptor is provided in Table 3.1.8-3. The oil/water separators are serviced periodically and waste oils are removed and processed through DRMO.

Industrial wastewater from Cannon AFB is combined with sanitary wastewater and is treated in two on-Base stabilization lagoons. The lagoons have a combined surface area of 32 acres and are operated in series. The lagoons, constructed in 1966, have unlined earth bottoms and concrete-lined banks and operate at an average depth of approximately 3 feet, with a maximum depth of 4.5 feet. The average daily flow to the

Table 3.1.8-3. Oil/Water Separators on Cannon AFB

Location (Building No.)	Date of Installation	Approximate Capacity (gallons)[a]	Discharge
108	--	500	Sanitary Sewer
119	1963	375	Sanitary Sewer
121	--	500	Sanitary Sewer
129	1958	500	Sanitary Sewer
165	1966	600	Storm Drainage System
170	--	500	Sanitary Sewer
186	1971	600	Sanitary Sewer
186	1971	600	Sanitary Sewer
194	1969	200	Storm Drainage System
195	1969	200	Storm Drainage System
196	1969	200	Storm Drainage System
379	1965	500	Sanitary Sewer
680	1965	--	Sanitary Sewer
4095[b]	1977	--	Leaching Field
5077[b]	1957	760	Sanitary Sewer
5077[b]	1957	760	Sanitary Sewer
5077	1957	1675	Sanitary Sewer
5114	1965	100	Leaching Field
5120	1969	100	Leaching Field
5121	1969	100	Leaching Field
5144[c]	1960	1700	Sanitary Sewer

[a] Total tank capacities.

[b] Vehicle washrack sump.

[c] Two washrack sumps and a sand trap.

Source: CH_2M Hill, 1983.

lagoons is approximately 566,000 gallons per day (gpd). The influent to the lagoons is monitored on a daily basis for flow and temperature and on at least a monthly basis for pH, settleable solids, and dissolved oxygen (DO). A sample of sludge from the lagoons was collected in July 1982 and analyzed for the characteristics of EP toxicity. The results of the EP toxicity test were negative (CH_2M Hill, 1983). The sewage lagoons are currently under review by NMEID for possible regulation under RCRA, based on pre-1984 discharges into the lagoon system. Prior to the construction of the two lagoons in 1966, the Base sanitary and industrial wastewater was treated by an Imhoff tank treatment system that discharged into Playa Lake.

The treated effluent from the lagoons is channeled into Playa Lake, a natural land depression, which is confined entirely within the Base perimeter. Final effluent disposal is by a combination of evaporation, infiltration, and sale to a neighboring farmer for irrigation purposes. Playa Lake has been sampled since 1981 on an annual basis; the samples were analyzed for nitrate, chloride, sulfate, total phosphorus, chemical oxygen demand, oil and grease, and metals. Analytical results have been within acceptable limits (CH_2M Hill, 1983).

The wastewater treatment system does not have a National Pollutant Discharge Elimination System (NPDES) permit. Because the lagoons do not discharge into navigable waters, the requirement for a NPDES permit was waived in 1975.

A major class of hazardous (flammable) material at Cannon AFB is fuel. The major fuel storage area at Cannon AFB is the petroleum, oil, and lubricants (POL) bulk storage area. The POL bulk storage area houses three aboveground, floating-roof, diked tanks for JP-4 storage. Two of the storage tanks have a capacity of 20,000 barrels (Facilities No. 395 and 396), and the other has a capacity of 10,000 barrels (Facility No. 394). Also located at the POL bulk storage area are a 25,000-gallon MOGAS tank (Facility No. 378), a 10,000-gallon MOGAS tank (Facility No. 398), and a 20,000-gallon diesel tank (Facility No. 399). The MOGAS and diesel storage tanks are all aboveground. There are numerous other tanks on Base used for the storage of MOGAS, diesel fuel, and JP-4. A complete inventory of existing POL storage tanks is included in Table 3.1.8-4. Table 3.1.8-4 also provides facility number, type of POL stored, capacity, and type of tank. The major JP-4 storage tanks at the POL bulk storage area are inspected on an annual basis and cleaned out approximately every 5 years. The quantities of sludge generated per tank cleaning operation are small, and the sludge consists mainly of water, rust, dirt, and fuel (Ch_2M Hill, 1983).

3.1.8.3 Identified Waste Sites and Disposal Areas

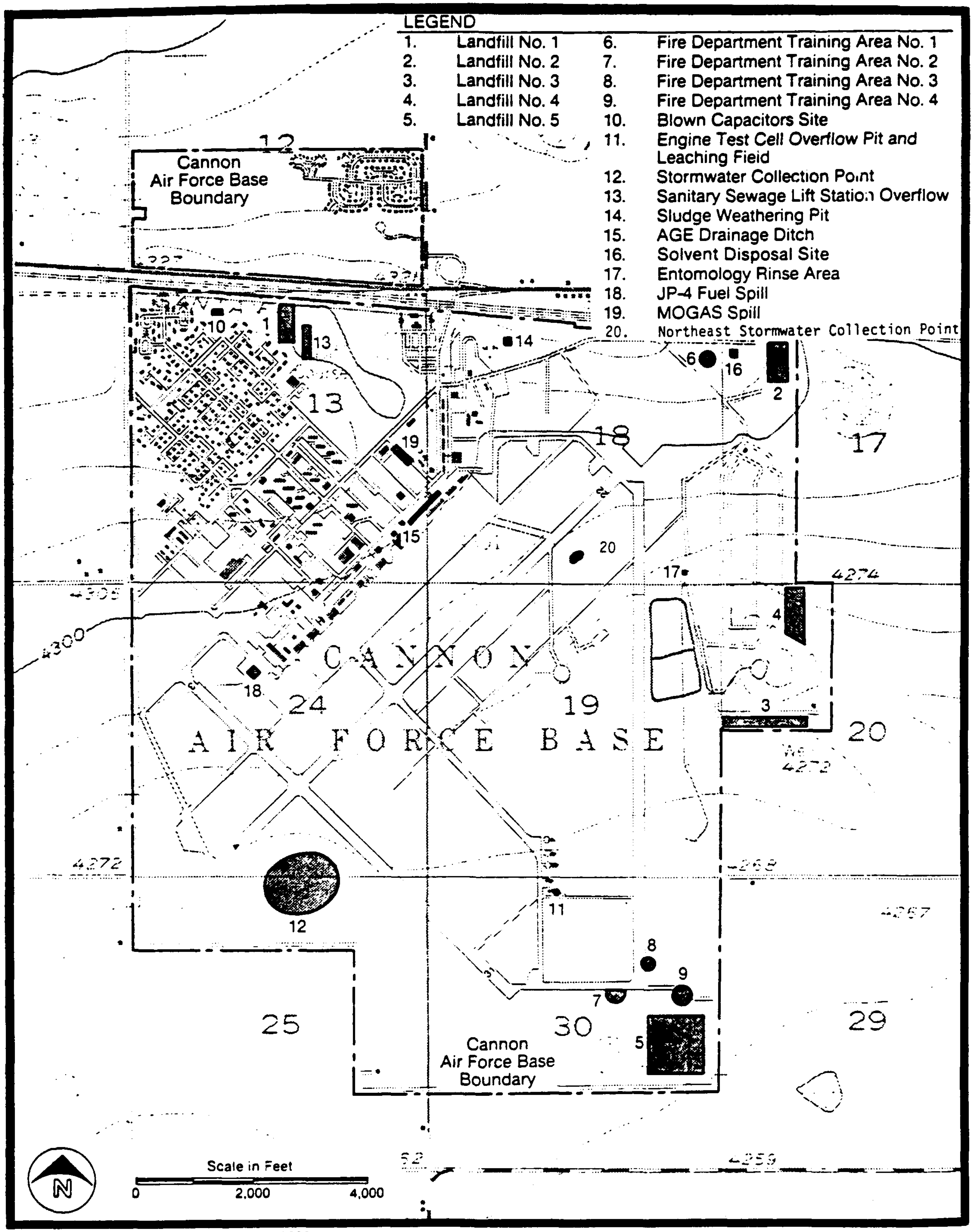
IRP program investigations have identified 20 disposal or spill sites at Cannon AFB (Figure 3.1.8-1). Eight of these sites have received further investigation (Figure 3.1.8-2). A summary of each site follows.

Table 3.1.8-4. Inventory of Existing POL Storage Tanks

Facility No./ Location	Type POL	Capacity (gal)	Aboveground (AG) Underground (UG)
108	Diesel	2,000	UG
121	Diesel	2,000	UG
129	Diesel	2,000	UG
136	Solvent	300	AG
140	Diesel	550	UG
163	Diesel	550	UG
170	Diesel	2,000	UG
181	Diesel	550	UG
182-A	MOGAS	2,000	UG
182-B	Diesel	2,000	UG
185	Diesel	4,000	UG
187	JP-4	6,000	UG
240	Asphalt	8,400	AG
241	Asphalt	8,400	AG
243	Diesel	600	AG
368	MOGAS	6,000	UG
368	MOGAS	6,000	UG
368	MOGAS	6,000	UG
368	MOGAS	6,000	UG
376	MOGAS	5,000	UG
377	MOGAS	5,000	UG
378	MOGAS	25,000	AG
390	Recovered JP-4	2,000	UG
394	JP-4	420,000	AG
395	JP-4	840,000	AG
396	JP-4	840,000	AG
398	MOGAS	10,000	AG
399	Diesel	20,000	AG
443	Diesel	1,500	UG
444	Diesel	1,500	UG
728	Diesel	1,000	UG
1400	Diesel	24,000	UG
2110	Diesel	550	UG
2160	Diesel	550	AG
2276	Diesel	550	UG
2280	Diesel	1,000	UG
2285	Diesel	1,000	UG
2300	Diesel	550	UG
2302	Diesel	550	UG

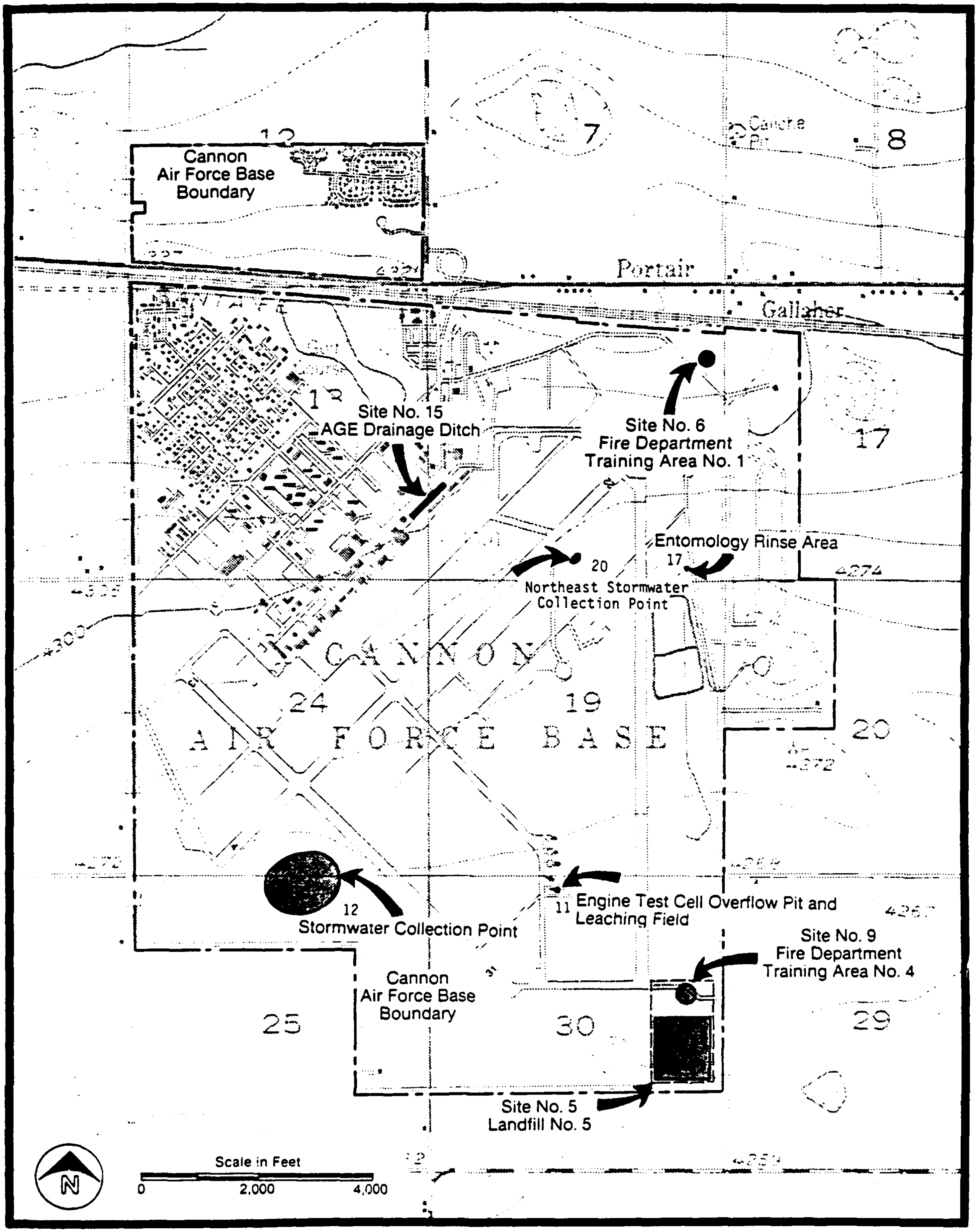
Table 3.1.8-4. Inventory of Existing POL Storage Tanks (Continued)

Facility No./ Location	Type POL	Capacity (gal)	Aboveground (AG) Underground (UG)
2307	Diesel	550	UG
2313	Diesel	550	UG
2319	Diesel	3,000	AG
2321	Diesel	550	UG
2327	Diesel	650	UG
2328	Diesel	3,000	UG
2330	Diesel	550	UG
2331	JP-4	2,500	AG
2332	JP-4	5,000	AG
2333	JP-4	2,000	AG
3117	Diesel	1,000	UG
3118	MOGAS	1,000	UG
3121-A	Diesel	550	UG
3121-B	Diesel	250	UG
4028	Waste oil	20,000	UG
5113	JP-4	2,500	AG
5114	JP-4	5,000	AG



Adapted from Cannon AFB, August 1983

Figure 3.1.8-1. Location Map of Identified Disposal and Spill Sites at Cannon AFB



Adapted from Cannon AFB, August 1983

Figure 3.1.8-2. Location of Identified Disposal and Spill Sites at Cannon AFB Chosen for Additional Investigation

A. Site No. 1 (Landfill No. 1)

This is the site of the original Base landfill that was operated from 1943 to 1946. This landfill covers approximately 4 acres. It was located on the site of the present golf course, approximately 500 feet north of the hospital (Facility No. 1400). Types of materials received at the landfill included domestic solid waste and shop wastes such as waste oils and solvents, paint strippers and outdated paints, paint thinners, pesticide containers, and various empty cans and drums. Burning of wastes, followed by burying, was apparently the mode of operation at this site.

There is no indication that buried wastes were encountered or excavated during construction of the golf course (CH_2M Hill, 1983).

B. Site No. 2 (Landfill No. 2)

Landfill No. 2 was operated from 1946 to 1947 and from 1952 to 1959. The inactivity of the landfill from 1947 to 1952 coincided with the period that the Base was on deactivated status. This site, approximately 4 acres in size, is located in the northeast corner of the Base, beyond the end of the primary runway. In its present state, the site appears as an open field, covered with prairie grass species; no evidence of recent use or unauthorized dumping was found (CH_2M Hill, 1983).

Materials received at this landfill were similar to those reported for Landfill No. 1, i.e., domestic solid waste; waste oils and solvents; paints, paint strippers and paint thinners; pesticide containers; and various empty cans and drums.

Burning of waste materials, followed by burial in trenches, was apparently the mode of operation at this landfill.

C. Site No. 3 (Landfill No. 3)

Landfill No. 3 was operated from 1959 to 1967. This site, approximately 9 acres in size, is located on the east side of the Base south of the ordnance area. In its present state, the site appears as a rectangular open field covered with prairie grass species; no evidence of recent use or unauthorized dumping was found (CH_2M Hill, 1983).

Materials received at this landfill were similar to those reported for Landfills No. 1 and No. 2, i.e., domestic solid waste; waste oils and solvents; paints, paint strippers, and paint thinners; pesticide containers; and various empty cans and drums. The mode of operation at this site was a burn and bury trench operation. Burned waste materials were covered the following day.

D. Site No. 4 (Landfill No. 4)

Landfill No. 4 was operated from 1967 to 1968. This site, approximately 7 acres in size, is located on the east side of the Base, between the ordnance area and the Base property line. In its present state, this site is an open field covered with prairie grass species; no evidence of recent use or unauthorized dumping was found (CH_2M Hill, 1983).

Materials received at this site were similar to those reported for the earlier landfills, i.e., domestic solid waste; waste oils and solvents; paints, paint strippers, and paint thinners; pesticide containers; and various empty cans and drums. The mode of operation at this site was the same as at previous sites. Wastes were deposited into trenches, burned, and covered the following day.

E. Site No. 5 (Landfill No. 5)

Landfill No. 5 began operation in 1968 and is the landfill in current use (CH_2M Hill, 1983). The site is located in the southeast corner of the Base and covers approximately 30 acres.

Materials received at this landfill are similar to those received at the former Base landfills and include domestic solid waste, waste oils and solvents, paints, paint removers, and paint thinners, pesticide containers; and various empty cans and drums. Until late 1981, an estimated 5 to 10 drums per month of waste oils and solvents were received at the site. The drums ranged from partially to completely full. Drummed materials received at this site were generally deposited directly into the trench and crushed by a bulldozer. Only empty drums are currently received at the site.

The mode of operation at this landfill was burn and bury in trenches from 1968 to about 1972. Since 1972, the standard operation has been direct burial of the wastes in trenches. Approximately 11 covered trenches exist at the site. A twelfth trench was opened and in use at the time of the records search site visit. Trenches were generally excavated 18 to 20 feet deep with trench bottoms into the underlying caliche layer.

F. Site No. 6 (Fire Department Training Area No. 1)

Site No. 6, located in the northeast corner of the Base, was operated from 1959 to 1968. In its present state, it appears as an approximately 100-foot-diameter, previously disturbed area, with some vegetative cover. No evidence of recent use was found (CH_2M Hill, 1983).

Waste oils, recovered fuels, and spent solvents were burned at this site. On some occasions, the ground may have been presaturated with water prior to pouring the wastes onto the ground. Most of the materials would have been consumed in the fires; however, some minor percolation into the ground probably occurred. It is not known what quantities of these waste liquids may have percolated into the ground; however, considering that most of the flammable liquids would have been consumed in the fires, the quantity was probably small.

G. Sites No. 7 and No. 8 (Fire Department Training Areas No. 2 and No. 3)

Sites No. 7 and No. 8, located in the southeast corner of the Base, were operated concurrently from 1968 to 1974. Each site appears as a surface-scarred circular area with some vegetative cover. No evidence of recent use was found at either site. It is not known why the two sites were operated concurrently (CH_2M Hill, 1983).

Unused JP-4 fuel was the only liquid burned at these training sites. The ground was presaturated with water prior to pouring the JP-4 fuel onto the ground. Most of the fuel would have been consumed in the fires; however, some minor percolation into the ground probably occurred. It is not known what quantities may have percolated into the ground. However, because the ground was presaturated with water and considering that most of the fuel would have been consumed in the fires, the quantity was probably small.

H. Site No. 9 (Fire Department Training Area No. 4)

Site No. 9, located in the southeast corner of the Base near Fire Department Training Areas No. 7 and No. 8, is the current training area and has been in use since 1974.

The training site is an unlined circular area, approximately 400 feet in diameter, which slopes slightly toward the center. A simulated aircraft site is at the center of the site. A 2000-gallon underground tank installed in 1975 is used to store recovered JP-4 fuel for burning. The fuel is pumped from the storage tank to the simulated aircraft prior to practice burns. Runoff from the area is collected in an unlined pit adjacent to the site.

This site was reportedly used from 1961 to 1974 as a fuel truck cleaning area in which residual fuels were drained onto the ground, and the fuel tanks were then cleaned at the site (CH_2M Hill, 1983). This practice apparently ended about 1974. For about 1 year, from 1974 to 1975, comingled waste oils, solvents, and recovered JP-4 fuels were burned at the site. Since 1975 only recovered JP-4 fuel has been burned at this site.

Presaturation of the ground with water prior to applying co-mingled wastes or recovered JP-4 fuel onto the ground was practiced in conjunction with fire department training exercises; however, presaturation was not practiced prior to about 1974, when fuel trucks were cleaned at the site.

Prior to 1974, fuels that did not volatilize would have percolated into the ground. From 1974 to the present, during burn exercises, most of the co-mingled wastes and recovered JP-4 fuel would have been consumed in the fires; however, some minor percolation into the ground has probably occurred. It is not known what quantities of fuels and co-mingled wastes have percolated into the ground; however, it is estimated that during the pre-1974 practice, a moderate quantity of fuel (3000-4000 gallons) percolated into the ground (CH_2M Hill, 1983).

During the records search team's Base visit, several small pools of a liquid having a characteristic fuel odor were observed in tire ruts around the mock-up aircraft. There was no evidence or reports indicating that the site had been in recent use, and it was speculated that the pools of liquid were liquid in the soil displaced by rain from a storm event of the previous day. In addition, signs of spillage were noted in the area of the underground storage tank. This spillage was assumed to have occurred during transfer of recovered JP-4 fuel into the storage tank (CH_2M Hill, 1983).

I. Site No. 10 (Blown Capacitors Site)

Site No. 10 is located in the northwest corner of the Base, about 300 feet northwest of Housing Facility No. 1437.

The site is the location of a power pole that houses six capacitors. In 1978, lightning struck and caused three of the capacitors to rupture and release about 6 gallons of oil, thought to contain PCB, onto the ground. The contaminated dirt was collected in 55-gallon drums and processed through the Defense Property Disposal Office (DPDO).

J. Site No. 11 (Engine Test Cell Overflow Pit and Leaching Field)

Site No. 11, located in the southeast area of the Base, is the overflow pit and leaching field receiving washdown wastewaters from Engine Test Cell Facility No. 5114.

An oil/water separator (and leaching field) for collection of oils was installed in 1965 along with construction of the engine test cell. Within recent years the leaching field hydraulic capacity has been reduced, possibly due to oils and solids passing through the separator (CH_2M Hill, 1983). The effect has been to reduce the hydraulic capacity of the oil/water separator, resulting in hydraulic overloading of the unit. To relieve the overloading, a pit was excavated in 1982 to receive a portion of the engine test cell washwaters. The pit is approximately 6 to 8 feet across and filled with 5 to 6 feet of liquid. At the time of the records search team's Base visit, the pit contained a black liquid with a hydrocarbon odor. The standing liquid in the unlined pit poses a concern for potential groundwater contamination. In addition, if the leaching field is partially clogged with oils that have passed through the separator, equal concern exists for potential groundwater contamination in the area of the leaching field.

K. Site No. 12 (Stormwater Collection Point)

Site No. 12, located near the southwest corner of the Base, is a playa that receives stormwater runoff from the flightline areas.

The playa covers approximately 9 acres and has been receiving the stormwater runoff since the Base was activated in 1943. The site has also been a disposal point for large pieces of broken concrete, apparently resulting from past apron and runway demolition.

A potential for groundwater contamination is posed by the nature of the materials suspected of having been discharged into the playa along with stormwater runoff. Due to the nature of activities along the flightline, it is likely that fuels from minor spills, oils, and similar POL materials have reached the site. In addition, washwater from the aircraft washrack (Facility No. 165) oil/water separator is discharged through the storm sewers to the playa. It is suspected that small quantities of PD-680 solvent pass through the separator and enter the playa. An analysis of this discharge completed in 1981 described a sample as being primarily water with a very thin layer of a hydrocarbon on the surface. It was noted that the hydrocarbon was similar to PD-680 solvent (CH_2M Hill, 1983). The same analysis detected the presence of lead and total chromium in low concentrations (80 μg/l and 212 μ/l, respectively).

Visual observation of the site produced no evidence of contamination. The playa was dry except for a ditch leading from the major influent pipe to the low point of the playa. No sheen or odor was noted in the ditch (CH_2M Hill, 1983).

L. Site No. 13 (Sanitary Sewage Lift Station Overflow)

Site No. 13 is located on the golf course just north of the hospital.

In February 1983, pumps in sanitary sewage Lift Station No. 1402 malfunctioned. An estimated 100,000 to 150,000 gallons of raw sewage were bypassed to an adjacent overflow pit until the pumps were repaired approximately one week later. At that time, the bypassed sewage was pumped back into the lift station.

The overflow pit, designed specifically for emergency use, is estimated to be approximately 100 feet wide, 600 feet long, and 2 to 3 feet deep. In its present state, it appears as a rectangular depression covered with grass. No evidence of environmental stress was observed at the site (CH_2M Hill, 1983).

The site was of concern primarily because of a water analysis completed in February 1983 that showed the sample to be ignitable at 60°C (140° F). In addition, the analyst commented that a hydrocarbon odor was noted. This evidence suggests that a POL material may have been in the sanitary sewage that was diverted into the overflow pit. It is not known what, if any, quantity might have percolated into the ground; however, it is assumed to have been small. A subsequent soil sample, collected after the liquid was pumped back into the lift station, tested negative for ignitability (greater than 60°C) (CH_2M Hill, 1983).

M. Site No. 14 (Sludge Weathering Pit)

Site No. 14, located adjacent to the east side of the POL bulk storage area, is a shallow, unlined pit, approximately 25 feet square.

This site was used in the 1960s and 1970s for the weathering of fuel tank sludges. Reportedly, AVGAS and JP-4 sludges were weathered and then taken to the landfills for final disposition. It was not known what quantities of sludge were weathered at the site nor how often; however, the quantities are considered to have been small.

Due to the concern over potential groundwater contamination from the site, a soil sample was analyzed in 1981 for lead and extractable oil and grease. The source of the lead could have been past weathering of AVGAS sludge. The test for lead was negative; however, the test for extractable oil and grease indicated 0.012 gm/kg. The positive oil and grease analysis is considered to represent confirmation that weathering of sludges did occur at this site.

No signs of stress or recent use of the site were observed during the records search team's Base visit (CH_2M Hill, 1983).

N. Site No. 15 (Age Drainage Ditch)

Site No. 15 is a ditch that originates on the flightline side of the AGE building (Facility No. 186) and runs parallel to Facilities No. 191, No. 192, and No. 193, terminating near Argentina Avenue. The ditch is reportedly the result of settled earth that followed removal of railroad tracks in the late 1960s (CH$_2$M Hill, 1983).

The ditch receives runoff from the maintenance pad adjacent to the AGE shop. Interviewees reported that fuel or oil spills and leaks that occur on the pad are often washed into the ditch during rainfall events. It is suspected that this has been occurring for several years. Existence of contamination was verified by the records search team during the Base visit (CH$_2$M Hill, 1983). For a distance of about 50 to 75 feet, soil in the bottom of the ditch was black and had a characteristic POL odor. A possible source of some of the contamination observed was a synthetic engine oil bowser parked on the edge of the pad on the ditch side. At this precise location, an eroded path, also black and with a POL odor, led from the pad down to the ditch. During the records search team's Base visit, personnel were observed pouring waste liquid into the top of the bowser. The dumping procedure appeared awkward and probably results in occasional spillage (CH$_2$M Hill, 1983).

O. Site No. 16 (Solvent Disposal Site)

Site No. 16 is located in the northeast corner of the Base between Fire Department Training Area No. 1 (Site No. 6) and Landfill No. 2 (Site No. 2).

Two empty 55-gallon drums labeled "Trichloroethylene" (TCE) were found on the ground, opened and positioned such that they would drain into a shallow surrounding pit. Each drum had rust holes in the top side, suggesting that they had been there for several years. A deteriorating black plastic liner was noted at the edge of the shallow pit. Approximately 4 to 6 inches of soil covered the rest of the liner, which had apparently been installed in the pit to prevent the volatile solvent from percolating into the ground. It is not known whether the drums were full at the time of disposal. Neither interviews with Base personnel nor a review of Base files revealed any information on this site (CH$_2$M Hill, 1983).

P. Site No. 17 (Entomology Rinse Area)

Site No. 17 is located near the wastewater treatment lagoons, behind Building No. 2160. Building No. 2160 is a storage area for pesticides and contains a sink for rinsing pesticide spraying equipment and empty containers. The drain from the sink exits the rear of the building and drops into a small open pit which is about 3 feet square and 2 feet deep. The pit structure appears to be an old Parshall flume and was apparently part of the influent structures for the former wastewater treatment system (Imhoff tank). Soil and some gravel in the base of the pit prevented inspection to determine the nature and condition of the bottom. It was not known whether pesticides that drain into the pit are self-contained within the open pit or percolate into the ground, possibly through cracked concrete (CH$_2$M Hill, 1983).

Q. Site No. 18 (JP-4 Fuel Spill)

Site No. 18 is located on the apron southwest of Building No. 120. It is the site of a JP-4 fuel spill from an aircraft fuel tank that occurred in 1980.

The accident resulted from a broken fuel coupling. During attempts to repair the coupling, the leak intensified. Altogether, an estimated 400 gallons of fuel were lost through evaporation and spillage onto the apron. Some of the lost fuel would have entered the ground through construction joints and cracks in the apron; however, it is believed that the quantity would have been small.

R. Site No. 19 (MOGAS Spill)

Site No. 19 is located along the southwest side of Argentina Avenue, opposite the vehicle maintenance shop (Facility No. 379).

On two occasions in the early 1960s, fuel trucks leaving the vehicle refueling area adjacent to the vehicle maintenance shop (Facility No. 379) turned over in a ditch on the opposite side of Argentina Avenue. In making the required turn leaving the refueling area, the tractor-trailer fuel trucks had to cross the road. Due to a poor connection between the tractor and the trailer, the trailers turned over, spilling MOGAS into the ditch. It is not known what quantity of fuel was spilled; however, it is suspected to have been a moderate quantity (2000 to 2000 gallons). No attempts were made to recover the fuel or to excavate and replace contaminated soils. Reportedly, the fire department washed down the area in both cases (CH$_2$M Hill, 1983).

S. Site No. 20 (Northeast Stormwater Connection Point)

Site No. 20 is one of two stormwater collection points on Base. It is located in the central eastern area of the Base. The site is defined by a shallow open ditch which crosses beneath a road. Flow is discharged to an open area to the southeast.

This site receives stormwater runoff from the northeast-southwest runway and washwater from the maintenance shops and hangar on the northwest side of the runway. Due to the nature of flightline operations, it is suspected fuels from minor spills, oils, and similar materials have been transported to the site with storm and washwater (Walk, Haydel & Associates, Inc., 1988).

Sites 9, 10, 11, 12, 15, 17, and 20 have received further remedial investigation (Walk, Haydel & Associates, Inc., 1988; U.S. Corps of Engineers, 1988) and removal of a 2000-gallon underground storage tank at Site 9 (U.S. Corps of Engineers, 1988). A Remedial Action Plan has been developed for Site 17 (Walk, Haydel & Associates, Inc., 1988). The ongoing IRP program will assure compliance of these sites with hazardous waste regulations. Sites 1-4, 7-8, 13, 14, 16, and 18-20 are not considered to present significant concern for adverse effects on health or the environment (CH_2M Hill, 1983). The remaining sites, 5 and 6, are in active use for training purposes.

3.2 GENERAL DESCRIPTION OF THE MOA AREA

To accommodate the increased flight training associated with the addition of another wing of aircraft in the Base Realignment Program, the area within 100nm of Cannon AFB was searched for an already established MOA suitable for conducting additional flying sorties. FAAH guidance suggests that such a Special Use Airspace should be established within 100nm of the Base of the proponent. A suitable established MOA was not found. The same area was searched for a suitable area in which to establish a new MOA. As a result, the Mount Dora area was identified as the best suited for the purpose. Reasons for the selection of the Mount Dora area are discussed in Section 2.2.5. A discussion of alternatives for meeting the increase in flight training is found in Section 2.3.3.

Currently, the use of the airspace proposed for the Mount Dora MOA is limited to local private airports, high-altitude routes used by commercial jets, and existing MTR use. Proposed boundaries of the MOA are shown in Figure 1.2-5. The southernmost boundary of the proposed MOA is located approximately 97 nm north of Cannon AFB. The proposed operational floor of this MOA is 1500 feet AGL. Existing MTRs will be used to access the MOA. The operating ceiling of the MOA is 18,000 feet above MSL. The proposed MOA contains an area of approximately 5200 square statute miles.

3.2.1 Air Quality and Meteorology

3.2.1.1 Air Quality

Airspace comprising the proposed Mount Dora MOA (1500 feet AGL to 18,000 feet MSL within the vertical boundaries) and associated MTRs used to fly between Cannon AFB and the MOA overlie portions of the states of Colorado, New Mexico, and Texas. The federally designated Air Quality Control Regions (AQCRs) within the states underlying the proposed Mount Dora MOA and the boundaries of each of these AQCRs are listed in Table 3.2.1-1. The MTRs also cross the Pecos-Permian Basin AQCR discussed in Section 3.1.1.1. The area lying between the proposed MOA, the associated IR 107, VR 108, IR 109, and IR 111 MTRs, and Cannon AFB is wholly contained within the Northeastern Plains and Pecos-Permian Basin Intrastate Air Quality Control Regions in the State of New Mexico.

The area impacted by the proposed Mount Dora MOA does not contain any Mandatory Class I Federal Areas or any Scenic Vistas associated with Class I Federal Areas. The Pecos Wilderness Area is the nearest Mandatory Federal Class I Area to the proposed Mount Dora MOA and is located approximately 20 miles west of the southwest boundary of the proposed MOA.

Table 3.2.1-1. Boundaries of the Air Quality Control Regions (AQCRs) Relevant to the Mount Dora MOA Airspace

Air Quality Control Region	State	Counties Included
Northeastern Plains Intrastate	New Mexico	Colfax, Guadalupe, Harding, Mora, San Miguel, Torrance, and Union.
San Isabel Intrastate	Colorado	Chaffee, Custer, El Paso, Fremont, Huerfano, Lake, Las Animas, Park, Pueblo, and Teller.
Amarillo-Lubbock Intrastate	Texas	Armstrong, Bailey, Briscoe, Carson, Castro, Cochran, Collingsworth, Crosby, Dallam, Deaf Smith, Dickens, Conley, Floyd, Garza, Gray, Hale, Hall, Hartley, Hemphill, Hockley, Hutchinson, King, Lamb, Lipscomb, Lubbock, Lynn, Moore, Motley, Ochiltree, Oldham, Parmer, Potter, Randall, Roberts, Sherman, Swisher, Terry, Wheeler, and Yoakum.

The State of New Mexico has identified the counties of Bernalillo, Chaves, Dona Ana, San Juan, and Santa Fe as Air Quality Maintenance Areas (AQMA). Ambient carbon monoxide and/or particulate concentrations could exceed standards within the near future, possibly resulting in nonattainment status. Santa Fe County is the closest AQMA to the proposed MOA, at a minimum distance of 40 miles due west of the southwestern MOA boundary.

The attainment status of each AQCR with regard to regulated pollutants is listed in 40 CFR Part 81. The AQCRs impacted by the proposed Mount Dora MOA and associated MTRs are listed as being in attainment for particulate and SO_2, and as either in attainment or unclassifiable for O_3, CO, and NO_2. The area underlying the proposed MOA is predominantly rural, with a low population density. Accordingly, little ambient monitoring is conducted in the MOA vicinity.

3.2.1.2 Meteorology

Most of the proposed Mount Dora MOA is located in the northeastern quadrant of New Mexico and traverses the southern Rocky Mountains. The general climate for this area is semiarid with an annual mean temperature in the mid-50s. Average monthly temperatures range from the low 30s in January to the mid-70s in July. Daytime temperatures in the summer months can reach 90°F or warmer. Hot days, registering 100°F or more, normally occur only once or twice each year. Minimum temperatures range from the upper teens in January to about 60°F in July.

The average annual rainfall is approximately 15 inches, with the majority occurring between May and October. Most of the precipitation for this region results from sudden thundershowers, which form over the mountains during the spring and summer months. The Four Corners area (the region around the intersection of Arizona, New Mexico, Colorado, and Utah) is near the MOA. The Four Corners area is a prime location for the formation and development of severe thunderstorms. In the warmer months, a southeasterly flow of air often brings moisture from the Gulf of Mexico into the area. This moisture, coupled with convective activity in the mountains around the Four Corners area, can generate strong storms within the region of the MOA. Occasional winter snows are generated in this area from the upslope movement of moist air from the Gulf of Mexico. The moisture in these warm, southerly air masses combines with the cold dry air masses from the north (e.g., the "Alberta Clippers"), and snow showers develop. Annual snowfall amounts of 40 inches or more have been recorded at several locations within the MOA. Based on Air Weather Service climatic data, the average annual snowfall is about 20 inches.

The atmosphere is well mixed in this region, and the seasonal and annual average mixing heights can vary from 400 meters in the morning to 4000 meters in the afternoon. The afternoon mixing heights are typically greater during the spring and fall seasons. The morning mixing heights are usually low, due to nighttime heat loss from the ground producing surface-based temperature inversions. After sunrise these inversions break up, and solar heating of the earth's surface causes vertical mixing in the atmosphere. Wind speed, frequency, and direction conditions and dust storm conditions for the MOA parallel those discussed in Section 3.1.1 for the Base.

3.2.2 Aircraft Noise

A sample survey of noise levels in some areas under the proposed MOA was conducted during the preparation of this EIS to provide general information on current noise conditions. These surveys included measurement of noise during 2 to 8 hours at some sites (which are denoted as average noise levels for those periods) and 24-hour measurements at other sites (which are denoted as DNL levels with the nighttime 10 dB penalty included). No aircraft noise events occurred during the measurement periods. The existing noise environment in the land area under the proposed MOA is typically that of rural countryside with a few obvious exceptions such as that within towns, near highways (e.g., Routes 56, 87, and others), and near the Burlington Northern Railroad (alongside Route 87).

The largest town in the area is Clayton with a population of about 3000 in which noise is predominantly due to automobile traffic and an occasional freight train passing through the town (about twice per day). A typical daytime average noise level in downtown Clayton is of the order of 60 dB(A), inclusive of one freight train pass-through, as measured near the railroad junction within the town. Nighttime noise in Clayton is due mainly to sparse road traffic, although a freight train pass-through does occasionally occur. The day-night average sound level (DNL) in the residential area of Clayton would therefore be of the order of 50 dB to 55 dB, with the highest levels, of the order of 60 dB to 65 dB, near the railroad junction.

Other towns in the area, such as Des Moines, New Mexico, and Texline, Texas, on Route 87 have noise environments typical of small rural communities but with a freight railroad within their boundaries. Other small communities, such as those along Route 56, contain a few scattered dwellings with no apparent main industry other than livestock or grain. Typical (measured) average noise levels in these rural areas were of the order of 45 dB during daytime and 35 dB during nighttime. Near the highways, averaged noise levels increased to, typically, 65 dB during daytime and 45 dB during nighttime; very few dwellings are located near the highways (within 50 feet).

The noise environment in public parklands, such as Kiowa National Grasslands, is primarily background (ambient) with average noise levels of less than 35 dB in the absence of road traffic.

Military operations occur sporadically on low-altitude Military Training Routes under the proposed MOA and over the land area discussed herein. These low-altitude routes (IR 107, VR 108, IR 109, and IR 111) are scheduled from Cannon AFB and include flights by F-111 and A-7 aircraft at altitudes of 100 feet AGL and above. These flights incur high single-event noise levels, on a sporadic basis, at locations near their flight tracks. Appendix C contains more details on these MTRs.

As previously illustrated in Figure 3.1.5-3 and as summarized in Table 3.2.2-1, routes IR 107 and VR 108 have much longer flight track lengths (181 miles and 131 miles, respectively) under the proposed MOA compared with those of IR 109 and IR 111 (19 miles). IR 107 is also the most used of these four low-altitude routes, with about 125 average monthly sorties and 165 sorties during the most active month between October 1988 and May 1989.

In assessing the noise impact of low-altitude MTRs, a slightly different version of the DNL noise exposure metric is used (Plotkin, 1987). This noise metric is the "onset-rate" adjusted monthly day-night average sound level, DNL_{mr}, which adds an onset-rate adjustment to account for the more sudden rise time of noise from a low-altitude, high-speed, overflight by military jet aircraft. This correction is between 0 dB and 5 dB, depending on the speed, altitude, and sound exposure level (SEL) of the flyover. Also, this metric uses the daily number of day and night operations for the worst (most-active) calendar month in the study period, rather than the annual average day or average busy day used to calculate DNL. In other aspects, DNL and DNL_{mr} are identical in that they are both based on A-weighted Sound Levels and have a 10 dB penalty applied to nighttime (2200 hours to 0700 hours) noise events.

An estimate of the noise impact of these four low-altitude MTRs has been made by use of the DNL_{mr} metric and a computer model developed by the Air Force, ROUTEMAP (Lucas, 1988). ROUTEMAP estimates values of DNL_{mr} at various sideline distances from the route centerline, based on details of the most-active monthly use by each type of aircraft and the speeds, engine power settings and altitudes of the aircraft. IR and VR routes have different characteristics of how closely aircraft follow the route centerline, these characteristics also being modeled in ROUTEMAP.

The model of noise exposures for each of the four routes is based on the information shown in Table 3.2.2-1, together with more detailed activity data on specific aircraft usage (Cannon AFB, 30 August 1989) of each route. For IR 107, VR 108, and IR 111 the percentage of use by F-111 aircraft is 98 percent, and for IR-109 usage is 85 percent. Typical altitudes flown on these routes are between 100 and 500 feet AGL, which are modeled using an "average" altitude of 300 feet AGL (which gives an equivalent average noise level for the 100-foot to 500-foot range). This means that the noise exposure from all of the aircraft flying at 300 feet is the same as that when the aircraft are statistically spread over the 100-foot to 500-foot altitude range.

IR routes are typically flown more accurately than VR routes and are modelled using a dispersion factor (standard deviation) of 0.5 miles. This means that 80% of the actual flight tracks would be within 0.64 miles of the route centerline and almost all tracks would be within 1.5 miles of the centerline. Thus, 0.5 miles was used for IR 107, IR 109, and IR 111. VR routes are modelled using standard deviations of 1.25 miles or 2.5 miles, depending on the training usage of the route. In the present analysis, a standard deviation of 1.25 miles was used for VR 108. This means that 80 percent of flights would be within 1.6 miles of the centerline and almost all flights would be within 3.75 miles of the route centerline. These estimates are based on Air Force studies of TAC and SAC low-altitude routes (Plotkin, 1987 and 1988) and their noise impacts.

Table 3.2.2-1. Low-Altitude MTR Activity on IR 107, VR 108, IR 109, and IR 111

Information	Low-Level Military Training Route IR 107	VR 108	IR 109	IR 111
Route Length (Miles)				
Under MOA	181	131	19	19
Outside MOA	71	140	274	297
Total Length	252	271	293	316
Average Monthly Sorties	125.4	26.8	79.0	79.1
Most Active Month Sorties	165	62	101	118
Ratio (Most Active/ Average)	1.32	2.31	1.28	1.49
F-111 Use (%)	98	98	85	98
Other Users	B-52 (1%)	Misc.	A-7 (14%)	Misc.

No nighttime operations (2200 hours to 0700 hours) on these routes.

Table 3.2.2-2 shows an estimate of the noise impact associated with aircraft operations on these four routes. A DNL of 65 dB is considered to be the level at which significant community reaction to noise would occur in residential areas. The noise impact is shown in terms of the total land area exposed to noise levels in excess of DNL_{mr} 65 dB, and the estimated number of the resident populations within this land area. There are currently no noise exposures of DNL_{mr} 70 dB or greater under these four routes.

The estimates of land areas within each noise exposure level were obtained by means of the ROUTEMAP model, which provides an estimate of the width of the noise exposure level boundary (contour width). This width multiplied by the track length gives the total noise-exposed land area. The estimate of noise-impacted residents under each route was obtained by using the rural population density for each county that is flown over, and the noise-impacted land area in each county.

The noise impact estimates shown in Table 3.2.2-2 are separately given for:

(a) the route segments below the proposed Mount Dora MOA, and

(b) the other route segments which are outside of the proposed MOA region.

This separation of the two noise impact regions is simply to aid assessment of the additional noise impacts of the proposed actions in Section 4 of this EIS.

The *current* noise impact under the proposed MOA airspace (Table 3.2.2-2(a)) is estimated to comprise a total land area of about 250 square miles with DNL_{mr} values between 65 dB and 70 dB. Almost all of this land is rural countryside with sparse resident population. Using the respective rural county population densities, it is estimated that about 170 people are currently exposed to DNL_{mr} values of between 65 dB and 70 dB.

Of the 168 people residing under the proposed MOA airspace with noise exposures in excess of 65 DNL_{mr} (due to the low-altitude MTR flights), about 58 persons would be expected to be highly annoyed by the noise environment. This estimate is based on the relationship between noise exposure (DNL) and annoyance shown in Figure 3.1.2-2.

Outside of the proposed MOA region, 916 square miles of land area and 2028 residents are estimated to have noise exposures exceeding a DNL_{mr} of 65 dB. Of these, about 525 residents would be expected to be highly annoyed by noise from current MTR operations.

Table 3.2.2-2. Noise Impact Due to Current (1988-89) Low-Altitude MTR Operations on IR 107, VR 108, IR 109, and IR 111

(a) Under Proposed Mount Dora MOA

Noise Impact	DNL_{mr}* (dB)	Low-Altitude Military Training Route IR107	VR108	IR109/IR111	All Routes
Land Area Within Noise Contour (sq. miles)	65	221	0	29	250
	70	0	0	0	0
Resident Population[1] Within Noise Contour	65	98	0	70	168
	70	0	0	0	0

(b) Outside of MOA Region

Noise Impact	DNL_{mr}* (dB)	Low-Altitude Military Training Route IR 107	VR 108	IR 109/IR 111	All Routes
Land Area Within Noise Contour (sq. miles)	65	87	0	829	916
	70	0	0	0	0
Resident Population[1] Within Noise Contour	65	107	0	1921	2028
	70	0	0	0	0

[1] Based on rural population densities in each impacted county.
* For the MTRs the contours fall within 0.8 miles of the track centerline.

3.2.3 Water Resources

The proposed action does not include activities which might potentially impact water. Water resources are not an environmental aspect applicable to the Mount Dora MOA since only the airspace is being used.

3.2.4 Socioeconomics

3.2.4.1 Population Characteristics

The area underlying the proposed Mount Dora MOA includes portions of four counties in northeastern New Mexico (Union, Harding, Colfax, and Mora counties), a portion of Dallam County in northwestern Texas, and a very small portion of Las Animas County in southern Colorado. Union County, New Mexico, comprises the largest area within the proposed area to be overflown. Figure 1.2-5 shows the county boundaries within the proposed area. There are six incorporated towns within the proposed area.

The area underlying the proposed Mount Dora MOA is sparsely populated. It is characterized by large ranches and a few built-up settlements. Estimated 1986 county population densities range from 0.4 persons per square mile in Harding County, New Mexico, to 2.3 persons per square mile in Mora County. The average estimated density underlying the proposed MOA (based on the estimated portions of each county that lie underneath the MOA) is approximately 1.3 persons per square mile, in contrast to the national average population density of 64 persons per square mile. The largest population center underlying the proposed MOA is Clayton, New Mexico, which had a 1984 population of 2968. The next largest towns are Wagon Mound and Roy, each having a population of approximately 400. Table 3.2.4-2 presents the estimated populations in the incorporated towns and unincorporated settlements within the affected area. The portion of Las Animas, Colorado, included within the study area contains no populated centers.

Transient populations within the area under the proposed Mount Dora MOA include visitors at the Capulin Volcano National Monument, the Kiowa National Grasslands, the Chicosa Lake State Park, and the Clayton Lake State Park.

3.2.5 Airspace Management and Land Use

3.2.5.1 Proposed Mount Dora MOA Airspace

The proposed Mount Dora MOA is depicted in Figure 3.2.5-1. As shown, the MOA will be divided into three sub-areas. Mount Dora North MOA (High and Low) will be divided from Mount Dora East and West by the N36°30' latitude line and a magnetic

Table 3.2.4-2. Population of Towns and Settlements in the Area Underlying the Proposed Mount Dora MOA

New Mexico

Town	County	Population
Abbott	Colfax	Rural[2]
Bueyeros	Harding	10
Capulin	Union	50
Chico[1]	Colfax	Unknown
Clapham	Union	Rural
Clayton[1]	Union	2968
Des Moines	Union	178
Farley	Colfax	30
Folsom	Union	73
Gladstone	Union	5
Grande	Union	no population[3]
Grenville[1]	Union	39
Levy	Mora	Rural
Mills	Harding	15
Mount Dora	Union	5
Roy[1]	Harding	381
Royce	Union	no population
Sedan	Union	40
Shoemaker	Mora	no population
Sixela	Union	no population
Seneca	Union	5
Sofia	Union	Rural
Staunton	Union	no population
Stead	Union	5
Wagon Mound[1]	Mora	416
Valmora	Mora	45
Taylor Springs	Colfax	Rural
Texas		
Perico	Dallam	Rural
Texline	Dallam	477

[1] These towns are incorporated

[2] "Rural" indicates open country localities that have a locally recognized name, although no built-up section exists

[3] "No population" indicates the existence of railroad stations or mines, not associated with any settlement.

Source: Rand McNally & Co. 1986, Commercial Atlas & Marketing Guide, 17th Edition, Chicago

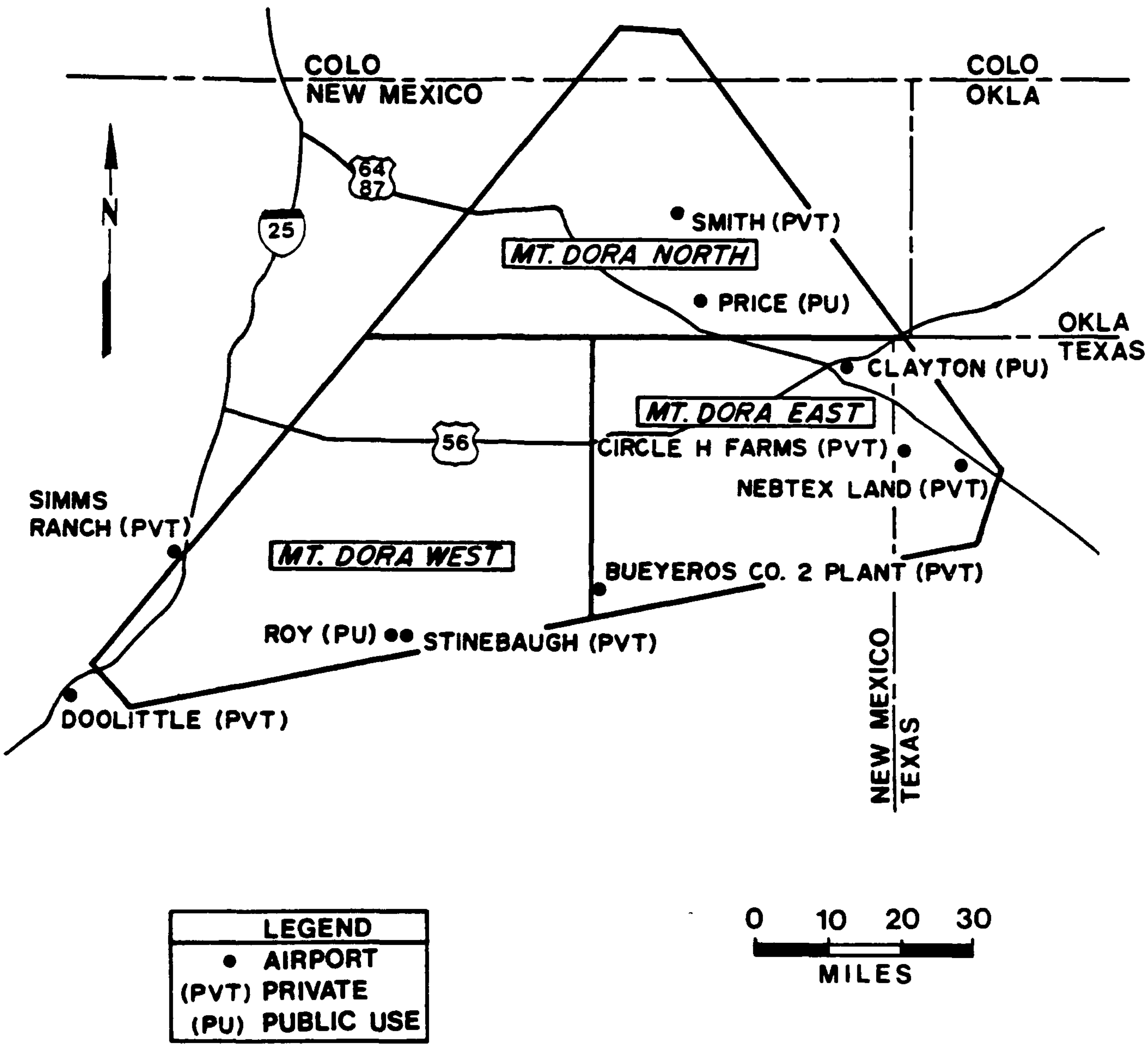


Figure 3.2.5-1. Proposed Mount Dora MOA in Relation to Public/Private Airports

bearing of 076 degrees from the Cimarron-navigational aid west of the proposed MOA. Mount Dora East will be separated from West along the W103° 51 ' longitude meridian. These areas are further subdivided by elevation. Stratification from 1500 feet AGL to, but not including, 11,000 feet MSL as Mount Dora Low, and 11,000 feet MSL to, but not including, 18,000 feet MSL as Mount Dora High, will permit efficient scheduling and productive joint use of the airspace. Subdivision of the High and Low strata will provide additional efficiency in airspace scheduling and joint use. The seven MTRs that transit this area are shown in Figure 3.1.5-3 and are listed in Table 3.2.5-1. Five of the MTRs have operating altitudes within the vertical structure of the proposed MOA and two have ceiling altitudes coincidental with the MOA floor (1500 feet AGL). Four of the MTRs are presently used in conjunction with the Melrose Range/Restricted area operations. The combined use of all seven MTRs is over 5500 annual sorties.

There are four high-altitude Jet Routes above the proposed Mount Dora MOA and three low-altitude Airways circumnavigating this airspace. Three public-use airports are located within the lateral boundaries of the proposed MOA. These are Clayton Municipal Airport (Clayton, New Mexico), Price Ranch Airport (Mount Dora, New Mexico), and Roy Municipal Airport (Roy, New Mexico). The 1500 foot AGL floor of the proposed MOA is above the typical VFR traffic pattern altitudes (800 to 1000 feet AGL) that would be flown at these airports. There are also seven private airports within the geographical area of the proposed MOA. The New Mexico private airports are in the vicinity of Valmora, Roy, Des Moines, Levy, and Bueyeros. Two of the private airports are near Perico, Texas. The traffic pattern altitudes of these airports would also be below the floor of the proposed Mount Dora MOA with the base of 1500 feet AGL. The Mount Dora MOA will not require any adjustments to this base altitude to accommodate the Clayton Municipal Airport or other charted airports in the area. Three major federal highways pass beneath the MOA which are used as visual "flyways" by general aviation aircraft transiting this area under Visual Flight Rules (VFR). VFR aircraft along any of those surface routes would not be restricted with the MOA base at 1500 feet AGL. Some crop dusting also occurs in this area; however, these operations could normally be conducted below 1500 feet AGL. Albuquerque Center (FAA) has remote radio coverage in the area with radar coverage at 11,000 feet MSL and above for air traffic service.

3.2.5.2 Land Use

The proposed Mount Dora MOA, as currently configured, will overlie portions of Colfax, Harding, Mora, and Union counties in New Mexico, as well as small portions of Dallam County, Texas, and Las Animas County, Colorado. Most of the land in the affected area is privately owned. The three states own school lands used for schools and state parks. The school lands are several parcels of land throughout the state that generate income for the state's educational system by leasing the land for various activities. The federal government owns land for the Kiowa National Grassland and Capulin Volcano National Monument. There are no Indian-owned lands under the proposed MOA.

Table 3.2.5-1. Military Training Routes Within the Proposed Mount Dora MOA

Route Number	Scheduling Organization
IR-107	Cannon AFB, NM
VR-108	Cannon AFB, NM
IR-109	Cannon AFB, NM
IR-111 (merged with IR-109)	Cannon AFB, NM
IR-177	Barksdale AFB, LA
VR-1574	Tinker AFB, OK
VR-1174 (reverse of VR-1574)	Tinker AFB, OK

Land underlying the proposed MOA is mainly used for agricultural purposes, primarily cattle raising. Raising cattle is the main economic activity in the area. There are also dryland and irrigated crops growing in the affected area, but these activities represent a smaller percentage of the value of agricultural products sold (Table 3.2.5-2). The amount of acreage used for crop growing is significantly lower than for cattle grazing. The principal crops grown are wheat, grain sorghum, corn, peanuts, cotton and cottonseed, barley, potatoes, and alfalfa. The average acreage per farm in the affected counties ranges from 1981 acres in Dallam County, Texas, to 6241 acres in Harding County, New Mexico (U.S. Bureau of the Census, 1989a). Since the farms are so large, the counties are sparsely populated, with scattered residential developments. Several small towns scattered throughout the area provide household goods and agricultural support products. Formal land use planning and zoning are not actively pursued by the local county governments in the affected area.

In addition to farming and small towns there are two state parks, one national grassland, one national monument, and one national historic trail (see Figure 1.2-5). Table 3.2.5-3 displays visitation figures for these recreation areas.

Clayton Lake State Park is 417 acres with a 170-acre lake. Camping is permitted only at a 40-site campground. Fishing is permitted from May to September, and no hunting is allowed. There is a 1/2-mile trail to dinosaur tracks. The area is a winter nesting site for birds. Chicosa Lake State Park is 620 acres with a 26-acre lake. The lake sometimes is dry due to insufficient rainfall. There is a designated 14-site campground, and camping is permitted anywhere along a road that circles the lake. Fishing is permitted year round, while hunting is not allowed.

The Kiowa National Grasslands is divided into two areas, one located in Union County (Union Unit) and the other in Harding County (Mills Unit). The Union Unit covers 57,542 acres, and hunting is the primary recreational activity. The Mills Unit covers 70,500 acres. The Canadian River runs through the area. There is an 8-site campground in Mills Canyon that has a primitive access road. Hunting and fishing are permitted in the area. The hunting season generally runs from mid-September to December and is governed by the New Mexico Department of Game and Fish. There are no restrictions on hiking or camping in the grasslands.

The Capulin Volcano National Monument is a volcanic crater that covers 790 acres. The main activities at the Park are geological interpretation, viewing the scenery, walking, and picnicking (15 tables). There is a nature trail at the monument's Visitor Center. A bill is currently before Congress to authorize a study into expanding the monument by approximately 10,000 acres. The expansion would be primarily to the west of the existing monument.

The Santa Fe Trail is registered as a National Historic Trail and runs from Santa Fe, New Mexico, to Old Franklin, Missouri. The trail branches near Springer, New Mexico, and the Cimarron cut-off trail extends through the proposed MOA. The National Park Service has put out a draft comprehensive management and use plan for the trail.

Table 3.2.5-2. Number of Farms, Ranches, and Land in Farms in the Counties Under the Mount Dora MOA 1987

	Farms (Number)	Farms With Cattle (Number)	Share of Farms in Ranches (%)	Land in Farms (Acres)	Approximate Land Area (Acres)	Share of Land in Farms (%)
Colfax, NM	303	227	74.9%	1,877,995	2,407,891	78.0%
Dallam, TX	397	267	67.3%	786,393	963,488	81.6%
Harding, NM	181	159	87.8%	1,129,548	1,358,252	83.2%
Las Animas, CO	481	391	81.3%	2,149,828	3,053,190	70.4%
Mora, NM	401	325	81.0%	950,958	1,234,988	77.0%
Union, NM[1]	438	347	79.2%	2,451,219	2,451,219	100.0%
Six-County Total	2,201	1,716	78.0%	9,345,941	11,469,028	81.5%
Estimated Total Under Mt. Dora MOA[2]	632	499	79.0%	3,008,773	3,313,980	90.8%

[1] The Census can report figures for Land in Farms greater than the Approximate Land Area. Land in each farm was tabulated as being in the operator's principal county, i.e., the county where the largest value of agricultural products was raised or produced. In counties such as Union, where farms extend over several counties, this procedure has resulted in the allocation of more land in farms to a county than the total land area of the county. Therefore, an adjustment to the Land in Farms is made for Union county, setting it equal to approximate land area rather than the reported value of 2,603,803. If the reported value were used, the estimated share of land in farms under the Mount Dora MOA would be biased upward.

[2] Calculated as the weighted sum of the six counties, assuming the following share of each county is included in the MOA: Colfax NM - 15 percent; Dallam, TX - 15 percent; Harding, NM - 50 percent; Las Animas, CO - 2 percent; Mora, NM - 25 percent; Union, NM - 75 percent.

Source: U.S. Bureau of the Census, Census of Agriculture, 1987, for Colorado, New Mexico, and Texas.

Table 3.2.5-3. Visitation at State and National Parks located in the Area under the Proposed Mount Dora MOA

Park	Visits, 1987	Visits, 1988
Chicosa Lake State Park	6,381	11,302[1]
Clayton Lake State Park	8,556	44,824[1]
Kiowa National Grasslands	N/A	5,600[2]
Capulin Mountain Natl. Mon.	38,849[3]	53,427

[1] Lower visitation occurred in 1987 because of drought conditions at the lake.

[2] Approximately 4,300 visits occurred during hunting season (September-December).

[3] Low visitation in 1987 was due to road construction.

Sources: Carlos Valdez, Regional Mgr., New Mexico State Parks
Ralph Harris, Superintendent, Capulin Mountain National Monument
Allen Hinds, Cibola National Forest

Most of the trail is on private land, so a cooperative agreement with landowners will be needed to allow public access to parts of the trail. Future plans include hiking on part of the trail, interpretive stations, and an auto tour route that generally follows the trail.

The MTRs associated with the proposed Mount Dora MOA (VR 108, IR 107, IR 109, and IR 111) are primarily located over land used for agricultural purposes. Cattle raising is the main agricultural activity under the MTRs. There is also scattered irrigated and dryland crop growing throughout the area. The average farm size in the counties under the MTRs is over 1500 acres, creating sparsely populated counties. Small towns throughout the area provide agricultural support products and everyday goods.

According to the defined distances from the MTRs centerline to be used for analysis (see Section 3.2.2), several recreation areas are currently being overflown. IR 107 and VR 108 are located over the Kiowa National Grasslands. IR 109 is located near the Cimarron Canyon State Park. The main recreational activities at this park are camping, fishing, hunting, backcountry hiking, rock climbing, and picnicking.

According to the defined widths for the MTR IR 111, the route is located over two national forests, a wilderness area, and a state park. The route is over the southern section of the Camino Real Ranger District in the Carson National Forest. Several campgrounds, ranging from 2 to 29 campsites, are located in this area. Other recreational activities in the area include hiking, fishing, mountain cycling, hunting, snow skiing, snowshoeing, and snowmobiling. IR 111 is also over the Pecos Ranger District of the Santa Fe National Forest. The route flies over several campgrounds ranging in size from 3 to 75 campsites. Other activities in this district are the same as those described for the Carson National Forest. In addition to recreational uses, portions of the national forests are used for timbering operations and cattle grazing.

The Pecos Wilderness Area is located in both the Carson and Santa Fe National Forests. The Wilderness Area was established in 1955 and was recognized by Congress under the Wilderness Act of 1964. The main activities in the area include camping, hiking, fishing, picnicking, cross-country skiing, and snowshoeing.

IR 111 is also over the Coyote Creek State Park. The main activities are camping, picnicking, hiking, and fishing. See Section 3.1.5 for lateral avoidances and raised flight floors over recreational areas, ranches, and towns.

3.2.6 Biological Resources

3.2.6.1 Plant Resources

The information presented in this section was obtained through a survey of local biological literature and contacts with local experts in field biology. No onsite field studies were made to support this data.

The Mount Dora MOA and associated MTR areas are composed of level plains, plateaus, and low mountains and are considered to be semiarid. The natural vegetation is mostly shortgrass prairie, including blue and mixed grama grassland vegetation types. This vegetation has a moderately fast recovery rate following periods of grazing or fires. The higher elevations are characterized by pinyon-juniper woodlands. Riparian gallery forests line the major rivers and streams of the region.

The following plants are candidate species for the Federal List of Endangered and Threatened Wildlife and Plants and are found below the Mount Dora MOA: chatterbox orchid (Epipactus gigantea), spiny aster (Aster harridus), and dune unicorn plant (Proboscidea sabulosa). The dune unicorn plant is also on the New Mexico state endangered plant species list (Knight, 1989, personal communication).

In addition to the above discussion, the plant resources discussion in Section 3.1.6.1 applies to the MTRs since they traverse both areas. The MTRs associated with the Mount Dora MOA have a few biologically sensitive areas. They are the Chama River Canyon Wilderness within 2 nm of IR 109, San Pedro Parks Wilderness Area within 7.5 nm of IR 109, and Pecos Wilderness Area located under a portion of IR 111.

3.2.6.2 Wildlife Resources

As determined by the regional office of the U.S. Fish and Wildlife Service, two federally listed endangered animal species, the bald eagle and peregrine falcon, are known to inhabit the area below the Mount Dora MOA (Peterson, 1989, personal communication). The New Mexico Department of Game and Fish (Sandoval, 1989, personal communication) and the Texas Parks and Wildlife Department (Sullivan, 1989, personal communication) indicated that the federally endangered black-footed ferret may possibly occur beneath the MOA, although its occurrence is unlikely. The New Mexico Department of Game and Fish also indicated that the federally endangered whooping crane may possibly occur beneath the MOA, although occurrence is unlikely (Sandoval, 1989, personal communication). The New Mexico state-protected species are listed in Table 3.2.6-1. The Texas state-protected species are listed in Table 3.2.6-2.

Two New Mexico state-protected mammals which may occur under the MOA are the pine marten and the black-footed ferret. The pine marten is present in the north central part of New Mexico in the San Juan and Sangre de Cristo mountains. Loss or alteration of habitat and exploitation for furs have contributed to declines in localized areas. The black-footed ferret is probably extinct in the state. Historically, the ferret was found in grassland plains and surrounding mountain basins to 10,500 feet in elevation.

Under the MOA in New Mexico, the bald eagle, white-tailed ptarmigan, sharptailed grouse, peregrine falcon, Baird's sparrow, whooping crane, and Bell's vireo are state-protected birds. The bald eagle and the white-tailed ptarmigan are known or are highly likely to occur regularly in the New Mexico counties under the MOA. The bald eagle is seen occasionally in summer in the four counties under the MOA. Winter and migrant populations appear to have increased with reservoir construction. The white

Table 3.2.6-1. State-Protected Species Potentially Occurring in the New Mexico Region of the MOA (Harding County, Colfax County, Union County, Mora County)

Common Name	Scientific Name	Occurrence
Birds		
Bald eagle	Haliaeetus leucocephalus	Likely to occur
White-tailed ptarmigan	Lagopus leucurus	Likely to occur
Peregrine falcon	Falco peregrinus	Less than regular occurrence
Baird's sparrow	Ammodramus bairdii	Less than regular occurrence
McCown's longspur	Calcarius mccownii	Less than regular occurrence
Sharp-tailed grouse	Pedioecetes phasianellus	Recent occurrence unlikely
Whooping crane	Grus americana	Recent occurrence unlikely
Bell's vireo	Vireo belli	Recent occurrence unlikely
Mollusks		
Linnaeus' ramshorn snail	Gyraulus crista	Likely to occur
Raymond's pea-clam	Musculum raymondi	Likely to occur
Circular pea-clam	Musculum patemeium	Likely to occur
Wide pea-clam	Musculum transversum	Likely to occur

Table 3.2.6-1. State-Protected Species Potentially Occurring in the New Mexico Region of the MOA (Harding County, Colfax County, Union County, Mora County)(Continued)

Common Name	Scientific Name	Occurrence
Fish		
Southern redbelly dace	Phoxinus erythrogaster	Likely to occur
Brook stickleback	Culaea inconstans	Likely to occur
Suckermouth minnow	Phenacobius mirabilis	Likely to occur
Arkansas River shiner	Notropis girardi	Recent occurrence unlikely
Speckled chub	Hybopsis aestivalis	Recent occurrence unlikely
Reptiles		
Western ribbon snake	Thamnophis proximus	Less than regular occurrence
Mammals		
Pine marten	Martes americana	Less than regular occurrence
Black-footed ferret	Mustela nigripes	Recent occurrence unlikely

Table 3.2.6-2 State-Protected Animals Potentially Occurring Under the MOA in Texas (Dallam County)

Common Name	Scientific Name	State Status*
Mammals		
Black-footed ferret	Mustela nigripes	Endangered (possible species)
Birds		
Bald eagle	Haliaeetus leucocephalus	Endangered (probable species)
Peregrine falcon	Falco peregrinus	Threatened (possible species)
Reptiles		
Horned Texas lizard	Phrynosoma cornutum	Threatened (confirmed species)

Source: Sullivan, 1989, personal communication.

* Confirmed species - verified recent occurrence in Dallam County.

Probable species - unconfirmed in Dallam County, but within the general distribution pattern of the species.

Possible species - unconfirmed in Dallam County, but at the periphery of known distribution of the species.

-tailed ptarmigan is becoming rare in New Mexico, due probably to livestock and recreational use of tundra habitats in wilderness areas. The sharp-tailed grouse is probably extinct in New Mexico. Its greatest abundance was on Johnson's Mesa east of Raton. The peregrine falcon and Baird's sparrow are discussed in Section 3.1.6.2.

The whooping crane was formerly widespread in North America but now breeds only in the Wood Buffalo National Park in the Northwest Territories. The bird migrates through the Great Plains to winter on the Texas coast at Aransas National Wildlife Refuge. An experimental population has been produced at Grays Lake National Wildlife Refuge, Idaho, and these birds migrate southward to winter in the central Rio Grande Valley in New Mexico. The New Mexico population has increased to a population of 32 in 1983-84.

Bell's vireo is a small songbird which breeds in parts of the Southwest. The Arizona subspecies summers in the lower Gila Valley and Guadalupe Canyon in Hidalgo County. The Texas subspecies summers locally in the lower Rio Grande and the lower Pecos valleys. The species has declined in parts of its range due to habitat destruction and nest-parasitism by the brown-headed cowbird.

In the New Mexico counties beneath the proposed MOA, the only state-protected reptile is the western ribbon snake. This snake has a wide distribution outside of New Mexico, but within the state is known from two disjunct areas in the eastern portion of the state. One is along Ute Creek in Harding and Union counties in the northeast, and the other is in the Pecos Valley north to Roswell.

The southern redbelly dace, the brook stickleback, and the suckermouth minnow are New Mexico state-protected fish likely to occur under the MOA. The southern dace could occur at several locations. The brook stickleback occurs locally in Stubblefield Lake and Merrick Lake on the Vermejo Ranch, Colfax County. The suckermouth minnow is known only in the Dry Cimarron River, the Canadian drainage (Cimarron to Conchas Lake), and in the Upper Pecos River from Sumner Lake to Fort Sumner. Under the proposed MOA, New Mexico state-protected fishes, known to occur less than regularly, are the speckled chub and the Arkansas River shiner. The chub occurs over a wide distribution, but in New Mexico, the fish is restricted to the Canadian River below Ute Reservoir in Quay County. At one time it ranged well upstream in Ute Creek in Harding County. The Arkansas River shiner minnow occurs in New Mexico in the Canadian River downstream of Ute Reservoir and in the lowermost reaches of Revuelto Creek, both in Quay County.

The Linnaeus' ramshorn snail, Raymond's pea-clam, circular pea-clam, and wide pea-clam are New Mexico state-protected mollusks likely to occur under the proposed MOA. New Mexico appears to be the southernmost known occurrence of the Linnaeus' ramshorn snail. It occurs in New Mexico on privately owned land along Coyote Creek, which is a tributary of Black Lake in Colfax County. Raymond's pea-clam occurs in New Mexico and is known only from upper Cieneguilla Creek in the southern end of Moreno Valley near the Angel Fire Recreation Area, Colfax County. The circular pea-clam is known in New Mexico only from Road Canyon Creek, which is a tributary of the

Dry Cimarron River on private land used for stock grazing in Union County. The wide pea-clam is found in New Mexico only in San Miguel County and in the Arkansas River drainage on Road Canyon Creek, Ute Creek near Gladstone, and Clayton Lake in Union County.

In addition to the above discussion, the wildlife resources discussion in Section 3.1.6.2 applies to the MTRs since they traverse both areas. The information presented in this section was obtained through a survey of local biological literature and contacts with local experts in field biology. No onsite studies were made to support this data.

3.2.7 Native American Values and Archaeological, Cultural, and Historical Resources

3.2.7.1 Native American Values

The Native Americans traditionally associated with the region under the Mount Dora MOA are the Jacarilla Apache and the Comanche. Neither group now lives in the project area. Both were effectively removed from the area by the late 19th century. Since they no longer live in the area, there has been a gradual decline in knowledge and interest about the region (HDR, 1981).

Features often considered sacred by Native Americans include habitation sites, rock art sites, burial sites, battlegrounds, special caves, ceremonial locations, and physiographic features of significance to traditional beliefs.

Some Native Americans consider all prehistoric sites to have religious significance, but archaeological sites known to have been occupied by historic Native Americans often have particular importance. A few such sites have been identified in the MOA area, but their tribal affiliation is uncertain. They could have been occupied by Jacarilla Apache, Comanche, or other groups that occasionally traveled through the region. Rock art sites are often considered sacred and where they exist often play an important role in modern Native American religion. Eleven rock sites have been identified in the Texas Panhandle, but none are reported in northeastern New Mexico, including the MOA area (HDR, 1981).

It is likely that a great number of burials of historic Native Americans exist in the project area (HDR, 1981), but few burial sites have been reported by professional archaeologists. Amateur archaeologists probably know of some burial sites and it is also possible that vandals have destroyed or damaged burial sites in some locations. Burials would be expected to occur at the heads of draws, in crevices, in caves, or in overhangs.

3.2.7.2 Archaeological, Cultural, and Historical Resources

Several sites on the NRHP lie beneath the MOA. These are briefly described below and their locations shown on the map in Figure 1.2-5. Dorsey Mansion (Colfax County, New Mexico) lies roughly 12 miles northeast of Abbott, off U.S. 56. This log and stone building dates from 1878-1879 and was built for U.S. Senator Stephen W. Dorsey. Currently the mansion is in private hands. Wagon Mound (Mora County, New Mexico) is east of the town of Wagon Mound on U.S. 25. This feature was a landmark on the high plains section of the Cimarron Cutoff of the Santa Fe Trail and a guidepost for westward travelers in the 19th century. Wagon Mound is in private hands. Rabbit Ears (Union County, New Mexico) lies northwest of Clayton. This double-peaked mountain, surrounding campsites, and trail remains are known as the Clayton Complex. Rabbit Ears served as the major landmark and guide for travelers along the Cimarron Cutoff of the Santa Fe Trail. The Rabbit Ears area is in multiple public and private ownership.

These places all owe their importance to the Santa Fe Trail, which crosses the MOA. This trail was in heavy use from 1849 through 1879, when the Atchison, Topeka, and Santa Fe Railroad reached Santa Fe. The trail crosses both public and private lands.

3.2.8 Solid Wastes, Hazardous Wastes, and Hazardous Materials

Solid waste is not an issue relevant to the Mount Dora MOA since only the airspace above the ground is being used and no waste is generated.

3.3 GENERAL DESCRIPTION OF THE MELROSE RANGE AREA

The proposed use of the Melrose Range and associated MTRs is to increase the current level of airspace activity. Existing Range boundaries (see Figure 1.2-6) and MTRs will be used. Current users are SAC and TAC aircraft (see Section 3.3.2).

3.3.1 Air Quality and Meteorology

3.3.1.1 Air Quality

The Melrose Range and associated MTRs used for travel to and from the Range are within the EPA-designated Pecos-Permian Basin Intrastate AQCR. The Pecos-Permian Basin Intrastate AQCR is designated by EPA as being either in attainment with or unclassifiable for the National Ambient Air Quality Standards. Due to the isolated nature of this area and the low population density, the State of New Mexico maintains ambient monitoring stations only for particulate matter within this AQCR. SO_2 and NO_2 are monitored at Artesia, New Mexico. Table 3.1.1-2 summarizes ambient monitoring data from these stations, supplied by the New Mexico Air Pollution Control Division.

As the Melrose Range and MTRs are located in an arid region, ambient particulate concentrations from wind-blown erosion comprise a high percentage of the total particulate loading. Other sources of emissions are:

- particulates from vehicle movement and aircraft engines, and
- carbon monoxide (CO), nitrogen oxides (NO_x), and hydrocarbons (HC) from aircraft engines.

Ambient concentrations from existing vehicular and aircraft traffic have been inventoried previously (Melrose Range FEIS, 1985) and are accounted for by the fact that this AQCR has not been classified as nonattainment for any criteria pollutant.

3.3.1.2 Meteorology

The meteorological conditions and parameters for the Melrose Range and associated MTRs are the same as those presented in Section 3.1.1.2 for the Cannon AFB.

3.3.2 Aircraft Noise

3.3.2.1 Melrose Range

The noise environment in the vicinity of Melrose Range has been addressed in two previous environmental assessments for SAC low-altitude operations (SAC, 1984; SAC, 1989). The routes and flight profiles used in these previous assessments were based on information developed in 1984.

For purposes of this present EIS, a new study of the usage of Melrose Range by TAC and SAC aircraft has been conducted. This study was coordinated by staff of the 27th TFW/DOAM at Cannon AFB and included compilation of Range usage by different aircraft over a 12-month period. The flight profiles used by these aircraft were also defined for purposes of modeling the noise exposures resulting from these flight operations.

The method of modeling applied to this evaluation of noise exposure is based on NOISEMAP, which allows noise contours of DNL values to be estimated from flight operations descriptions. These include:

- Flight tracks
- Altitude profiles
- Aircraft power settings and speeds during flight around the tracks
- Number of aircraft sorties using each track, based on a busy month, for each aircraft type
- Number of passes (circuits) flown during each sortie at the Range

Table 3.3.2-1 summarizes the operational data used to estimate noise exposures for the 1988-89 baseline conditions. The total number of sorties per year at Melrose Range was obtained from range usage records covering the period from October 1988 through September 1989. The total annual sorties are divided by 260 days per year of range usage to obtain the average busy day number. However, the Range has large fluctuations in monthly usage, the most busy month having 60 percent more operations than the annual average month. Noise analysis, therefore, included this factor to represent this most active monthly usage of Melrose Range. In addition, an average of three passes (circuits) of the range flight tracks (per aircraft sortie) was used as representative of all range users. The number of passes per day over the target area on Melrose Range is therefore as shown in Table 3.3.2-1 to be of the order of 103 passes per day during the active month (with 5 days per week activity on the Range).

These range operations are typically conducted on seven specific flight target tracks comprising closed-loop patterns as illustrated in Figure 3.3.2-1, although

Table 3.3.2-1. Current Usage of Melrose Range

User	Aircraft Type	Sorties /Year	Passes /Day
27 TFW	F-111 D	3628	67.0
150 TFG /NMANG	A-7	1365	25.2
NWEF	F-18 A-7 A-6	195	3.6
SAC	B-52G B-1B FB-111	147	2.7
149 TFG	F-16	57	1.1
67 TRW	F-4	54	1.0
Other	A-7, F-4 F-16, F-111D	108	2.0
Total		5554	102.6

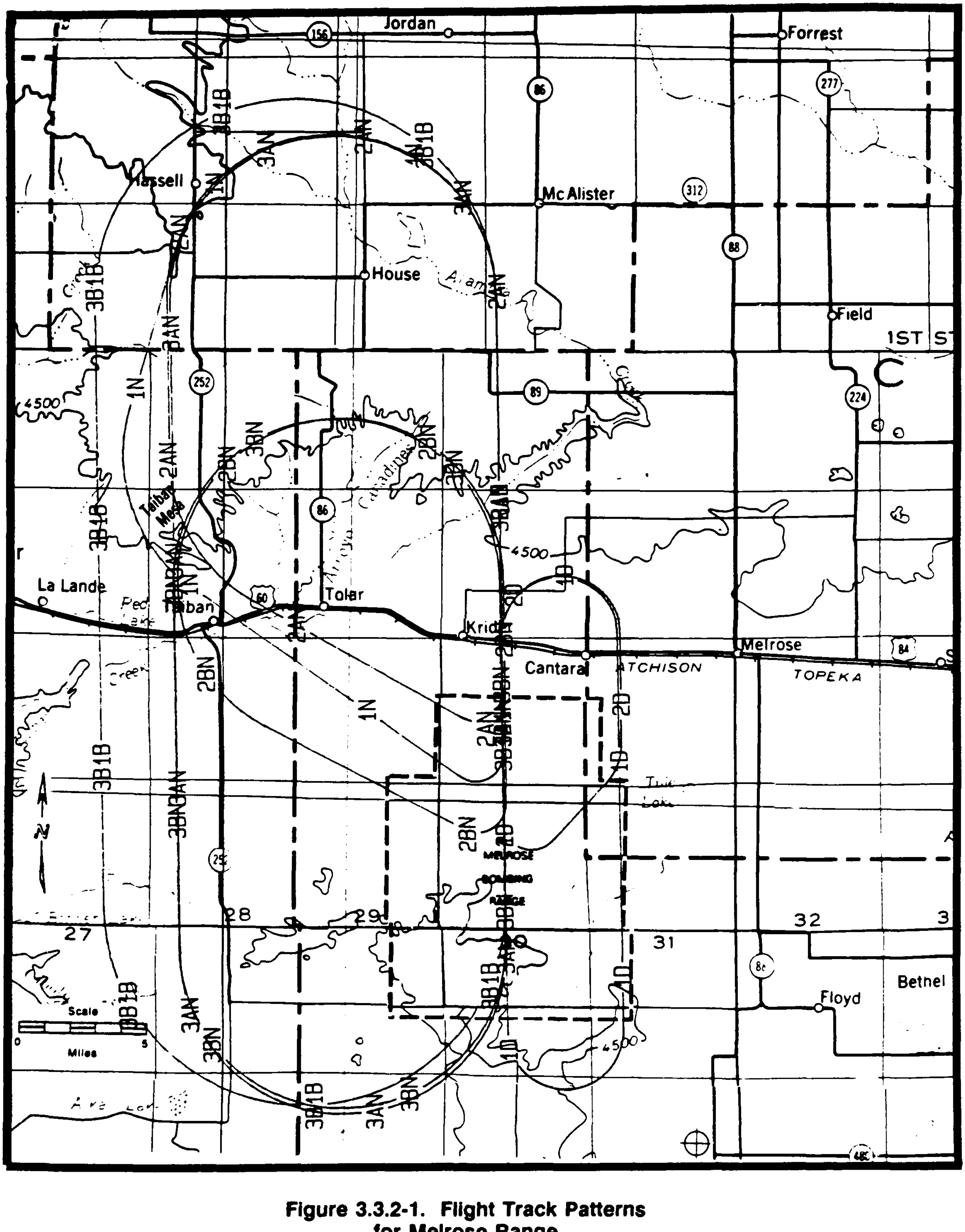


Figure 3.3.2-1. Flight Track Patterns for Melrose Range

other target approaches do occur from other (more random) directions. The seven tracks comprise two daylight tracks (1D and 2D) and five night tracks (1N, 2AN, 2BN, 3AN, and 3BN). The latter are used during darkness hours but before 2200 hours under certain weather conditions. An additional track, 3B1B, is used to represent the wider track pattern of B-1B aircraft using Melrose Range.

Table 3.3.2-2 shows the typical usage of these tracks by TAC, SAC, and other users of Melrose Range, based on range activity estimates.

The flight patterns used in aircraft operations at Melrose Range are illustrated in Figures 3.3.2-2 and 3.3.2-3 for SAC and other users.

The altitude and speed profiles, together with the flight tracks illustrated in Figure 3.3.2-1, were modeled by examination of the actual flight instructions used by the 27th TFW at Cannon AFB. These were verified by airspace management staff as representative of typical patterns for Melrose Range. In general, aircraft approaching Melrose Range for a first pass climb to about 1000 feet AGL at 20 miles from the target area to receive clearance from the Range Control Office (RCO) to enter the Range airspace. Occasionally, pilots will then descend to about 200 feet AGL for altimeter calibration and then return to the usual 1000 feet AGL pattern. On turning into the approach leg of the pattern, the aircraft start a descent and acceleration to 400 feet AGL, release ordnance, and depart the target area in different climb profiles. SAC (and TAC F-111D) aircraft climb steadily, returning to 1000 feet AGL. Other aircraft perform a more rapid ascent during ordnance release and climb to altitudes as high as 2500 feet AGL before returning to as low as 1000 feet AGL on the downwind leg of the pattern.

These flight profiles and tracks for Melrose Range usage have been used to develop the DNL noise contours for the Range, which are shown in Figure 3.3.2-4. The noise contours shown in this figure are for DNL values of 65, 70, and 75 dB. A DNL value of 65 dB is regarded as the level at which significant community reaction would be expected and about 14 percent of exposed population would be expected to be highly annoyed.

The noise contours generally depict the much greater use of the larger radii tracks by F-111D and SAC aircraft. Usage of the smaller radii tracks is primarily by other aircraft and does not create noise exposures greater than DNL 65 dB under current operating conditions.

The noise impact within these DNL contours has been estimated in terms of the enclosed land area, in square miles (irrespective of land use), and the number of residents estimated within the enclosed areas.

These noise impacts are summarized in Table 3.3.2-3. Thus, for current operating conditions at Melrose Range, the DNL 65 dB contour encloses 60 square miles of land area and 74 residents. About 20 of these residents would be expected to be highly annoyed by these aircraft noise exposures (based on the DNL versus annoyance relationship shown in Figure 3.1.2-2).

Table 3.3.2-2. Track Usage at Melrose Range by Specific Aircraft (Aircraft Passes Per Day)

AIRCRAFT TYPE	MELROSE RANGE TRACK 1D	2D	1N	2AN	2BN	3AN	3BN	3B1B	AIRCRAFT TOTAL
F-111D	0.0	0.0	0.0	0.0	0.0	33.6	33.6	0.0	67.2
FB-111	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2
A-7	16.9	5.7	1.9	0.9	0.6	0.9	0.6	0.0	27.5
F-18	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	1.2
A-6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.8
B-1B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
B-52G	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	1.6
F-16	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	1.2
F-4	1.2	0.4	0.1	0.1	0.0	0.1	0.0	0.0	1.9
Total	20.2	6.9	2.3	1.0	0.6	35.5	35.1	0.9	102.6

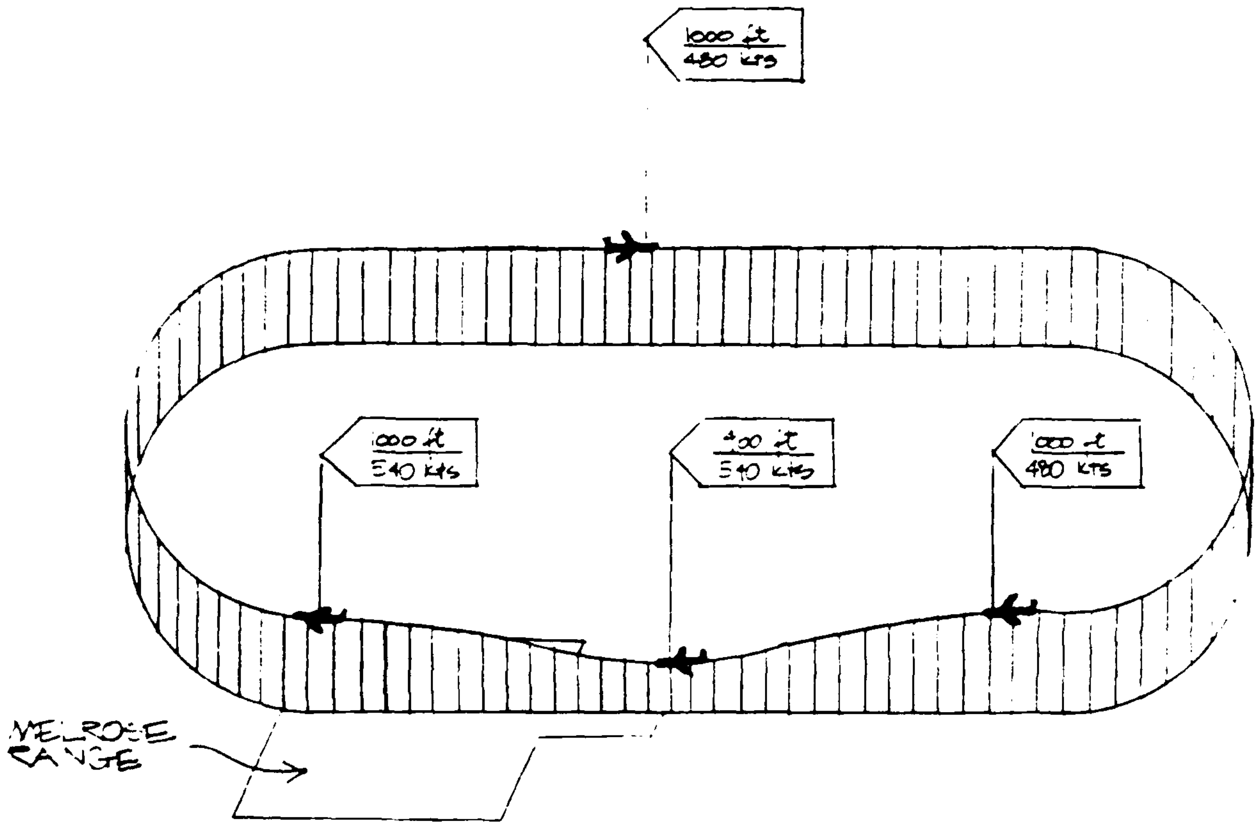


Figure 3.3.2-2. Typical Flight Pattern for SAC-Type Aircraft (Not to Scale)

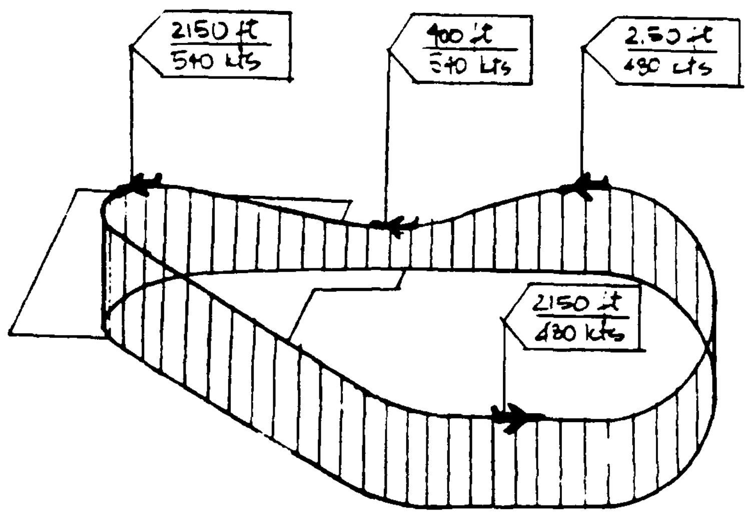


Figure 3.3.2-3. Typical Flight Pattern for Non-SAC-Type Aircraft (Not to Scale)

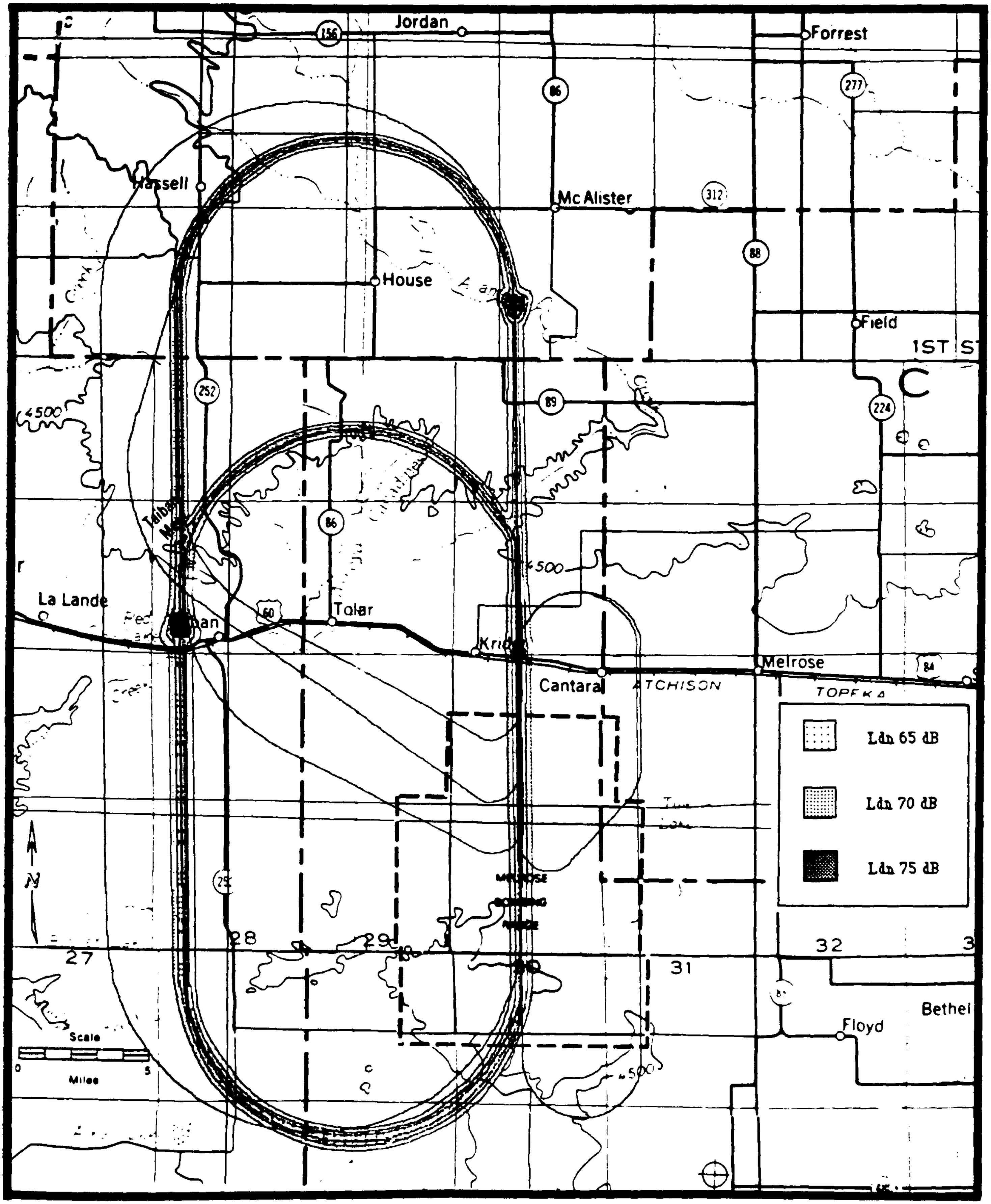


Figure 3.3.2-4. DNL Noise Contours for Melrose Range Under Current Operational Conditions

Table 3.3.2-3. Estimated Noise Impact Due to Melrose Range Aircraft Operations under Current Conditions

Noise Impact	DNL Contour Level, dB 65	70
Total Land Area (sq. miles)	60	30
Resident Population*	74	37

*Note: Based on count of number of residences multiplied by persons per household for Roosevelt County, 1985, from County and City Databook, 1988. Approximately 65 percent of the land area under the noise contours was sampled or viewed to identify residences. Residences in the remaining area under the contours were counted from the applicable U.S. Geological Survey Maps.

Sources: U.S. Geological Survey Maps, U.S. Geological Survey, 7 1/2 x 7 1/2 minutes, Scale 1:23,000, 1985. (Cunavea Basin, McAlister, House Hassell, Candy Mesa, Peach Canyon, House SE< Field SW, Taiban, Tocar, Kriper, Melrose W, Lomas Gatos, Tolar SW, Tolar SE, Watts Hill, Gammill Well, Gammill Well NE, Howell Ranch, and Rippee Ranch)

Bureau of the Census, U.S. Department of Commerce, 1988. County and City Databook, 1988.

3.3.2.2 Other Low-Altitude MTRs

The noise impact currently caused by low-altitude MTR aircraft flights to the Melrose Range is partially addressed in Section 3.2.2 for IR 107, VR 108, IR 109, and IR 111 which traverse the proposed MOA region. Six other low-altitude MTRs also terminate at the Melrose Range and are discussed herein relative to their noise impact. These routes and their current operations are described in Table 3.3.2-4 and are depicted in terms of geographic extent in Figure 1.2-2.

IR 113 traverses seven counties in New Mexico with a total route length of 333 statute miles. VR 100 and VR 125 are identical to each other, but in reverse directions and traverse six counties in New Mexico. The total route length is 365 statute miles. VR 1107 and VR 1195 are also identical to each other, but in reverse directions. The total route length of 278 statute miles crosses seven counties in New Mexico. VR 114 traverses three counties in New Mexico and four counties in Texas with a total route length of 198 statute miles. The standard deviation used for IR 113 was 0.5 miles, for VR 114 was 1.25 miles and for VR 100/125 and VR 1107/1195 was 2.5 miles.

The estimated noise impact of these routes is summarized in Table 3.3.2-5 for current aircraft operations. The land areas shown for each noise exposure DNL_{mr} level are those comprising the total length of the route multiplied by the width of the noise contour area across any segment of the flight track. The total area of the DNL_{mr} 65 dB contour therefore includes that of the DNL_{mr} 70 dB contour. The population estimates shown in Table 3.3.2-5 are based on rural population densities (residents per square mile) in each of the counties overflown by the route.

This analysis indicates that VR 1107 and 1195 have the largest amount of noise impact area and population of the six routes discussed here. The total noise impact of all six routes is estimated to cover about 2350 square miles of rural land area at noise exposure levels in excess of 65 dB DNL_{mr}. The corresponding resident populations are estimated to be about 3450 persons. About 960 of these residents would be expected to be "highly annoyed" by this noise exposure.

3.3.3 Water Resources

The Melrose Range is located within the Southern High Plains section of the High Plains physiographic province. The area is characterized by flat, featureless terrain with little or no relief with the exception of the escarpment and mesa occurring in the southwest corner of the Range. Elevations range from approximately 4200 feet msl to approximately 4600 feet msl. Surface drainage at the Range is poorly developed, which is typical of the South High Plains.

Soils at the Range consist primarily of sandy loam overlying a hard, low-permeability caliche layer occurring at various depths. Soil permeabilities range from 1×10^{-4} to 3.5×10^{-3} cm/sec (moderately permeable). The Range is underlain by

Table 3.3.2-4. Current Low-Level MTR Activity on IR 113, VR 100/125, VR 1107/1195, and VR 114

Information	Low-Level Military Training Route			
	IR 113	VR 100/125	VR 1107/1195	VR 114
Route Length (Miles)	333	365	278	198
Average Monthly Sorties	100.0	21.0	183.3	100.0
Most Active Month Sorties	160.0	34	293	160
Ratio (Most Active/Average)	1.6	1.6	1.6	1.6
F-111 Use (%)	100	100	0	100
Other Users			A-7 (90%)	

No nighttime operations (2200 hours to 0700 hours) on these routes.

Table 3.3.2-5. Noise Impact Due to Current (1988-89) Low-Level MTR Operations on IR113, VR100/125, VR1107/1195 and VR114

Noise Impact	DNL_{mr}* (dB)	Low-Level Military Training Route IR 113	VR 100/125	VR 1107 /1195	VR 114	Total
Land Area Within Noise Contour (sq. miles)	65	399	0	1716	238	2353
	70	0	0	0	0	0
Resident Population[1] Within Noise Contour	65	463	0	2616	369	3448
	70	0	0	0	0	0

[1] Based on rural population densities in each impacted county.

* For IR 113 and VR 114 the contours fall within 0.6 mile of the track centerline. For VR 1107/1195 the contour falls within 3.1 miles of the track centerline.

approximately 200 to 400 feet of unconsolidated sediments deposited over a sandstone known as the Triassic red beds. This stratum forms the base of the aquifer, which is developed within the overlying sediments.

The Range lies at the western boundary of the High Plains Aquifer developed within the Ogallala Formation. This regionally significant aquifer wedges out against the escarpment of the mesa occurring in the southwest corner of the Range. The saturated thickness of the aquifer is less than 100 feet where it occurs below the Range. Groundwater movement is from the southwest to the northeast across the Range. Water quality within the Ogallala at the Melrose Range is typical of the High Plains Aquifer, the water being hard and somewhat high in fluoride and silica (CH_2M Hill, 1983). Potable water is supplied by an onsite water well and receives chlorination by a hypochlorinator. A septic tank/drainfield system is used for the disposal of domestic sewage.

3.3.4 Socioeconomics

Resident population within the Melrose Range DNL 65 dB noise contour is estimated to be 56 persons. Details of this distribution and the estimated population underneath the Melrose Range MTRs are included in the discussion of the noise environment in the vicinity of Melrose Range, Section 3.3.2.

3.3.5 Airspace Management and Land Use

3.3.5.1 Airspace Management

The Melrose Range is located within restricted area R-5104A. Area R-5104A is a subpart of Area R-5104 which also contains R-5104B. These Restricted Areas are located 20 statute miles west of Cannon AFB (see Figure 3.1.5-2). R-5104A extends from the surface to 18,000 feet MSL. R-5104B extends from 18,000 feet MSL to 23,000 feet MSL. R-5105 extends from the surface to 10,000 feet MSL. These areas provide restricted airspace for flight maneuvers to Melrose Range, which is contained within R-5104A. This range, which occupies 77,190 acres, is used primarily for air-to-ground weapons delivery using inert, nonexplosive ordnance. Small ground-to-air inert smoke rockets are also used for visual acquisition by military flight crews. The range is approved for rocket firing; however, no such operations have occurred there within the last three years. Over 5700 annual sorties are conducted within the Melrose Range/Restricted Areas by Cannon AFB and other users. This complex is normally scheduled from 0700 hours to 2200 hours Monday through Thursday, and 0700 hours to 1800 hours on Fridays for an average of 150 hours a month.

3.3.5.2 Land Use

The Melrose Range was expanded from 22,120 acres to 77,190 acres in 1986. This acreage consists of 71,992 acres located in Roosevelt County, New Mexico, and 5198 acres located in Curry County, New Mexico. Of the 55,000 acres that were added to the Range, 16,040 acres were owned by the State of New Mexico, 48 acres were owned by the Bureau of Land Management, and the remaining 38,912 acres were privately owned.

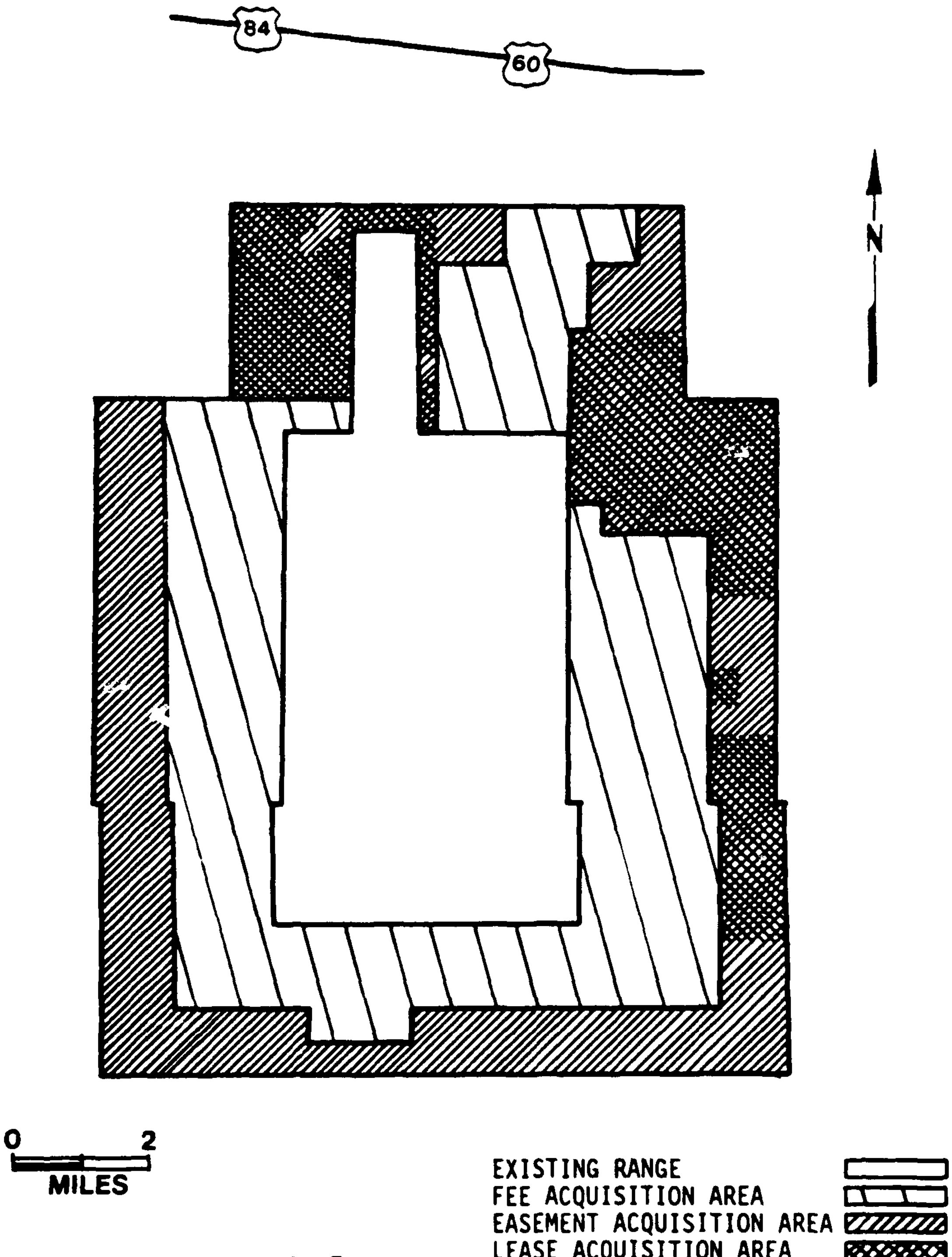
When the 55,000 acres were added to the Base, 27,760 acres were purchased outright (23,280 acres privately owned, 4480 acres state owned). Adding the expansion acreage to the original range acreage (22,120) brings the total acreage controlled by the U.S. Air Force to 49,880 acres. The 15,680 acres (15,632 acres privately owned, 48 acres publicly owned) were given a restrictive easement, which means that the U.S. Air Force purchased minimal rights with the intent of limiting use of the property to cattle grazing or gas/oil exploration or extraction. In addition, structures are limited to 100 feet in height and to minimal building for cattle grazing, farming, and mineral exploration/extraction activities. The State of New Mexico owns both the surface and mineral rights to 11,560 acres, with the Air Force acquiring a lease for those acres. These lands are sub-leased for grazing wherever possible (see Figure 3.3.5-1).

Most of the land that is in the easement or is leased is used for agricultural purposes, primarily cattle grazing. Some crops are grown on the range, primarily in the northern section of the range. In the Range, the Air Force wants to convert croplands to grasslands over the next 5-10 years. The Air Force is currently working with the State of New Mexico in a land swap for state-owned lands in the Range. Table 3.3.5-1 gives a breakdown of agricultural activities in the expansion area before the land was added to the Range. A range support facility near the center of the Range houses a fire station, maintenance area, TV camera station for monitoring ordnance practices, and other support facilities.

Most of the land surrounding the Range is used for agricultural purposes, primarily cattle grazing and crop growing. The majority of crop growing is to the east of the Range. The small community of Taiban and several scattered residences are located under the area that is subject to noise (see Section 3.2.2).

The MTRs associated with the Melrose Range (VR 100, VR 114, VR 125, VR 1107, VR 1195, and IR 113) are mainly located over land used for agricultural purposes, primarily cattle grazing. There are scattered irrigated and dryland crop growing lands throughout the area. The average farm size in the counties below the MTRs is over 1000 acres, creating a sparsely populated area. Small towns scattered throughout the area offer household goods and agricultural support products.

According to the defined distances from the centerline of the MTRs to be used for analysis (see Section 3.3.2.2), several of the routes fly over recreation areas. VR 100 and VR 125 fly over the Sumner Lake State Park, Bitter Lake National Wildlife Refuge, the Cibola and Lincoln National Forests, and Gran Quivira National Monument.



Source. Department of the Air Force
Tactical Air Command, 1985

Figure 3.3.5-1. Melrose Bombing Range Boundaries (With Defined Areas for Easement and Lease Restrictions)

Table 3.3.5-1. Agricultural Activities in Melrose Bombing Range Expansion Area Before the Land was Added to the Range

	Curry County Acres	Roosevelt County Acres
Dryland Farming	0	2,500
Irrigated Farming	640	2,860
Private Rangeland	878	36,622
Lease Rangeland (state)	3,680	7,820
Total	5,198	49,802

The Sumner Lake State Park is located on a reservoir that offers several water-oriented activities such as boating, waterskiing, swimming, and fishing. A boat ramp and marina are located on the lake. Other activities include camping and picnicking. Bitter Lake National Wildlife Refuge has a large concentration of waterfowl.

VR 100/VR 125 is also located over the Mountainair Ranger District of the Cibola National Forest. The main activities in this area include camping at a 5-site campground and hunting. These routes are also over the Smoky Bear Ranger District in the Lincoln National Forest. Included in this area is the Capitan Mountains Wilderness Area, which was founded in 1950. The main activities in this district include snow skiing, camping, picnicking, hunting, fishing, and hiking.

The Gran Quivira National Monument is part of the Salinas Pueblo Missions National Monument. Two Spanish churches from the 1600s and Pueblo Indian artifacts are the main attractions at Gran Quivira. Other activities include visiting the visitor center and picnicking.

IR 113 is also over the Lincoln and Cibola National Forests, Gran Quivira National Monument, Bitter Lake National Wildlife Refuge, and Sumner Lake State Park. VR 1107 avoidances and VR 1195 are over the Cibola National Forest. Section 3.1.5 describes lateral and raised flight floors over recreation areas, ranches, and towns.

3.3.6 Biological Resources

3.3.6.1 Plant Resources

The plant resources on Melrose Range and under the associated MTRs are similar to those present around Cannon AFB. See Section 3.1.6.1 for a description of vegetation on the Base. In general, the range is lacking in plant and habitat diversity. Vegetation consists mainly of short grass plains interspersed with low mesas. A sandhill area is located at the northernmost boundary and is dominated by an association of sand sagebrush and bluestem grasses.

Although the natural vegetation is essentially the same over the Range, the area has been differentiated by mission activities into three management zones for plants and wildlife (Cannon Air Force Base, 1985):

(1) Target Zone (4951 acres) - because of saturation with ordnance, this area is permanently closed to ground access and to any form of land management other than controlled burning.

(2) Critical Safety Zone (4951 acres) - ground access to trained and authorized personnel is permitted, and some land management may be performed, although general access is not permissible.

(3) Buffer Zone (17,162 acres) - greatly reduced mission and safety constraints in this area permit a more general development and management of vegetation for the wildlife resource.

In general, Melrose Range is managed only to maintain and enhance a good natural grassland habitat that supports a viable and diversified population of cattle, game, and non-game species. Vegetation, except within the impact area, will be maintained in a vigorous and healthy condition. Sufficient ground cover is left in place to assure that wildlife needs are met outside the impact area. To accomplish this, cattle on the range are moved periodically to different areas to prevent overgrazing. Also, since shrubby vegetation is generally scarce and its presence highly beneficial to upland and non-game bird species, native or American wild plum has been established in the sandhill area in the northern part of the range.

The only biologically sensitive area under the MTRs associated with the Melrose Range is a portion of IR 113, which is located near the Bitter Lake National Wildlife Refuge, northeast of Roswell, where there is a heavy concentration of wild fowl.

3.3.6.2 Wildlife Resources

The wildlife resources on the Melrose Range are similar to those present around Cannon AFB. See Section 3.1.6 for a description of wildlife around the Base. To maximize wildlife use and grazing on the Range and still accomplish mission objectives, a Wildlife Management Plan for the Range has been adopted (Cannon Air Force Base, 1985). The objectives of the plan are as follows:

(1) To develop and maintain wildlife populations in a diverse and productive condition.

(2) To protect and conserve threatened and endangered wildlife species.

(3) To give wildlife habitat needs preference over competitive uses when not in conflict with military missions.

(4) To manage fish and wildlife habitats so that artificial stocking and predator control serve only minor roles in the management scheme.

Certain portions of the Melrose Range have been leased to local cattle producers for grazing purposes. Grazing is regulated by an established grazing plan designed to protect the ecosystem, yet provide optimum beef production.

3.3.7 Native American Values and Archaeological, Cultural, and Historical Resources

3.3.7.1 Native American Values

The discussion presented in Section 3.1.7.1 also applies to the Native American value aspects relevant to the Melrose Range.

3.3.7.2 Archaeological, Cultural, and Historical Resources

The Melrose Range and surrounding areas have been used by man for many millennia. Paleo-Indians hunted in the Llano Estacado as long as 10,000 years ago. A famous Paleo-Indian site, the Clovis site, lies east, outside of the Range along Blackwater Draw. Blackwater Draw crosses the northern edge of the range. Later, a variety of Native American groups exploited the region. During the historic period, Native American, Spanish, and Euro-American traders and settlers traveled the Jim Stinson/Comanchero Trail. This trail crosses the northern portion of the Melrose Range.

Numerous cultural resource surveys have been conducted in and near the Melrose Range. These have looked at a only small part of the Range. The most recent major study was a survey and test excavation project funded by the Air Force (Mariah Associates, 1988). This project assessed impacts to cultural resources from Range expansion and provided guidance for managing those impacts.

Since the whole Range could not be examined in detail, the Mariah survey sampled a representative 12.9 percent (9940 acres) of the expansion area. Sixty-two sites and 195 isolated occurrences were located. Analyses of these sites show that the Melrose Range area has been used from Folsom to historic homestead times, a span of over 10,000 years. During prehistoric periods, a wide variety of hunting and gathering groups used the area. Sites are mainly found near the edge of the Llano Estacado, in dune deposits in valleys, along ephemeral arroyos and channels, and adjacent to playa lakes. The Jim Stinson/Comanchero Trail passed by these playa lakes, which provided fresh water. Intensive historic settlement on the Range occurred during the late 1800s. Droughts and the 1930s Depression greatly reduced the number of settlers. One historic site is the Boys Ranch Property. This complex was known as the Old Hart Headquarters in homesteading times. The property is adjacent to the present range (Williams, 1989, personal communication). Another historic property is the Greathouse Ranch in the southeastern corner of the Range.

Sites located during the Mariah study were also evaluated for their research potential. Sites with significant research potential are eligible for listing on the NRHP. Of 62 sites considered, 19 demonstrated significant research potential, 6 had only minor research potential, and 37 required further investigation to determine their significance.

3.3.8 Solid Wastes, Hazardous Wastes, and Hazardous Materials

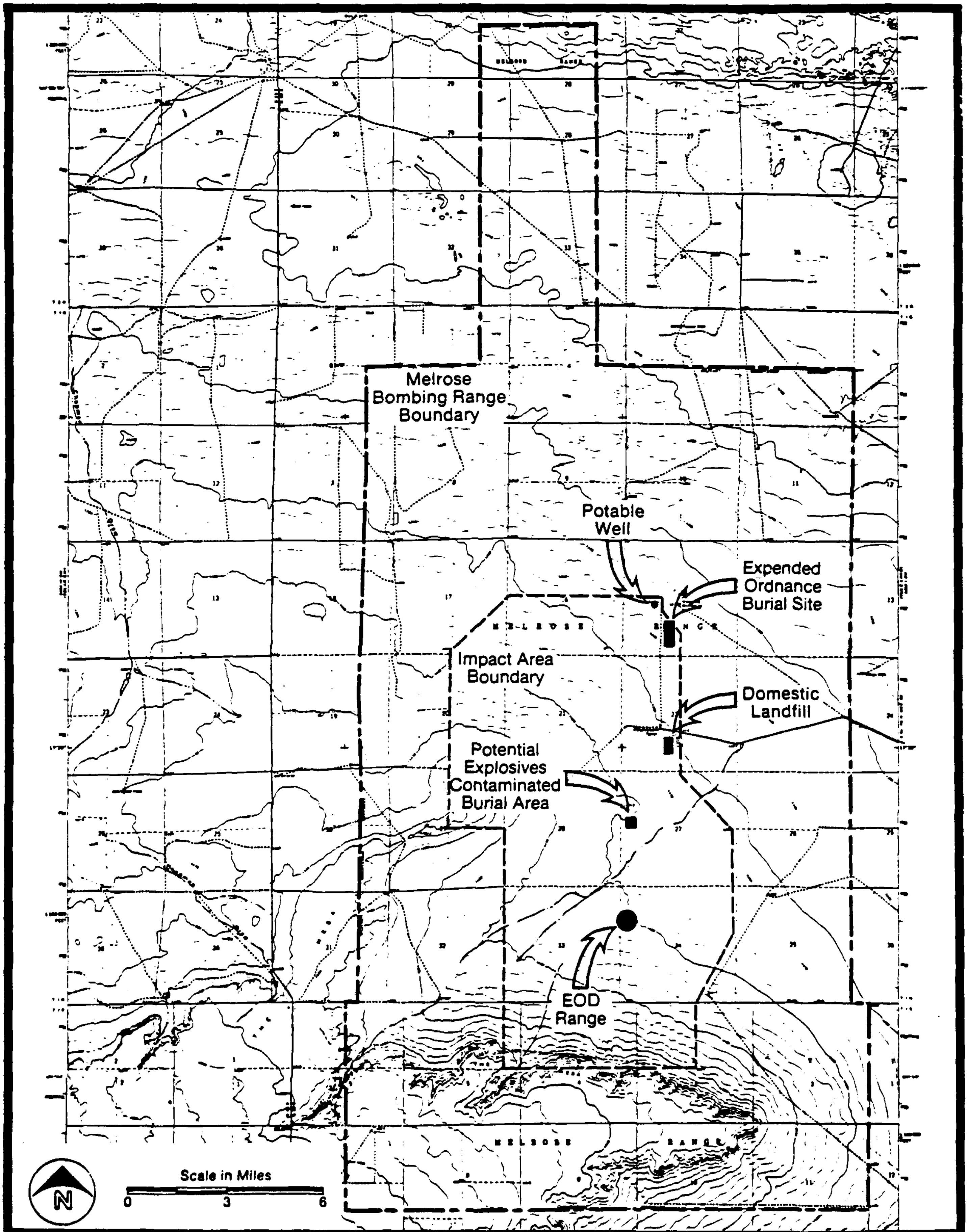
The Melrose Range is comprised of approximately 77,000 acres and provides aircrew training opportunity in ordnance delivery. In engaging targets on the Range complex, aircraft deploy a variety of ordnance, including the following:

- Bullets
- Bombs, with various wing-fin configurations and seeker heads. (Most bombs are small, light practice models that duplicate the flight characteristics of various real bombs. They contain only a smoke charge, comparable to a shotgun shell, to allow observers to see where they hit. Less frequently, full-size, concrete-filled inert copies of real bombs are used. These allow aircrews to experience the feel and handling characteristics of a fully loaded, combat-ready aircraft).
- Parachute flares. (Parachute flares would be used for illumination of targets at night)
- Rockets
- Air-to-surface missiles
- Self-protection chaff

The use (delivery) of this ordnance produces waste which must be disposed of. The waste consists of concrete, cast iron, steel, tin, aluminum, and synthetic materials (from parachutes). The ordnance delivered during training is recovered and disposed of by Explosive Ordnance Disposal (EOD) personnel. The only hazardous (explosive safety) materials are the dud (unexploded) smoke charges which are disposed of by EOD teams. The munitions are collected, with dud smoke-charged ones having the smoke charge destroyed by EOD personnel.

The remaining inert waste is placed with the additional spent ordnance and buried at the Expended Ordnance Burial site (see Figure 3.3.8-1). One active, one recently deactivated, and six closed expended ordnance burial pits have been identified (CH_2M Hill, 1983), all of which are located in one area known as the Expended Ordnance Burial site. The locations of the EOD detonation and burning range and the Expended Ordnance Burial site are shown on Figure 3.3.8-1.

The Expended Ordnance Burial site receives primarily scrap metal from practice bombs and munitions picked up during range clean-ups and residue from EOD detonation and burning operations. Range clean-ups are performed monthly, yearly, and every 5 years. Approximately 12,000 to 15,000 pounds of scrap metal are collected and disposed of at the burial site on a monthly basis. EOD activities, which include detonation and burning of any unexploded practice munitions, are conducted on a monthly basis.



Adapted from Cannon AFB, August 1983

Figure 3.3.8-1. Site Map of Melrose Bombing Range

Twenty to 30 pounds are detonated on a routine basis. The residue from the EOD activities is collected and disposed of at the Expended Ordnance Burial site. Each pit at the burial site is approximately 15 to 20 feet deep, 20 feet wide, and 150 feet long. With the exception of small spotting charges, continuing disposal of actual explosive materials does not occur. However, the U.S. Air Force conducted a historical survey of range records and identified two areas as potential explosives-contaminated burial areas. These areas are identified on Figure 3.3.8-1. One of the areas is where the closed Expended Ordnance Burial pit (previously discussed) is located. The other area may also be an old expended ordnance burial pit which has been closed for a long period. The burial sites, especially the closed sites, may contain hazardous unexploded ordnance.

EOD teams will clear approximately 1600 acres in a typical year and collect approximately 160 tons of spent munitions (EOD Annual Report). A small portion of the practice ordnance is shattered or buried on impact and is never recovered. Outdated or damaged explosive materials have been transported to the Melrose Range for disposal. The explosives (shells, igniters, smoke grenades, flares) require disposal because the shelf life of the material(s) has expired or due to damage to the package. The waste explosives are destroyed by EOD personnel in the thermal treatment pit by burning. This pit is regulated under RCRA, and is included in the RCRA Part B permit application (Hazardous Materials Technical Center, Final Report, September 1987). Domestic garbage and solid waste from Range support activities are disposed of in an onsite landfill. A septic tank and drainfield system is used for the disposal of domestic sewage.

CHAPTER 4.0 - ENVIRONMENTAL CONSEQUENCES

This chapter forms the scientific and analytical basis for the discussion of the environmental impacts of the action. It discusses the environmental effects associated with the action. The relationship between the uses of the environment and the maintenance and enhancement of long-term productivity are discussed in terms of commitments and resources. Parallel to Chapter 3.0, this chapter addresses the environmental consequences of the Cannon Air Force Base realignment, the proposed creation of the Mount Dora Military Operations Area, and the proposed additional use of the Melrose Range.

4.1 ENVIRONMENTAL CONSEQUENCES FOR THE BASE AREA

No significant environmental impacts are expected to be associated with increases in aircraft and personnel at Cannon AFB. Moderate increases in noise impacts are expected. Short-term socioeconomic impacts are expected, principally as a result of increased demand for housing and public services. New housing construction is expected to mitigate housing shortage impacts. Impacts on schools will be addressed by the AF working with OEA.

4.1.1 Air Quality and Meteorology

This section addresses the impacts of the action on baseline air quality. The changes in air quality that will occur as a function of changes in mission at the Base are presented and compared to applicable air quality standards. The expected impacts to air quality resulting from the action are insignificant. Air quality in the vicinity of Cannon AFB is expected to remain in attainment with all applicable state and national standards.

The realignment of Cannon AFB will impact air quality in the vicinity, due primarily to emissions from increases in the following activities:

- aircraft ground operations including runups
- heating and power production
- fuel storage, transfers, and spills
- surface coating
- aircraft flying operations
- Aerospace Ground Equipment (AGE)
- diesel fuel combustion
- motor vehicles
- base construction

Emissions due to these increased activities are summarized in Table 4.1.1-1, and are compared to the current Cannon AFB emission level by listing percentage increases where appropriate. Aircraft ground support activities include routine maintenance, machining, surface coating, refurbishing, aerospace ground equipment testing, and fuel storage/ handling. This includes losses due to fuel transfer operations. The projected increases in these emissions was calculated by using a ratio of the number of incoming F-111s to the current number of F-111s. An increase in flight operations will also result in an emissions increase. These emissions were calculated based on information supplied by Cannon AFB concerning the expected increase in the number of sorties. Additional Base personnel and a general increase in Base activities will result in increased vehicular emissions as well as increased emissions from heat and power production. Using AP-42 and conservative estimates of the number of vehicles expected and modes of operation, maximum 1-hour emissions were projected (see Table 4.1.1-2).

Extensive military construction is scheduled during FY90-92. The principal pollutant generated will be fugitive dust from activities such as water well drilling, soil excavation, loading, and hauling. Current projections call for approximately 12 construction projects during FY90 that involve soil excavation and handling. The fugitive emission levels given in Table 4.1.1-2 were estimated based on the cumulative area of the projects and a general construction emission factor listed in AP-42.

To estimate the impact of the total emissions given in Table 4.1.1-2 on ambient air in and around Cannon AFB, a simple open box model was used. The box width was 1500 meters, which is characteristic of the dimension over which the activities are distributed. The conservatively chosen box height was 300 meters, which is the lowest mean seasonal mixing height of the area (Holtzworth, 1972). In this application of the box model, a conservative wind speed (2.5 meters per second) was assigned to the box length. Assuming uniform concentrations of pollutants within the box, the concentration at the downwind end of the box was equal to: source strength (grams per second) divided by the product of box width (meters), box height (meters), and wind speed (meters per second). The resulting concentrations, as shown in Table 4.1.1-2, are low in comparison to National Ambient Air Quality Standards (NAAQS) or New Mexico Standards. National and state air quality standards for CO, NO_2, TSP, and SO_2 are based on averaging time periods that range from 3 hours to 1 year. Although jet engines emit low levels of hydrocarbons, there are no comparable NAAQS for hydrocarbons. Overall air quality impacts from the realignment would be less than those listed in Table 4.1.1-2 due to the intermittent nature of the flight activities.

This Cannon AFB area is in attainment with NAAQS for all criteria pollutants. The additional impacts of on-Base construction, increased vehicle use, aircraft refueling, and maintenance resulting from the action are expected to be minor; therefore, air quality in the Cannon AFB region should remain in attainment with all applicable standards.

Table 4.1.1-1. Increased AFB Emissions

Stationary Sources Activity	Pollutants (TPY)[1] CO	NMHC[2]	NO_x	TSP	SO_x
Aircraft Ground Ops	12.8	4.06	8.79	0.47	2.05
Heating & Power Prod.	6.77	0.59	33.0	0.49	0.43
Fuel Storage, Transfers, & Spills		45.4			
Surface Coating		15.9			
Base construction				72	
Fire Fighting Training	---	---	---	---	---
Subtotal	19.57	66.0	41.8	73.0	2.48

Non-Stationary Sources Activity	Pollutants (TPY) CO	NMHC	NO_x	TSP	SO_x
Aircraft Flying Ops.	340	118	118	1.78	16.2
AGE	32.9	4.98	62.8	4.48	0.90
Diesel Fuel Combustion	10.6	1.69	7.68	0.47	1.03
Motor Vehicles	272	29.4	29.1	3.87	1.18
Subtotal	656	154	217	10.6	19.3
TOTAL	676	220	259	11.5	21.8
Percent Increase	78%	74%	74%	66%	73%

Note: These increased emissions are based on data supplied by the Bio-Environmental Division of Cannon AFB.

[1] TPY - Tons Per year
[2] NMHC - Nonmethane hydrocarbons

Table 4.1.1-2. Emissions Increase Due to the Proposed Action ($\mu g/m^3$)

	CO	NMHC	NO_x	TSP	SO_x
Aircraft Ground Operation	0.37	0.12	0.25	0.01	0.06
Heating and Power Production	0.19	0.02	0.95	0.01	0.01
Fuel Storage, Transfers, and Spills		1.31			
Surface Coating		0.46			
Fire Fighting Training (See Notes below)					
Aircraft Flying Operation	43.0	15.0	15.0	0.22	2.04
AGE	1.89	0.29	3.60	0.26	0.05
Dual Fuel Combustion	0.61	0.1	0.44	0.03	0.06
Motor Vehicles (Privately owned)	15.6	1.69	1.67	0.22	0.07
Base Construction Activities				29	
Total Increase from the Proposed Action	61.6	18.9	21.9	30.0	2.3

Notes:

1. These emissions are based on data supplied by the Bio-Environmental Division of Cannon AFB.
2. Emissions from fire fighting training activities decreased substantially from 1987 to 1988.

Table 4.1.1-2. Emissions Increase Due to the Proposed Action ($\mu g/m^3$) (Continued)

Comparison of Ambient Air Standards with Emissions from F-111G Aircraft

Pollutant	Averaging Period	Standard State	Standard Federal	Ambient Concentrations
TSP	24 hour primary	none	260 ug/m^3	14.9 ug/m^3
	24 hour secondary	150 ug/m^3	150 ug/m^3	14.9 ug/m^3
SO_2	24 hour	265 ug/m^3	365 ug/m^3	1.1 ug/m^3
	3 hour	none	1300 ug/m^3	1.6 ug/m^3
NO_x	24 hour	200 ug/m^3	none	11 *ug/m^3
CO	8 hour	9.7 mg/m^3	10 mg/m^3	38 ug/m^3
	1 hour	15 mg/m^3	40 mg/m^3	55 ug/m^3
HC	1 hour	NA	NA	17 ug/m^3

* Assumed 100% conversion of NO_x to NO_2 (worst case).

The New Mexico Air Quality Improvement Board requires that construction and operating permits be obtained for any stationary source of a regulated pollutant if the actual emissions rate exceeds ten pounds per hour or if the potential emissions rate exceeds 100 pounds per hour. Toxic emissions are strictly regulated, and allowable emissions of toxic pollutants are listed individually by compound in Appendix A of the New Mexico Air Regulations. Based on the current emissions inventory supplied by the Bio-Environmental Division of Cannon AFB, there are no significant sources of toxic emission on the Base.

Facilities such as new fuel storage tanks, painting and/or coating operations which use volatile paints and coatings, and fossil-fuel-fired boiler plans are among those that may require permits, depending on the facility size and emissions level. As shown in Table 4.1.1-1, the surface coating activities at the Base will result in 15.9 tons per year. This value corresponds to an actual emissions rate of approximately 16 pounds per hour (based on 2000 hours per year operation). Permitting may be required for surface coating activities even though multiple facilities are used. Table 4.1.1-1 shows a non-methane hydrocarbon emission of 45.4 tons per year due to fuel storage, transfer and spills. This corresponds to an actual emission rate of approximately 10.4 pounds per hour (based on 8760 hours per year operation). Modifications to existing permitting will be required.

Neither the New Mexico Air Quality Improvement Board or the EPA have established regulations which require that air quality permits be obtained for military aircraft operations. Emissions from military aircraft may be tracked via a regional or state emissions inventory, but permits are not necessary at this time.

4.1.2 Aircraft Noise

The impacts to baseline noise levels due to the increased subsonic flights activity at the Base that would be expected to occur if the action is adopted are addressed. The increase in aircraft is evaluated in terms of timing, duration, and overall noise. The change in the number of off-Base "highly annoyed" people expected as a result of the action is from 88 to 118.

The action would cause an increase in long-term noise exposures around Cannon AFB, due primarily to the additional flight and engine-test operations of the relocated F-111G aircraft. Other short-term and long-term noise impacts would be caused by the construction of new facilities on the Base and the inevitable increase in road traffic due to additional personnel at the Base. These latter noise impacts would not be significant in residential community areas relative to noise impacts caused by aircraft operations.

The additional noise impact due to aircraft operations of the action has been analyzed by incorporating the aircraft movement data for the F-111G aircraft into the NOISEMAP data base used to evaluate existing noise conditions (Section 3.1.2). The additional aircraft operations would comprise 8000 sorties per year by 48 F-111G aircraft at the Base. This would amount to an additional 30 sorties on an average busy day, each consisting of a takeoff and landing with additional closed pattern training go-arounds of about 154 per day. These operations have been modeled, for noise analysis purposes, as equivalent in noise level to FB-111 aircraft.

Table 4.1.2-1 shows the result of the action in terms of additional operations on each of the Cannon AFB runways. The additional aircraft operations have been distributed, for analysis purposes, among all of the existing flight tracks at Cannon AFB in an identical manner as those for the current F-111D aircraft at the Base. The resulting noise contours for the combined noise environment of the existing and future aircraft activity are shown in Figure 4.1.2-1. These noise contours differ from those for current conditions in that the additional flight activity has increased DNL noise exposure levels to above 65 dB over the farthest southwest (closed-loop) pattern used by the aircraft and also increased DNL values and exposed land areas around the Base. These additional noise impacts are summarized in Table 4.1.2-2 which includes a comparison with current conditions. The increases in contour sizes are primarily due to the added number of operations on each flight track, which is an approximate doubling of the current activity. This increase noise exposures by about 3 dB and therefore the previous (current) DNL 65 dB contour would become 68 dB. The new DNL 65 dB contour is for each flight track is therefore wider than that for current operations. In terms of noise-exposed land areas, the action would cause an increase in the land area within the DNL 65 dB from about 99 square miles to about 137 square miles, this land being predominantly agricultural.

Surveys of dwelling units within the noise contours indicate that the action would cause an additional 33 units to be within the expanded DNL 65 dB contour with an associated increase of 89 occupants within this contour. At the higher DNL contour levels, the increase in noise-exposed dwelling units would be 27 within the DNL 70 dB contour, seven within the DNL 75 dB contour, and two within the DNL 80 dB contour. These increases are caused by the modified noise contours expanding and lengthening to the north of Cannon AFB and beyond Route 60. The two dwellings within the future DNL 80 dB contour are mobile home/trailer units, and most within the DNL 75 dB contour are of similar construction. As in previous tabulations of noise impact, the land areas and populations listed for each DNL contour are the totals for the entire enclosed area, inclusive of those at higher DNL levels. Of the 452 persons who reside within the extended DNL 65 dB contour, about 118 persons would be expected to be "highly annoyed." This is an increase of 30 persons relative to current conditions at the Base. These exposed residents would experience an increase in the number of noise events during a typical busy day at Cannon AFB rather than be exposed to aircraft noise for the first time.

On-Base residents would also experience an increase in noise exposure due to the increased flight activity. Whereas about 1320 persons are currently exposed to noise levels between DNL 65 dB and 70 dB on the Base, this number would increase to about 1700 within the modified DNL 65 dB contour and 138 persons within the modified DNL 70 dB contour. Such noise exposures are common to on-Base residents of military air fields and would not therefore be considered as a significant noise impact.

Table 4.1.2-1. Average Busy-Day Operations on Cannon AFB Runways, Including Realigned Aircraft

Aircraft	Runway 04 D/A[1]	Runway 04 CP[2]	Runway 22 D/A	Runway 22 CP	Runway 13 D/A	Runway 13 CP	Runway 31 D/A	Runway 31 CP	Total ops.
F-111	14.6	37.6	35.3	94.0	3.6	6.2	7.9	19.6	218.8
T-38	9.2	8.3	31.9	2.8	1.9	1.7	4.8	4.3	64.9
A-4	2.2	1.3	4.1	3.3	0.4	0.3	1.2	0.7	13.5
F-14	0.4	0.2	6.9	4.8	0.0	0.0	0.0	0.0	12.3
F-4	2.0	0.4	4.7	1.0	0.4	0.1	1.0	0.2	9.8
T-37	1.5	1.0	4.9	0.0	0.3	0.2	0.9	0.5	9.3
Other	3.6	0.5	14.4	2.0	0.1	0.1	0.3	0.1	21.1
Realigned FB-111	14.3	36.7	34.5	91.7	3.5	6.0	7.8	19.2	213.7
TOTAL	47.8	86.0	136.7	199.6	10.2	14.6	23.9	44.6	563.4

Notes:
1. D/A is the total number (sum of departures and arrivals) using the runway.
2. CP is the total number of closed pattern operations using the runway.

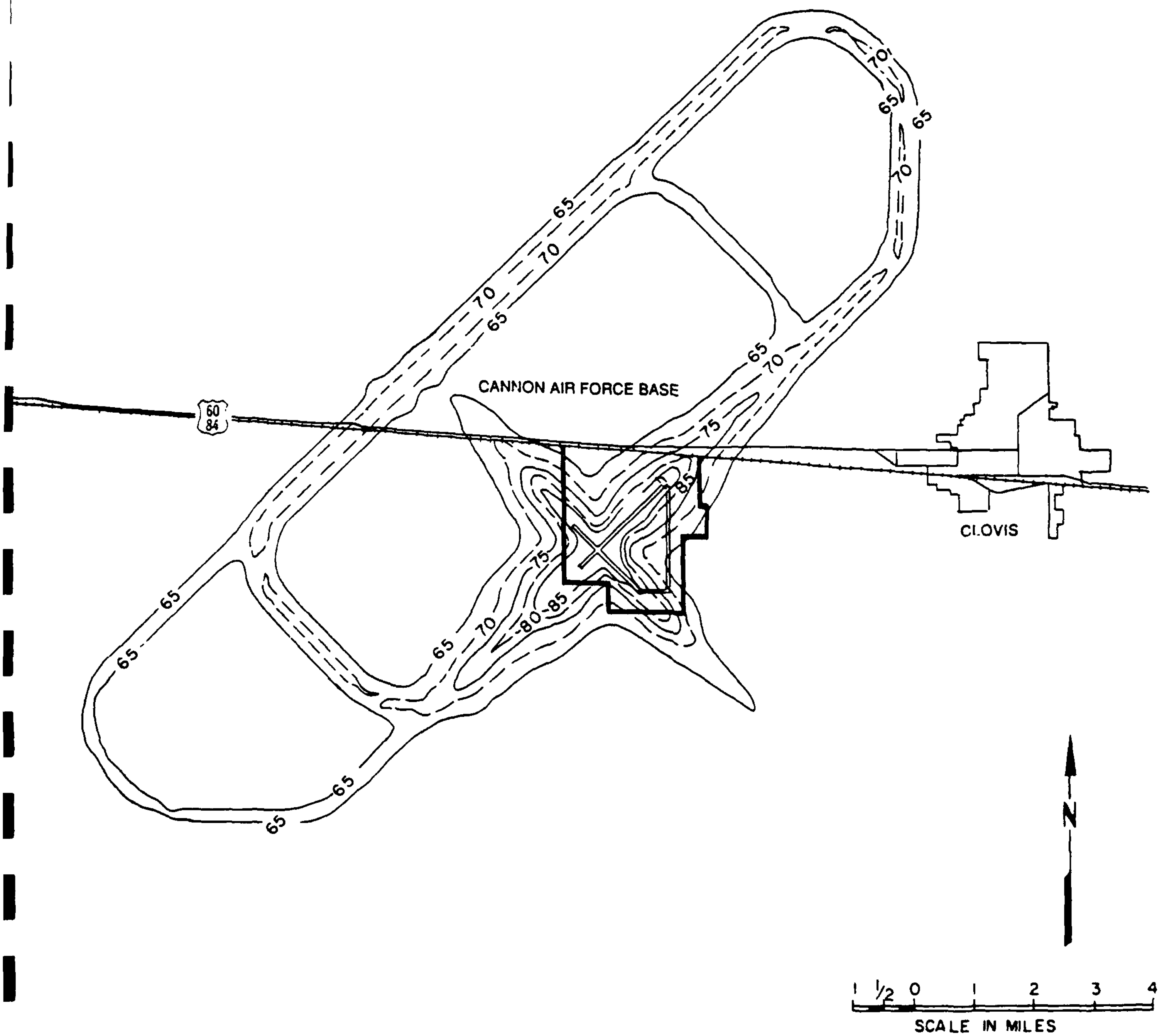


Figure 4.1.2-1. Noise Contours for Existing and Future Aircraft Activity

Table 4.1.2-2. Land Use Within Cannon AFB Noise Contours (Including Realigned F-111G Aircraft)

Land Use Impacted	Day-Night Average Sound Level, DNL (dB)			
	80	75	70	65
Total Land Area (sq. mi.)[1]	13.7	24.3	58.6	137.3
Land Area Increase (sq. mi.)	2.3	3.8	23.5	38.5
No. of Dwellings Within Contour				
Outside Base Expected	2	16	70	170
Outside Base Increase	2	7	27	33
No. of Residents[2] Within Contour				
Outside Base Expected	5	47	187	452
Outside Base Increase	5	23	73	89
Within Base Expected	0	0	138	1703
Within Base Increase	0	0	138	380
Percent of Land Area Within Contour				
Residential	0	<1	2	<3
Commercial	0	<1	<1	<1
Agricultural	(100)	(98)	97	96

Note: All increases are relative to CY1988 noise impacts (i.e., the current operations level).

1 Includes Cannon AFB Land Area of 5.9 square miles.
2 Based on count of number of dwellings multiplied by persons per household for Curry County, from Bureau of Census, 1988, City and County Databook.

Sources: Bureau of Census, 1988. City and County Databook, U.S. Deparment of Commerce.
Cannon AFB, New Mexico, 1988. Economic Resource Impact Statement (ERIS).

Single event noise levels for the FB-111 (F-111G) aircraft are tabulated in Table 4.1.2-3. These noise levels are slightly less during landings and afterburner takeoffs than those of the F-111D currently at Cannon AFB, but their noise intrusion in terms of speech interference is approximately equivalent. The increase in noise impact by the action would therefore be due to the increase (approximate doubling) of the flight operations at Cannon AFB.

In summary, the result of the action would be to expand the area of noise impact around Cannon AFB and thereby include more dwellings and residents in the noise impact areas. This additional impact would be notable by the increased number of overflights (noise events) rather than by an increase of each single event noise level.

Noise mitigation could be applied to this future scenario by:

a. Controlling the development of further residential uses within the DNL 65 dB noise contours.

b. Purchase and removal of dwellings within the DNL 75 dB contour which are normally assessed as being unacceptable land uses.

c. Application of sound insulation to other permanent dwellings within the highest noise impact areas. This method of noise mitigation is not applicable to mobile homes/trailer units due to limitations in the structural (load bearing) strength of such structures.

d. Modification of closed-loop traffic patterns around Cannon AFB, if necessary, to avoid established farms and ranch homes in the rural areas.

4.1.3 Water Resources

The realignment is not anticipated to have any significant effect on water quality in the vicinity of Cannon AFB or surrounding communities.

4.1.3.1 Surface Water

The surface water features on and around Cannon AFB are small depressions known as playas. Surface water runoff drains to these depressions forming temporary "lakes" until the water infiltrates or evapotranspires. There is one large playa (Playa Lake) on Cannon AFB which receives most of the surface water runoff from the Base and is the on-Base surface water (temporary "lake") feature. The on-Base construction activities (resulting from Realignment) are not anticipated to adversely affect Playa Lake. The increase in surface water runoff resulting from the apron expansion, additional roads, and buildings would not be detectible above existing conditions at Playa Lake and are not anticipated to have any short or long term adverse effect upon this resource.

Table 4.1.2-3. Single Event Noise Levels (Sound Exposure Level, dB) Caused by FB-111 (F-111G) Aircraft at Various Altitudes Above Ground Level

	Altitude (ft above Ground Level)			
Power Setting	500	1000	2000	4000
Takeoff (without afterburner)	111	105	99	93
Approach	104	99	93	87

Notes:

1. Maximum A-weighted sound levels are approximately 5 to 8 dB less than the referenced sound exposure levels.

2. These noise levels are derived from Omega 10 and NOISEMAP computer programs, which use a reference NOISEFILE data base for each type of aircraft.

3. Afterburner power on takeoff increases noise levels by about 12 dB for the FB-111 (F-111G).

There are no permanent surface water features on Cannon AFB. Therefore, there will be no impacts to permanent surface water(s).

4.1.3.2 Groundwater

Water withdrawn from the Ogallala in this area comes primarily from water stored in the aquifer. The semiarid climate with low rainfall (approximately 15 inches/yr) and reported low (about 1 inch per year, EPA, Drastic, 1987) recharge cannot replenish the area groundwater resource at the rates of withdrawal experienced in the last 40 years and has resulted in declining water levels in the aquifer (Section 3.1.3.2). Impacts to the groundwater resource become more severe with increasing withdrawal.

As shown on Table 3.1.3-2 of Section 3.1.3, Wells 1 and 7 should be nearing the end of their useful life. In 1985 both of these wells had static water levels below the top of the screens and pumping water levels well below the middle of the screens. As discussed in Chapter 3.0, these two wells had experienced the greatest decline in water level and the greatest rate of decline. No estimate of anticipated useful life was made for Well 4, which is used primarily to irrigate the golf course. Well 4 had a pumping level below the bottom third of the screen. The authors of the 1985 study concluded that at the present rate of groundwater decline, the life of Well 4 had been significantly shortened (William Matotan and Associates, 1985). The remaining Wells 2, 3, 5, and 8 should have useful lives of 7 years, 30 years, 37 years, and 22 years, respectively.

The useful well lives were projected based upon an increase of 2,000 on Base residents (500 families) by the year 2000. The planning period (1985 through 2000) provides an equivalent growth of 133 persons per year (2000 persons each year 1985 through 2000). Realignment is expected to generate 418 (Table 3.1.4-2) on-Base residents during the period 1990 to 1995. The growth of on Base residents during the 1990 to 1995 portion of the planning period (1985 through 2000) would amount to 667 persons (133 per year x 5 years). Cannon AFB is not currently experiencing the growth projected in the 1985 study. The increase of 418 on Base resident (realignment increase) is less than the projected (1990 through 1995 portion of planning period) 667 persons used to project on-Base well lives. Therefore, the increase in Base residents (418 resulting from realignment) is not expected to change the projected useful lives of on-Base well.

Extension of the North Apron is anticipated to remove (cover) Well 3 from production. If Well 3 is removed from service and not replaced, the remaining Wells 1, 2, 5, 7, and 8 will supply Base demand with an anticipated decrease in their useful lives. There will be 46 additional aircraft at Cannon AFB under the action (Table 2.2.3-1). Operation and maintenance of these aircraft will require water. Table 4.1.3-1 shows the anticipated increase in water demand on Base resulting from realignment. A water supply study for Cannon AFB has been commissioned (Richards, 1989, personal communication) to evaluate the existing water supply system and provide recommendation(s) to meet Cannon AFB water demand.

Table 4.1.3-1. Groundwater Usage on Cannon AFB

	Average Daily Consumption (gpd)	Golf Course Irrigation (gpd)	Domestic (Housing) (gpd)	Base (gpd)
*Existing	1,300,000	260,000	622,000	418,000
With Realignment	1,672,000	260,000	684,700[1]	727,320
Percent Increase	29%	---	10%	74%[2]

*Source William Matotan and Associates, 1986.

[1] 418 x 150 gpd/person increase.

[2] 74% increase based on proportional increase in aircraft.

The total FY95 population increase as a direct result of the action is projected to be 4816 people (Table 4.1.3-2). This increase in local (Cannon AFB and surrounding communities) population will increase local water demand by approximately 722,000 gpd (4816 X 150 gpd/person). This demand (722,000 gpd) includes 62,700 gpd (418 X 150 gpd/person) for the additional on-Base residents. The demand for approximately 660,000 gpd will be met by the local utilities (see Section 4.1.4). Base realignment is anticipated to produce a total (on Base and off Base) water demand of 2,332,000 gpd. The withdraw of this additional volume of water from the Ogallala Aquifer will not have an adverse affect upon the local water resources. Groundwater quality within the Ogallala is acceptable for most uses. Water is typically hard and high in silica and fluoride. The Ogallala Formation is the only reliable source of water in the vicinity. The results of water quality analyses from Cannon AFB Wells is reported in Appendix D. Figure D-1 shows the locations of the base wells including in the sampling.

Potentially for contamination of the High Plains Aquifer at Cannon AFB is low, primarily due to low rainfall, depth to water table, and the occurrence of a caliche layer of low permeability. Three cases in which the potential would be greatly increased would be (1) where there is a constant driving force such as an impoundment, pond, or disposal pit; (2) where the caliche layer has been breached, since sediments which directly underlie this stratum are quite permeable; and (3) where wells have not been properly sealed, therefore creating a direct pathway to the aquifer. Realignment activities are not expected to adversely affect area water quality.

4.1.4 Socioeconomics

This section summarizes the estimated economic and social effects of the realignment of Cannon AFB on the surrounding region. A more detailed discussion of the basis for the assessment is provided in Appendix A, Section 2. Appendix B describes the regional model, adjustments, and assumptions used in projecting the earnings, employment, and population impact of realignment.

In making the economic estimates, reliance was placed on an application of RIMS II (Regional Input-Output Modeling System) earnings multipliers. RIMS II is a method for estimating regional input-output multipliers developed by the Bureau of Economic Analysis (BEA). The economic analysis was supplemented by local interviews and analyses to assess the effects on local communities.

As shown in Table 3.1.4-1, the realignment is expected to increase Base employment by 1739 (43.6 percent) from a total of 3984 personnel to 5723 appropriated-fund civilian and military personnel. In addition to these initial employment impacts from increases in Base personnel, new jobs will be created through direct and indirect employment impacts. Direct employment is defined to include those jobs created by the increased demand for inputs resulting from the initial Air Force expenditures. Indirect employment is associated with the labor required to satisfy the ensuing consumer demand created by the additional economic activity. Four key factors that affect the degree of

Table 4.1.3-2. Population Impacts, FY90, FY92, and FY95
Cannon AFB Community

	FY90	FY92	FY95
Population:			
Military			
Military personnel	649	1662	1662
Military dependents	1085	2779	2779
Total military including dependents	1734	4441	4441
Civilians			
Personnel	453	428	161
Civilian dependents	605	571	214
Total civilian population impact	1058	999	375
Total population impact	2792	5440	4816
Total community population impact[1,2]	2746	5122	4398

[1] Assumes (1) dormitory space of 200 rooms to be constructed in FY90, and occupied in FY91, and (2) an additional 100 rooms to be constructed in FY92, and occupied in FY93 (Department of Expansion, Civil Engineering, Cannon AFB, 1989).

[2] Assumes double occupancy of additional personnel of E1-E3 rank.

impact are (1) characteristics of the inmigrating personnel--their income level, marital status, and the number and ages of their children; (2) expenditures from outside the region required for the realignment; (3) timing of the action; and (4) residential distribution of new residents.

Information supplied by officials at the Base, supplemented with extensive survey data provided by the Defense Manpower Data Center (1986), was used to estimate military personnel characteristics. National averages were used to estimate civilian characteristics. Data on planned construction expenditures were provided by the Base. Historical data on services secured through Base Contracting and medical services provided by Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) were provided by the Base and used to project additional services expenditures. Information supplied by the Air Force indicated that the action would take place in two primary phases. One group of new personnel would move into the area at the end of FY90 (July-September, 1990); the remaining personnel would relocate during the first quarter of FY92 (October 1991-December 1991). It is assumed that 40 percent of new personnel immigrate during the first phase and 60 percent inmigrate during the second phase.

As shown in Table 3.1.4-2, all of the new married military personnel and approximately 112 unaccompanied personnel are expected to live off Base. However, their actual distribution in area communities is not known. An additional unknown is the likely distribution of construction and direct and indirect workers associated with the additional spending. The current distribution of Base personnel indicates that most have chosen to live in Clovis and, to a lesser extent, in Curry County. However, it is uncertain whether past trends will continue, given that the city of Portales is attempting to attract 20 percent of the new residents. In light of this uncertainty, the following discussion of impacts presents two potential population distribution scenarios. Scenario I assumes that current distribution patterns will be adopted. It is based on the current distribution of married military personnel living off Base. That distribution is 84 percent in Clovis, 98 percent in Curry County overall, and 2 percent in Portales (Housing Management Office, Cannon AFB, 1989, personal communication). Scenario II assumes that 20 percent of all new residents will locate in Portales, with Clovis maintaining 69 percent and the remaining 11 percent locating in Curry County.

4.1.4.1 Population, Employment and Earnings

The sources and projected impacts of the realignment on population, employment, and earnings are discussed in this section. Population in the combined counties of Curry and Roosevelt is projected to increase by 6.5 to 9.0 percent over projected baseline populations between FY90 and FY95.

The primary initial sources of impact of the realignment on population, employment, and earnings in the region are: the on-Base military construction projects, the construction of additional medical facilities, off-Base construction, additional services to be acquired through Base contracting, medical services required for the additional personnel, and the additional payroll for the Cannon AFB military and civilian personnel. These sources have been identified as the initial increments of spending that are expected to generate successive "rounds" of economic activity. For instance, construction spending from outside the region will generate earnings for local construction workers. A typical worker may spend $1 for bread, the baker may in turn spend $.80 for taxicab fare, the taxicab driver may spend $.64 for a chocolate candy and so on.

The realignment will require an estimated $58 million in military construction projects, excluding the medical military construction. An estimated $31 million of the $58 million planned construction expenditures are scheduled for FY90 (Civil Engineering, DEX, Cannon AFB, 1989). The remaining construction is planned for FY91 and FY92. Planned expenditures for additional medical facilities are spread over 1991 to 1994 (Regional Health Facilities Office, Dallas, Texas, 1989, personal communication).

Off-Base construction, contracted services, medical services, and payroll spending are associated with the additi... of ...itary and civilian personnel. The first squadron of 649 military members as we... 30 civilians are expected to be added to the Base personnel in FY90. The additional payroll for FY90 is estimated at $14 million. Two squadrons consisting of a total of 1013 military members are scheduled to arrive in FY92. At that time, the Base plans to hire an additional 47 civilians. The total annual payroll for all Cannon AFB military and civilian personnel associated with the expansion is estimated at $36 million beginning in FY92. (Calculated from data provided by the Housing Management Office, 1989a.)

The impacts of these initial expenditures were applied to the RIMS II earnings multipliers for the ROI to calculate total earnings and employment impact (see Appendix B). The employment impacts were further adjusted to estimate population impacts (see Appendix B). The impacts for population, employment, and earnings discussed below have been calculated as total impacts. Population impacts may be compared with current baseline population projections (see Table 3.1.4-4).

Population

Figure 4.1.4-1 shows the population impacts related to the expansion for FY90, FY92, and FY95. A large population influx associated with the expansion is projected in FY90 due to the addition of approximately 40 percent of the projected total additional Base personnel and the $31 million in planned construction expenditures. The overall population impact remains substantial in FY91. However, as shown in Table B-1, the civilian population impact declines to 556 from 1058 in FY90 (see Table B-1) because of the decline in planned construction expenditures.

The maximum population impact of the Cannon AFB expansion is expected to occur in FY92 with an overall addition of approximately 5440 persons coming into the region (see Figure 4.1.4-1). The full impact of military personnel and dependents will begin in FY92, and these persons account for 4441 of the 5440 projected. Thus, the impact of civilians and their dependents result in the remaining 999 persons. However,

	FY90	FY92	FY95
Total Military Including Dependents	1734	4441	4441
Total Civilian Population Impact	1058	999	375
Total Population Impact	2792	5440	4816
Total Community Population Impact [1,2,3]	2746	5122	4398

[1] Assumes (1) dormitory space of 200 rooms to be constructed in FY90, and occupied in FY91, and (2) an additional 100 rooms to be constructed in FY92 and occupied in FY93 (Department of Expansion, Civil Engineering, Cannon AFB, 1989.)

[2] Assumes double occupancy of additional personnel of E1-E3 rank.

[3] Total community population impact is defined as additional off-Base military personnel and their dependents plus all civilian personnel and their dependents whose employment is either directly or indirectly created by the expansion.

[4] RIMS II earnings multipliers were used to project employment impacts. Standard labor market and demographic statistics were then used to project the associated population impacts.

Sources:
Housing Management Office, Cannon AFB, 1989.
Bureau of the Census, U.S. Department of Commerce, 1989. Statistical Abstract of the United States.

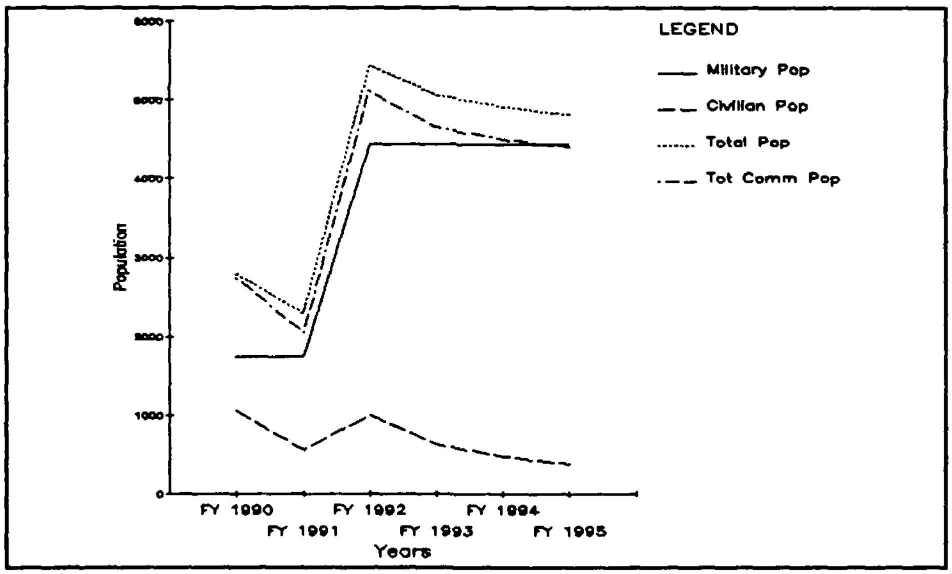


Figure 1

Figure 4.1.4-1. Population Impacts from Cannon AFB Realignment

since construction is planned throughout the period from FY90 to FY94, portions of the population impact in each of those years will be temporary.

The projected impact in FY95 is based on operations only and reflects expected permanent impact. The aggregate total population impact is projected to be 4816. Again, an estimated 4441 of these persons will be military members and their dependents. Therefore, the permanent population impact of civilians and their dependents is only 375. An alternative measure of population impact on the region is the total community population impact. It is defined as additional off-Base military personnel and their dependents plus all civilian personnel and the dependents whose employment is either directly or indirectly created by the expansion. Total community population impact is projected to be 4398 in FY95.

As explained in Appendix B, the population forecast includes the assumption that a portion of the new jobs created by the realignment will be filled by spouses of incoming military and appropriated-fund civilian personnel and by a share of the currently unemployed labor force in Curry and Roosevelt counties. In addition, approximately a third of the civilian households inmigrating to fill the new jobs created by the realignment are assumed to be two-wage-earner families. Therefore, the increase in the number of households due to direct and indirect employment impacts is approximately 10 to 15 percent of the projected increase in employment in FY95.

Table 4.1.4-1 presents the two scenarios which have been used in analyzing the likely distribution of community population impacts on the cities of Clovis and Portales in the peak year of impact. Using the maximum projected overall community population impact of 5122 (see Table 4.1.3-1), which is anticipated in FY92, the impact in Clovis under Scenario I would be 4302, or 11.8 percent of the projected baseline population for Clovis in that year. Similarly, the impact for all of Curry County would be 5020, or 11.0 percent of the projected baseline population for FY 92. Under Scenario II, the projected community population impact for Portales is 1024 in FY92, or 9.8 percent of the projected baseline population for FY92. Also, population impacts will be lessened as a percent of projected baseline population to 9.7 for Clovis and 9.0 for Curry County.

The permanent population impacts are expected to be in place in 1995. Assuming the applicability of the current geographic distribution of married off-Base personnel, the distributed community population impacts are expected to be 9.7 for Clovis and 9.3 for Curry County measured as a percent of projected baseline population. Under the alternative assumptions of Scenario II, the distributed impacts as a percent of projected baseline population are 8.0 for Clovis, 7.6 for Curry County, and 8.3 percent for Portales.

Employment

Military and civilian employment at Cannon AFB is projected to increase by 1739, or 43.6 percent of the current level of employment at the Base (Figure 4.1.4-2).

Table 4.1.4-1. Geographic Distribution of Estimated Total Population Impacts and Percentage Changes from Baseline Projections

	Clovis[1]	Curry County[2]	Portales[1]
Distribution-Scenario I	84.0%	98.0%	2.0%
1990	2307	2691	55
Percent Change	6.5%	6.0%	0.5%
1992	4302	5020	102
Percent Change	11.8%	11.0%	1.0%
1995	3694	4310	88
Percent Change	9.7%	9.3%	0.8%
Distribution-Scenario II	69.0%	80.0%	20%
1990	1895	2197	549
Percent Change	5.3%	4.9%	5.3%
1992	3534	4098	1024
Percent Change	9.7%	9.0%	9.8%
1995	3035	3518	880
Percent Change	8.0%	7.6%	8.3%

[1] The annual compound rate of growth implicit in comparing the 1 July 1986 city population estimate from the Bureau of the Census to the city population given in the 1 April 1980 Census was used to project populations of selected cities from 1990 to 1995.

[2] The annual compound rate of growth implicit in comparing the 1990 and 1995 Bureau of Business and Economic Research (BBER) projections of county population was used to project population for the individual years 1991 through 1994.

Sources: "Population and Employment Projections - Counties in New Mexico 1985-2010," Bureau of Business and Economic Research, University of New Mexico, 1989.

Current Population Reports, Local Population Estimates, Series P-26, No. 86-W-SC, March 1988, Bureau of the Census, U.S. Department of Commerce.

The first squadron is expected to arrive in 1990 when a projected 679 new military members and civilians will be needed at the Base. The remaining 1060 personnel are expected to arrive in FY92. Other non-appropriated fund (NAF) civilian positions (e.g., employees at the commissary, Base exchange, and private businesses on Base) are projected to be created from the initial expenditures associated with the realignment. These additional jobs are included in the projections of increases in total direct and indirect employment.

Projected total direct and indirect employment associated with both construction and operations for the expansion (excluding additional Cannon AFB personnel) is 1192 in FY90. This employment figure is expected to decline sharply to 902 in FY91 as planned expenditures for military construction projects decline from $31 million to $18.7 million (see Table A.2-1). Planned construction expenditures decline somewhat in 1992, but operational expenditures increase dramatically as the remaining 60 percent of the new Cannon AFB military and civilian personnel are added. The total direct and indirect employment impact is projected to reach a high of 1410 in FY92. This impact represents 9.6 percent of the average annual nonagricultural wage and salary employment in the ROI in 1987, the latest date for which the figure is available (New Mexico Department of Labor, 1987). After construction impacts have dissipated in FY95, the remaining direct and indirect employment impact is projected to be 1050, or 7.2 percent of the 1987 average annual nonagricultural wage and salary employment for the region.

Construction employment impact is expected to peak in FY90 and to decline throughout the period until FY95. The greatest impacts of construction workers associated with the on-Base construction are realized in FY90 through FY92. Construction workers required for the on-Base construction in FY90 are projected to be 296, or 38.0 percent of the 1987 average annual construction employment in the ROI. Construction employment requirements for the on-Base work are expected to be 178 in FY91 and 111 in FY93. On-Base construction will continue in FY93 and FY94, but employment requirements will fall to around 3.0 percent of 1987 average annual nonagricultural wage and salary construction employment in the ROI.

A considerable amount of off-Base construction is expected to take place to accommodate the additional housing and services needs of the additional population. An additional 330 workers are projected to be needed in FY90 to carry out the total on-Base and off-Base construction that will need to take place during the year. These additional 330 workers represent 42.4 percent of the 1987 average annual covered construction wage and salary employment in the ROI. Employment requirements for total construction in the region are projected to decline throughout the period analyzed, but are expected to be relatively high at 212 in FY91 and 173 in FY92.

The total direct and indirect employment impact in the service sectors is projected to reach 1025 in FY92 and to stabilize at 863 in FY95 after the primary construction projects associated with the expansion have taken place. The 863 jobs are derived entirely from ongoing operations from the expansion and represent 8.7 percent

	FY90	FY92	FY95
Total Employment	1871	3149	2789
Total Employment - Operations	1089	2789	2789
Military	649	1662	1662
Civilian	1222	1487	1127
Appropriated-fund	30	77	77
Direct and Indirect	1192	1410	1050
Operations [1]	410	1050	1050
Construction [2]	782	360	0

[1] Generated from initial operations expenditures.

[2] Generated from initial construction expenditures.

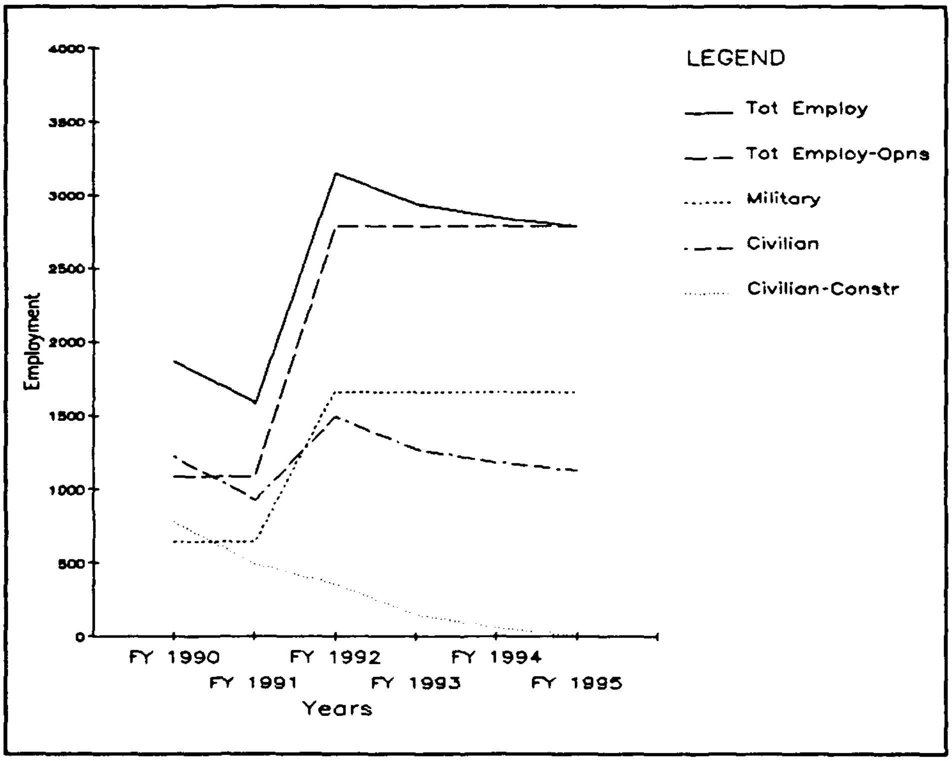


Figure 4.1.4-2. Employment Impacts from Cannon AFB Realignment

of 1987 average annual trade and services wage and salary employment in the ROI. As expected, job impacts in the services sectors are less volatile and more permanent than in construction.

Earnings

The projected increase in Cannon AFB payroll is over $36 million (see Table 4.1.4-2). The projected impact of earnings from direct and indirect jobs created from the additional construction and operational expenditures associated with the expansion is just under $25 million in FY90 (Table 4.1.4-3). This figure represents 11.7 percent of 1987 covered nonagricultural wage and salary earnings in the ROI (Table 3.1.4-5). The additional expenditures for Base operations will be permanent and are expected to generate an additional $14 million in FY95. This level of earnings is 6.6 percent of the 1987 covered nonagricultural wage and salary earnings in the ROI.

As shown in the employment section above, the relatively strong impacts are expected to be seen in the construction sector in FY90 through FY93. Table A.2-2 shows the projected impacts on earnings for those years. These impacts are further reflected in the projected mean annual wage rates for those years. The projected mean annual wage rate from the additional direct and indirect employment from the realignment-related spending is $20,919 in FY90 (Table 4.1.4-3). These wage rates are weighted by the fact that the contractors of the on-Base construction will be required to comply with Davis-Bacon laws in setting wages. Since the primary construction impacts will be completed by FY95, the average annual wage rate of the additional permanent jobs is $13,457. As stated in Section 3.1.4.1 (Earnings, Region of Influence), the 1987 annual mean wage for covered nonagricultural wage and salary employment was $14,488 (New Mexico Department of Labor, 1988).

4.1.4.2 Housing

Impacts on housing in the Clovis-Portales area are expected to result from the Base realignment. The growth in the number of people needing housing is expected to be greater than that supplied by 1994. This conclusion is based on the assumption that average annual baseline growth in the housing stock from 1990 to 1994 will be equal to that observed over the last year. Estimated housing demand growth is based on the increased staffing at the Base and the associated civilian employment growth projected in the previous section. It is estimated that there will be excess demand for housing, with community housing needs greater than the available supply in 1994. The details of the analysis conducted to project housing demand and supply in 1994 are reported in the Segmented Housing Market Analysis for Cannon Air Force Base New Mexico (SAIC, 1989).

The Air Force has proposed two building programs that would mitigate the anticipated negative impacts on housing availability in the Clovis-Portales area. Plans are in place to construct 300 dormitory units on Base. These units would result in housing

Table 4.1.4-2. Projected Impact of Cannon AFB Realignment on Annual Payroll

Personnel	Number	Mean Annual Wage	Total[1]
Officers	183	$35,535	$6,502,967
Enlisted	1,479	$18,928	$27,995,020
Civilian	77	$20,709	$1,594,601

[1] Annual wages include basic allowances for quarters, basic allowance for subsistence, and appropriate VHA allowance.

Source: Housing Management Office, August 1989a.

Table 4.1.4-3. Projected Impact of Cannon AFB Realignment on Earnings in the ROI[1]

	1990	1992	1995
Projected Earnings of Increase in Direct and Indirect Employees (Excluding Additional Cannon AFB Personnel)	$24,935,391	$23,065,380	$14,129,543
Percent of 1987 Total Covered Wages and Salaries in ROI	11.7%	10.9%	6.6%
Increase in Direct and Indirect Employees (Excluding Additional Cannon AFB Personnel)	1,192	1,410	1,050
Mean Annual Wage	$20,919	$16,358	$13,457

[1] RIMS II earnings multipliers were used to project earnings impacts (see Appendix B).

Source: New Mexico State Department of Labor, Albuquerque, New Mexico, August 1989.

for an estimated 418 enlisted personnel, assuming that there will be double-occupancy in 118 of the rooms (SAIC, 1989). The other housing plan involves "Section 801" housing (Section 801 of PL 98-115), which would result in the construction of an additional 700 family rental units. A long-term lease is negotiated with a private entrepreneur who provides the financing necessary to purchase land and construct, operate, and maintain family housing for military personnel. In return, the entrepreneur receives lease payments directly from the government and benefits from various tax incentives (interest deductions and depreciation). The Air Force establishes waiting lists, assigns members to this housing, and manages it identically to government-owned housing (Earls, 1989).

Table 4.1.4-4 presents a summary of the military and civilian housing demand increases due to the Base realignment and the associated estimated housing deficits assuming that the two building programs discussed above are put in place. The number of military personnel living in military housing is projected to increase by the 418 dormitory spaces. The number of military personnel living in community housing is estimated to increase by 1244. Assuming that the proposed 700 rental units are built under Section 801 funding, the estimated excess demand for community housing by military personnel is 112 units. The number of appropriated-fund civilians is expected to increase by 77, with the estimated housing deficit equal to 76 units (SAIC, 1989).

As shown in Section 4.1.4.1, there will be an increase in general civilian employment to support the growth in military and appropriated-fund civilians assigned to the Base. This growth will result in more housing demand. The estimated number of additional civilian housing units required in the community (excluding appropriated-fund civilians) are 423 in FY90, and 351 in FY92. The number stabilizes at 84 in FY95 (based on Table B-1, assuming 30 appropriated-fund civilian households in FY90-91 and 77 in FY92-95). It is assumed that there will be some households supplying more than one person to the employed labor force; therefore, the growth in the number of civilian households is less than the projected growth in employment.

The estimated number of households unable to rent or buy dwelling units within their budget in 1994 is estimated to be 241 units (Table 4.1.4-4). The estimated deficits represent an excess demand of approximately 1.5 percent of the total housing stock in 1994.

In the short-term, the impact of the excess demand in housing will be to increase rents. One can expect the older, less-desirable units to filter to the low-income households. There may be increased competition for these low-rent units because of the excess demand for medium-priced housing. The newer units (except for the Section 801 housing) can be expected to command prices that would reflect the relative scarcity of rentals. Some military and civilian households may temporarily pay a larger share of their income for housing until more units are built to meet the demand. Low-income families in the area can be expected to be particularly affected. Their range of choice and ability to find low-cost housing will be reduced.

Table 4.1.4-4. Summary of Military and Civilian Housing Deficits for 1989 and 1994

Housing Category	Housing Demand 1989	Housing Demand 1994	Increase In Units Demanded	Estimated Deficit
Military Living in Military Housing:				
UPH[1]	830	1248	418	---[2]
Family	1011	1011	0	---[2]
TOTAL MILITARY HOUSING	1841	2259	418	---[2]
Military Living in Community Rentals:				
UPH	290	402	112	112
Family	906	1922	1016	0[3]
Ownership[4]	502	618	116	0
COMMUNITY HOUSING FOR AF	1698	2942	1244	112
Civilian Demand:				
Appropriated-Fund Civilians	445	522	77	76
Other Related Civilians	NE	NE	84	53
TOTAL	NE	NE	1823	241

Source: SAIC, 1989 and Table B-1.

[1] UPH denotes unaccompanied personnel housing. These estimates assume that the 300 dormitory rooms in the construction budget will be built by 1994, with 118 of those rooms housing two military members.

[2] Assumes that all additional housing demand not currently in the construction budget will be supplied by the community housing market.

[3] Assumes that 700 Section 801 housing units will be built.

[4] Assumes that of the military members with families, 46 percent of the officers, and 27.3 percent of the enlisted personnel (with grade over E4), purchase homes.

NE = Not Estimated.

A greater share of the new households can be expected to try to qualify to purchase homes because of the anticipated shortages of rental units. Mortgage funds are available, and housing prices are currently low relative to national averages. In addition, there are few zoning restrictions on the location of mobile homes in the area. Therefore, mobile home purchases could provide an increase in the housing stock when other units are unavailable.

4.1.4.3 Community Services

Community Services in the City of Clovis and Curry County

Basic community services are likely to be strained under both scenarios by the projected increase in population resulting from realignment, particularly in the short term. Staff from the Office of Economic Adjustment, Department of Defense, are currently working with community representatives for Clovis and Portales to plan for, mitigate, and monitor, anticipated increases in population. Officials welcome the realignment and expect the long-term community impacts to be beneficial.

The peak increase in population is expected to occur early, during FY92 (October 1991-September 1992). Under Scenario I, population is projected to increase by 4302 (almost 12 percent) during this time. Under Scenario II, population is projected to increase by 3534 or almost 10 percent. Thus, the community will have only a very short time frame in which to make necessary adjustments.

Services that require a long lead time in planning for increased equipment, buildings, or the hiring of qualified personnel are most likely to feel the strain. Services that are likely to be less seriously affected are those such as recreation and medical care where new military personnel have access to Base services. City services particularly affected include jail, police, fire, and ambulance services. Currently inadequate jail capacity would be further exacerbated under both scenarios. Under both population distribution scenarios, additional police, fire, and emergency medical personnel and additional equipment would be required if current service levels are to be maintained.

Community Services in Portales

Community services are likely to be affected only under the second scenario, in which 20 percent of new residents locate in Portales. An increase of 1024, or almost 10 percent, is projected to occur during the peak year of impact (October 1991-September 1992). Thus, police, fire, and ambulance services would require additional personnel if current service levels are to be maintained.

Medical Services

The impact on area medical services will be reduced by the extent to which the Cannon AFB hospital is able to provide medical care to military beneficiaries in the community. The Base hospital has expansion capacity that could more than double its current inpatient bed space, while the expected increase associated with the action would represent an increase of less than 30 percent over the current population of active duty personnel, retirees, and dependents who are eligible for Base hospital benefits. Additionally, expansion of outpatient facilities by 20 to 40 percent, based on staffing projections, would accommodate the increased demand from military families expected with the action.

The community hospitals would experience increased demand from the influx of civilians expected and from the proportion of military dependents who choose to use civilian rather than military hospitals. Occupancy rates at the two community hospitals indicate sufficient availability of bed space to absorb the increased demand, as confirmed by hospital administrators. The increase in civilian population is estimated at approximately 1000 in FY90 and FY92, decreasing to less than 400 by 1995 (see Figure 4.1.4-1). The increase in 1992 would change the ratio of beds to population from the current 1:405 to 1:418 (assuming no increase in beds to take care of baseline population growth). Since the current inpatient use of civilian hospitals by retirees and dependents is very low, a negligible increase in demand could be expected from military personnel associated with the realignment.

Community medical services most likely to be affected by realignment include specialties not available on Base such as orthopedics, ear, nose, and throat (ENT); neurology and dermatology. Although these specialties are available locally, coverage is limited to one or two physicians per specialty. Thus, minor impacts on the community's ability to provide medical services could be expected as a result of the realignment. Two possible effects are the need to recruit additional staff locally or the inconvenience to patients and their families of a 2-hour drive to Lubbock or Amarillo for specialty services not readily available locally.

4.1.4.4 Utilities

With the exception of waste water treatment, realignment is not expected to impair utilities' ability to serve the additional load imposed. Overall, utilities serving the two-county area are capable of handling continuing growth, including the impact of the realignment, through the end of the century. However, additional industrial demand could exceed waste water treatment capacity. A detailed discussion of the impact on utilities is discussed in Appendix A.

Both Portales and Clovis have large water pumping reserves. (See, however, the effect on the Ogallala Aquifer, discussed in the Groundwater section.) Gas and electric utilities also have large reserves. Waste water treatment capacity reserve of 0.8 million gallons per day (mgpd) in Clovis will accommodate additional households, but may not accommodate both additional households and new major industries. Portales also has minimal waste water treatment capacity reserve. Extra households can be accommodated, but additional industrial demands may exceed the capacity.

4.1.4.5 Education

School Districts will be significantly impacted by projected increases in the number of school-aged children (see Appendix B). Totals rise with each of the three phases of Base realignment, varying slightly throughout the time period FY90 to FY95 as the number of construction workers and expenditures rises and falls. An initial increase of 657 is expected to occur during FY90, when construction expenditures begin and when the first group of military personnel inmigrate. Peak levels of almost 1300 are reached during FY92 (October 1991-September 1992), when the second phase of the realignment occurs. The peak number decreases slightly over the following years, stabilizing below 1200 by 1994-95. This section assesses the impact on the school districts in Clovis and Portales based on the two population distributions discussed in Section 4.1.4.

Clovis Municipal School District

Tables 4.1.4-5 and 4.1.4-6 present the analyses of projected initial and peak impacts of each population distribution scenario on the Clovis school district. The impacts are significant under each scenario. Even with a reduced number of inmigrants in Scenario II, when 80 percent of the increase in school-aged children locate in the district, the school district could expect an overall impact of over 6 percent as a result of the initial realignment phase and 12 percent during the peak year of impact, in school year 1991-92. Under Scenario I (98 percent locate in the district), these percentages rise to 7.7 percent and 15.1 percent, respectively. For this scenario, the peak impact represents an estimated increase of over 1200 students, approximately 640 in grades 1-6.

Figure 4.1.4-3 shows the projected fluctuation in student increases throughout the 6-year period of impact. This fluctuation is attributable to changes in the civilian population -- in the number of appropriated-fund civilian personnel, construction workers, direct, and indirect workers resulting from the increased level of expenditures. Increases in student dependents of military personnel are projected at a constant number of 418 during FY90 and FY91, and 1071 for each succeeding year.

The most significant impact to the school district would occur during the school year 1991-92. The second wave of children, expected to enroll between October 1991 and December 1991, would present a considerable challenge in terms of the numbers to be accommodated within a very short time period. Additional teaching and support staff, classrooms, equipment, and ancillary staff would be required. Under the first scenario, the projected peak increase in students in grades 1-6 would be more than the additional capacity provided by the planned new elementary school. At the elementary level alone, between 25 and 30 additional teachers would be required to maintain classroom sizes mandated by the state for the 1991-92 school year.

Table 4.1.4-5. Clovis Municipal School District, Scenario I: Initial and Peak Impacts on Enrollment[1]

Grades	School Year 1990-91: Initial Impact[2] Projected Baseline (Without Action)	Projected Enrollment (With Action)	Increase Number	Increase %	School Year 1991-92: Peak Impact[3] Projected Baseline (Without Action)	Projected Enrollment (With Action)	Increase Number	Increase %
Kindergarten[4]	351	381.5	30.5	8.7	354	416	62	17.5
1-6	4043	4365	322	8.0	4110	4754	644	15.7
7-9	1654	1779	125	7.6	1620	1864	244	15.1
10-12	1547	1663	116	7.5	1560	1785	225	14.4
Special Students	346	366	20	5.8	366	400	34	9.3
Total	7941	8554.5	613.5	7.7	8010	9219	1209	15.1

[1] Scenario I assumes current distribution of new residents, with 98 percent of new students in Clovis Schools.

[2] Assumes that the projected increase in school-aged children resulting from the first phase of realignment, scheduled to occur in the fourth quarter of FY90 (July-September), will be in class for the 40th-day enrollment count in school year 1990-91.

[3] Second phase of the realignment is scheduled to occur during the first quarter of FY92 (October 1991-December 1991). Projected enrollment, which includes children from the two phases of the realignmnet would thus peak during the school year 1991-92. The increase in enrollment shown is not cumulative.

[4] Full-time equivalent.

Table 4.1.4-6. Clovis Municipal School District Scenario II: Initial and Peak Impacts on Enrollment[1]

Grades	School Year 1990-1991: Initial Impact[2]				School Year 1991-1992: Peak Impact[3]			
	Projected Baseline (Without Action)	Projected Enrollment (With Action)	Increase Number	Increase %	Projected Baseline (Without Action)	Projected Enrollment (With Action)	Increase Number	Increase %
Kinder-garten[4]	351	376	25	7.1	354	405	51	14.4
1-6	4043	4307	264	6.5	4110	4635	525	12.8
7-9	1654	1756	102	6.2	1620	1819	199	12.3
10-12	1547	1641	94	6.1	1560	1744	184	11.8
Special Students	346	362	16	4.6	366	394	28	7.7
Total	7941	8442	501	6.3	8010	8997	987	12.3

[1] Scenario II assumes 80 percent of school-aged children in Clovis schools.

[2] Assumes that the projected increase in school-aged children resulting from the first phase of the realignment, scheduled to occur during the fourth quarter of FY90 (July-September 1990) will be in class for the 40th-day enrollment count in school year 1990-91.

[3] Second phase of the realignment is scheduled to occur during the first quarter of FY92 (October 1991-December 1991). Projected enrollment, which includes children from the two phases of the realignment, would thus peak during the school year 1991-92. The increase in enrollment shown is not cumulative.

[4] Full-time equivalent.

Fiscal Year (FY)[1]	Projected Increase in School-Aged Children	
	Scenario I (98%)	Scenario II (80%)
1990 (10/1/89-9/30/90)	613.5	501.0
1991 (10/1/90-9/30/91)	507.0	414.0
1992 (10/1/91-9/30/92)	1209.0	987.0
1993 (10/1/92-9/30/93)	1130.0	922.0
1994 (10/1/93-9/30/94)	1197.5	896.0
1995 (10/1/94-9/30/95)	1076.5	879.0

[1] It is assumed that the projected increase in children from each fiscal year will impact the enrollment in the next school year.

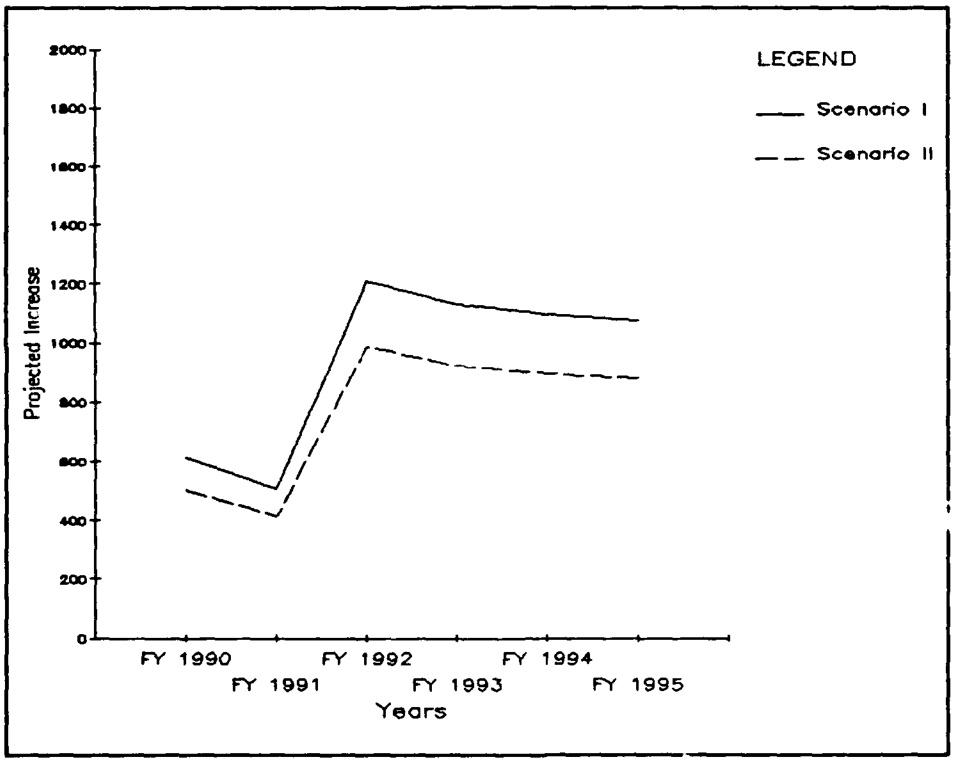


Figure 4.1.4-3. Clovis Municipal School District: Total Enrollment Impacts Over Time

The district is in a fiscally sound position from the viewpoint of capital expenditures for new building; over 3 percent of the permissible 6 percent bonding capacity is available (New Mexico State Department of Education; Purvis, 1989, personal communication). In the short term, however, operational funding capacity could be strained. The expected location of new students in off-Base housing and the timing of the increase would likely result in a negative financial impact, at least in the short term, both to the State and to the local school district. All of the inmigrating students, including students who are dependents of military personnel, would reside in the community. Base-related students, therefore, would be "B" students. Based on recent experience, little or no Federal Impact Aid may be paid for these "B" students (Lopez, 1989, personal communication). Local school districts in New Mexico do not benefit directly from payment of these federal funds, 95 percent of which are taken into account in calculating the state equalization guarantee; thus the loss would be borne by the State. The local school district would suffer financially if many new students arrive after the 40th-day enrollment count that is factored into the equalization formula. If this were to occur, the district would not receive state funds for these students for the immediate school year.

Although school officials expect that in the long term the school district will benefit from growth, in the short-term, impacts may be negative. The Air Force is working with staff from the Office of Economic Adjustment of the Department of Defense and with community representatives to monitor and mitigate the severity of the impact to the schools. Additionally, the underlying basis of community support for the military and for the Cannon AFB realignment may be expected to facilitate the adjustments that will be required.

Portales Municipal School District

Figure 4.1.4-4 shows projected increases in student enrollment in the Portales school district throughout the 6-year period of impact. Initial and peak impacts on enrollment under the second scenario are presented in Table 4.1.4-7. Impacts under Scenario I are small (25 students in the peak year of impact); therefore, the tables show impacts under Scenario II only (20 percent are assumed to enroll in Portales' schools). Projections indicate that initial and peak impacts are greatest, in absolute numbers, for the 1-6 grade grouping: an additional 65 students are expected initially, and 131 students are expected during the peak year of impact for these grades. As in Clovis, the timing of new student enrollment could affect operational funding capacity, although the school district has adequate bonding capacity. Overall, officials believe that the additional students could be served with minimum hardship to the district (Overby, 1989b, written communication).

Eastern New Mexico University (ENMU)

Enrollment at ENMU may be expected to increase as a result of the realignment. The impact would be significant at the Clovis Campus. A 47 percent increase in military students and in student dependents of military personnel would occur,

Fiscal Year (FY)[1]	Projected Increase in School-Aged Children[2]	
	Scenario I (2%)	Scenario II (20%)
1990 (10/1/89-9/30/90)	12.5	125.0
1991 (10/1/90-9/30/91)	10.5	103.5
1992 (10/1/91-9/30/92)	24.5	246.5
1993 (10/1/92-9/30/93)	23.0	231.0
1994 (10/1/93-9/30/94)	23.0	224.5
1995 (10/1/94-9/30/95)	22.0	219.5

[1] It is assumed that the projected increase in children from each fiscal year will impact the enrollment in the next school year.

[2] Kindergarten students are included as full-time equivalents only.

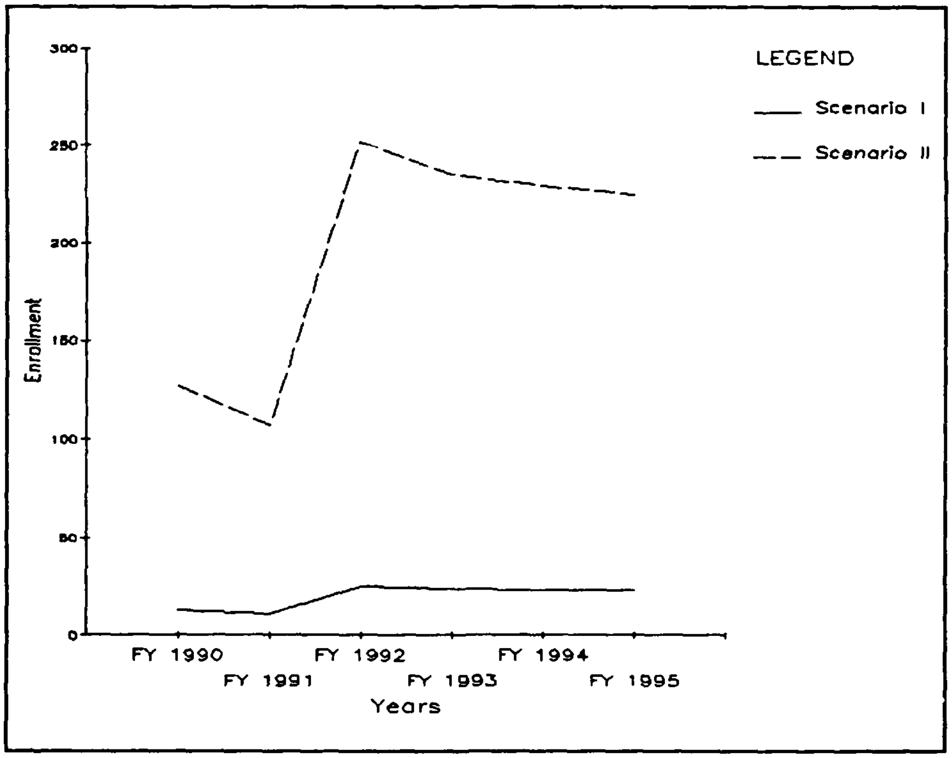


Figure 4.1.4-4. Portales School District: Total Enrollment Impacts Over Time

Table 4.1.4-7. Portales Municipal School District Scenario II: Initial and Peak Impacts on Enrollment[1]

Grade	School Year 1990-1991: Initial Impact[2]				School Year 1991-1992: Peak Impact[3]			
	Projected Baseline (Without Action)	Projected Enrollment (With Action)	Increase Number	Increase %	Projected Baseline (Without Action)	Projected Enrollment (With Action)	Increase Number	Increase %
Kinder-garten[4]	100.5	106.5	6	6.0	97	109.5	12.5	12.9
1-6	1371	1436	65	4.7	1412	1543	131	9.3
7-9	612	638	26	4.2	620	670	50	8.1
10-12	534	558	24	4.5	552	598	46	8.3
Special Students	82	96	4	4.9	80	87	7	8.8
Total	2699.5	2824.5	125	4.6	2761	3007.5	246.5	8.9

[1] Scenario II assumes 20 percent of new school-aged children in Portales' schools.

[2] Assumes that the projected increase in school-aged children resulting from the first phase of the realignment scheduled to occur during the fourth quarter of FY90 (July-September 1990) will be in class for the 40th-day enrollment count in school year 1990-91.

[3] Second phase of the realignment is scheduled to occur during the first quarter of FY92 (October 1991-December 1991). Projected enrollment, which includes children from the two phases of the realignment, would thus peak during the school year 1991-92. The increase in enrollment shown is not cumulative.

[4] Full-time equivalent.

assuming that the increase in student enrollment at each campus is proportional to the overall increase in military personnel stationed at the Base (refer to Table 3.1.4-1). Based on Spring 1989 headcount data, the Clovis campus could expect an additional 216 military enrollees and an additional 47 student dependents of military personnel, representing a 9 percent increase in enrollment, for each of the two primary school semesters. Similarly, the Portales campus could expect an additional 43 undergraduate (representing an increase of less than 2 percent over Spring enrollment) and two graduate military enrollees. (No data on military dependents are available.) Additionally, a small increase in enrollment at each campus could result from the projected increase of approximately 1000 civilians during 1990 and 1992 (see Appendix B).

4.1.4.6 Public Finance

This section discusses in general terms the impacts that each community is likely to experience as a result of the realignment. The purpose is to pinpoint problems that could occur in public finance as the communities adjust to different patterns of revenues and expenditures. Impacts on the city of Clovis and, to a lesser extent Curry County, may be expected under both scenarios. Portales is likely to be affected only under Scenario II.

Two general types of impact are likely to occur in situations of rapid, military-related growth. In the short term, communities are likely to experience a lag between receipts of revenues and the need for expenditures. Over the longer term, public revenues may expect to receive a lower per capita contribution from military as compared with civilian residents. This section evaluates these general types of impacts in the context of the New Mexico tax structure.

Public finances may be impacted in the short term by the need to fund additional community services that the influx of population will require. Planning and financing of services will be required prior to receipt of tax dollars from new residents, if the influx is to be managed without detriment to community quality of life. Two features of the current fiscal situation may be expected to facilitate this process. First, both cities are fiscally sound. Each has available full general obligation bonding capacity to finance capital and service improvements. Second, the reliance of each city on user fees would tend to relieve the burden on public taxes. However, a possible disadvantage in the current context is the dependence of local governments on revenues from the state. The redistribution of these shared taxes may be less immediately responsive to local needs.

Long term, public finances may expect to recoup less revenue per capita to fund services for military as compared with civilian residents. Differences in military and civilian revenue patterns are particularly relevant in planning for future community expenditures, given that the majority of new residents are military rather than civilian. Two aspects of these differences in revenue patterns are noteworthy.

A first difference is that a lower percentage of military as compared with civilian residents own homes on which property taxes are paid. Data on current Cannon personnel show that 27 percent of total families own their homes (Housing Management Office, 1988); civilian norms are 64 percent (Smith, Rosen, and Fallis, 1988, p. 35). The effect of this lower propensity to own homes may be reduced in the current context because of the lesser dependence of the affected cities on property taxes than service charges as a source of revenue. A second difference is that many purchases by military personnel are made on Base rather than in the community. For example, a recent survey of personnel at Mather AFB, California, showed that the greater proportion of respondents purchased day-to-day items such as grocery, gas, and medical purchases on Base; durables, cars, and furniture were the items most frequently purchased in the community (Department of the Air Force, 1987). Similar types of spending patterns by Cannon personnel would reduce the amount of additional revenue to be gained from gross receipt taxes, on which the two city governments depend for over 60 percent of revenue.

4.1.4.7 Transportation

Increased traffic resulting from realignment is not expected to result in a significant negative impact on the road network in the vicinity of the Base. An estimated peak hour traffic increase of approximately 780 vehicles on U.S. 60/84 is not expected to exceed the practical capacity of 3200 vehicles per hour in each direction. However, service levels may decline during peak traffic, with drivers experiencing reduced speeds and queuing at intersections where there is traffic control. Similar effects may occur on local streets in Clovis, especially on 7th Street. The major potential impact from increased Base traffic is expected to occur at the Base interchange, where the facility appears inadequate to accommodate the increase. The situation may require monitoring by local military personnel, who will be the primary persons affected. A detailed discussion of potential impacts is included in Appendix A.

4.1.5 Airspace Management and Land Use

No significant impacts are expected from usage of the airspace associated with Cannon AFB. For land use, encroachment by off-site development into the CUZs north of the Base is occurring. Detrimental impacts to values and beneficial uses of property could be expected if such encroaching development is not controlled by the local community or county governments.

4.1.5.1 Airspace

There are no modifications or physical area expansions to the existing Controlled Airspace, Special Use Airspace, MTRs, or the Refueling Route associated with the Cannon AFB. However, the number of sorties conducted within each of these airspace elements would increase with the realignment. Each airspace type is discussed below relative to increased subsonic operations.

Controlled Airspace

Operations within Controlled Airspace would increase proportionally with the realignment, adding an estimated 54,000 air traffic operations. This represents nearly a 45 percent increase over present operations. About 85 percent of these operations would be practice low approaches and touch and go landings at Cannon AFB within the control zone and airport traffic area. This overall increase in air traffic operations would have minimal impact on civil use of this airspace.

Special Use Airspace

The Pecos MOA is presently used at nearly full capacity and would continue to experience similar use as a result of the realignment. The overall increased use of this Special Use Airspace would have no effect on civil aviation since it does not conflict with Victor Airways, Jet Routes, and airports in the local vicinity.

Military Training Routes

Eight of the ten MTRs transiting the Pecos MOA and Restricted Areas would double their current use as a result of the realignment. The two non-Cannon AFB MTRs would not be as affected by the realignments but may experience a slight increase in their use. These low-altitude routes would have no impact on commercial aviation; however, VFR general aviation aircraft would have to exercise increased vigilance when operating within these MTRs.

Aerial Refueling Route

AR-602 use would increase proportionally to the aerial refueling requirements of the realignment. Since such operations are conducted at high altitudes under FAA control, civil aircraft would be provided separation through this airspace and would therefore not be affected.

Flight Safety

The number of flying hours at Cannon AFB will double with the realignment. Thus, there is the potential for the number of aircraft mishaps and bird strikes to increase relative to the rates and occurrences described in Section 3.1.5.1.

4.1.5.2 Land Use

Most land surrounding Cannon AFB is irrigated farmland of statewide importance. Due to the type of soil surrounding the Base, the farmland directly adjacent to the Base is not classified as prime or unique (Shaw, 1989, personal communication). The realignment of Cannon AFB is to be done within the current Base boundaries and should not directly impact the surrounding farmlands.

The realignment of Cannon AFB and the required construction translate into both permanent and temporary population increases at the Base, with expected impacts to residential development in surrounding vicinities. Population demographics are discussed in Section 4.1.4.1. The majority of additional residential family housing is anticipated to be built in Clovis. Based on projections of personnel demographics, available housing, and anticipated construction, approximately 1000 to 1700 houses above what is presently available will be needed over the 1990 to 1995 period. The majority of the residential growth is anticipated in the north and northwestern areas of Clovis, toward Cannon AFB.

Residential housing and commercial activities are encroaching into the CUZs north of the Base (see Figure 3.1.5-5). Residential housing is not recommended by the U.S. Air Force in this area but is expected to increase due to the need for housing near the Base. It is also expected that commercial land use will increase along Highway 60/84 as support to the Base, further impacting the CUZs and encouraging further growth. Community or county governments are responsible for adopting land use or zoning controls to prevent incompatible development in the CUZs. Curry County is in the process of developing a master plan and zoning ordinance. Section 4.1.2 describes the potential noise impacts to residential areas near the Base.

4.1.6 Biological Resources

No significant impacts to biological resources associated with Cannon AFB are expected as a result of realignment.

4.1.6.1 Plant Resources

Construction of new facilities on the Base will be the only action to affect plant resources. The areas in which construction will take place will obviously destroy plant life in the location where buildings will be situated. However, these areas have previously been disturbed by human activity to the point that cultivated species comprise almost all of the vegetation at these locations. As indicated in Section 3.1.6, five species of plants that are candidates for the federal list of Endangered and Threatened Wildlife and Plants are found within a 50-mile radius of Cannon AFB. In addition, one of these species, as indicated in Section 3.1.6, is on the state endangered plant species list. At the present time, no survey of the presence or abundance of these plants has been made on the Base. Because of long-term disturbance of the areas in which construction will take place, the presence of protected species is considered unlikely. During construction the presence of any threatened or endangered species will be handled according to Base procedures.

4.1.6.2 Wildlife Resources

As with the plant communities, construction will be the only activity to affect animal resources on the Base. As mentioned previously, these areas have already undergone long-term disturbance, and the construction associated with the action is not anticipated to significantly affect animal communities on the Base. In addition, the expected occurrence of any of the endangered species which were cited as possibly occurring in the vicinity of the Base is considered highly unlikely because of lack of suitable habitat for these species and because of the history of long-term land disturbance.

4.1.7 Native American Values and Archaeological, Cultural, and Historical Resources

No significant impacts to Native American values are expected as a result of the activities at the Base which are related to the action.

4.1.7.1 Native American Values

The land occupied by the Base neither resembles the areas most likely to contain cultural resources (broken terrain along perennial streams), nor have significant cultural resources been discovered during a recent archaeological survey (Trierweiler, 1988). The relatively small area to be affected by construction has, for the most part, already been extensively disturbed by historic and recent Euro-American activity. Therefore, impacts from the Base realignment will not significantly affect Native American economic resources, cultural resources, or values.

4.1.7.2 Archaeological, Cultural, and Historical Resources

The cultural resource survey work already undertaken on Cannon AFB (Trierweiler, 1988) located no sites eligible for listing in the National Register of Historic Places (NRHP). In light of the significant earlier disturbance of the ground surface throughout the Base and the nonstratified nature of sites already located, it is unlikely that any remaining sites maintain the integrity and significance for listing on the NRHP.

The blanket consultation under negotiation with the New Mexico State Historic Preservation Officer (NMSHPO) provides a protocol for determining if specific activities may disturb sites. If potential for such disturbance exists, the NMSHPO may request that a survey be done prior to construction. This process will adequately protect any remaining, undiscovered cultural resources in the areas affected by the installation realignment.

4.1.8 Solid Wastes, Hazardous Wastes, and Hazardous Materials

This section addresses the solid waste aspects of the Base construction, remodeling, and building demolition activities of the realignment. It also covers waste associated with the increased maintenance anticipated from the realignment. The handling and disposition of these resultant wastes are addressed. Solid wastes resulting from realignment will be managed in compliance with all applicable state and federal regulations. No significant impacts are expected.

Construction activities at Cannon AFB resulting from the base realignment will generate construction and demolition waste (solid). Identification and assessment of all materials (buildings) containing asbestos will be completed prior to building disposition (renovation, demolition). Demolition waste containing asbestos will be disposed of in state and federally approved disposal facilities. Normal construction and demolition waste will be placed in the Base Land Fill (Richards, 1989, personal communication).

The operational activities at Cannon AFB involve hazardous materials and generate hazardous wastes. These are described in detail in Section 3.1.8. The activities that will increase as a result of the proposed action include maintenance of aircraft, aircraft corrosion control, vehicle maintenance, and ground support equipment maintenance. Other waste-generating activities include grounds maintenance, munitions storage and disposal, medical services, and laboratory operations (including photo development, nondestructive inspection, and fuels analysis). Wastes generated in maintenance activities include spent solvents, waste oils, contaminated fuels, and greases removed from the equipment. Waste from corrosion control operations include paint chips, waste paint, spent solvents, and spent strippers. Soap, detergents, and small amounts of PD-680 waste are generated by aircraft washrack activities. The current production of waste associated with operation and maintenance of Cannon AFB is described in Section 3.1.8. The waste generated during operation and maintenance of the aircraft is expected to increase by approximately 74 percent (based on proportional increase in planes, Section 2.2.3).

The final disposition of these wastes is controlled by the Defense Reutilization and Marketing Office and Base Civil Engineer. Solid waste generated by activities resulting from the action will be handled, stored, and disposed of in accordance with applicable federal, state, and local regulations. The wastes will be disposed of by recycling or will be placed in state and federally approved land fill. These disposal activities are not anticipated to cause any adverse environmental effects.

The industrial and sanitary wastewater will increase with the increase in on-Base population and number of aircraft. The industrial wastewater is expected to increase (in proportion to the increase in aircraft) by 74 percent, while the sanitary wastewater is expected to increase by approximately 10 percent (based on 110 gallons per capita per day). The increase in wastewater (combined industrial and sanitary) will be handled by expansion of the on-Base stabilization lagoons (see Section 2.2.4 on-Base Construction). This increase in wastewater treatment and disposal is not expected to cause any adverse environmental effects.

The proposed on-Base construction is not anticipated to involve the IRP sites (9, 11, 12, 17, 20) which are continuing under the IRP program. The existing on-Base Fuel Storage Facilities (Section 3.1.8) will be upgraded during Apron modifications. This construction is not anticipated to cause any adverse environmental effects.

4.2 ENVIRONMENTAL CONSEQUENCES FOR THE MOA AREA

The following sections present the environmental impacts associated with the creation of the Mount Dora MOA and use of the associated IR 107, VR 108, IR 109, and IR 111 MTRs used to access the MOA. The "no action" alternative is not feasible because of the needed training required to maintain combat readiness. All flights will be subsonic and will occur over low-density population areas. No significant impacts are expected to result from the MOA proposed action. The Air Force will consult with the U.S. Fish and Wildlife Service on mitigating actions with respect to potential jet collisions with avian species.

4.2.1 Air Quality and Meteorology

In general, the total pollutant impacts should remain less than state and federal standards at the Mount Dora MOA and associated MTRs, and the use of the MOA and MTR corridors should have an insignificant impact on air quality. Further, the ground-level impacts of refueling emissions are expected to be negligible.

All jet engines produce nitrogen oxides, sulfur oxides, carbon monoxide, particulate matter, and unburned hydrocarbons. The amounts vary according to engine design and mode of operation. To estimate site specific air quality impacts that would result from the projected overflights, a simple closed box model methodology was used. The closed box methodology assumes no air exchange between the box and the surrounding air. Aircraft emissions uniformly dispersed within the box are assumed to represent the concentration at ground level. All aircraft were conservatively assumed to fly near the floor of the MOA (1500 feet AGL). Accordingly, a square box was assumed, each side being twice the distance from ground to floor (i.e., 3000 feet). Box length determines both the box volume and the flying time (amount of emissions) in the box. It was assumed that the box length was 1 mile, and aircraft speed was 400 miles per hour. The maximum number of aircraft passing through the specifically defined box space was assumed to be nine per hour. A conservative analysis was performed assuming that emissions from these aircraft would impact the same ground-level location within the same hour. Table 4.2.1-1 lists emission factors in pounds per hour for F-111G aircraft in "military" power mode. The annual emission level results of the closed box analysis using these emission factors are given in Table 4.2.1-1.

The same modeling scenario was applied to the MTR corridor. The MTR annual emissions, also listed in Table 4.2.1-1, are based on the conservative assumption that all of the projected 16,500 sorties from Cannon will be destined for the MOA, using a single MTR corridor.

The maximum hourly emissions for the closed box space are listed in Table 4.2.1-2, along with the resulting ground-level concentrations. All the concentrations are insignificant when compared to corresponding NAAQS and New Mexico State Air Quality Standards as also shown in Table 4.2.1-2. Thus, the total pollutant impacts would remain

Table 4.2.1-1. Aircraft Emission Factors and Annual Emissions

F-111G Emission Factors, Military Mode[1]

(Pounds per hour)

CO	HC	NO_x	TSP	SO_2
11.6	1.46	290	5.08	14.5

Cumulative Annual Emissions[2]

(Tons per year)

	CO	HC	NO_x	TSP	SO_2
MOA	143	18.1	3590	62.9	179
MTR	65.3	8.21	1630	28.6	81.6

1 Source: Seitchek, 1985. The reference manual Aircraft Engine Emissions Estimator does not list the F-111G in either the engine type table or the emissions rate table. As the F-111G is a refitted version of the FB-111, it is assumed that the F-111G emission rates will be identical to those of the FB-111. (Fuel consumption in military mode is 14,520 lb per hour).

2 Based on 16,500 sorties per year and 36,000 flying hours per year (24,750 in MOA, 11,250 in MTR).

Table 4.2.1-2. Maximum 1-Hour Emissions and Resulting Ambient Concentrations

Emissions From Nine F-111G Aircraft [1]

(Box model input, grams per second)

CO	HC	NO_x	TSP	SO_2
13.1	1.65	329	5.77	16.5

Comparison of Ambient Air Standards With Ground Level Concentrations

Pollutant	Averaging Period	Standard State	Standard Federal	Ambient Concentrations
TSP	24 hour primary	none	150 ug/m^3	0.10 ug/m^3
	24 hour secondary	none	150 ug/m^3	0.10 ug/m^3
SO_2	24 hour	265 ug/m^3	365 ug/m^3	0.32 ug/m^3
	3 hour	none	1300 ug/m^3	0.48 ug/m^3
NO_2	24 hour	200 ug/m^3	none	6.51 *ug/m^3
CO	8 hour	10 mg/m^3	9 mg/m^3	0.264 ug/m^3
	1 hour	40 mg/m^3	35 mg/m^3	0.4 ug/m^3
HC	1 hour	NA	NA	.006 ug/m^3

[1] Based on F-111 emission factors, Table 4.2.1-1 and aircraft speed of 400 miles per hour.

* Assumed 100% conversion of NO_x to NO_2 (worst case).

less than the NAAQS, and the projected use of the MOA and MTR corridor(s) would have an insignificant impact on air quality.

Additional sources of emissions attributable to the proposed MOA include usage of non-Cannon AFB based aircraft and mid-air refueling. The ground-level impact of refueling emissions would be negligible because of the small quantity of fuel lost, the distance to the ground, and the flight altitude which is usually greater than the mixing depth. Emissions from non-Cannon based aircraft are listed in Table 4.2.1-3. The emissions were not analyzed using the box model since the frequency of usage for any non-Cannon aircraft is much less than that of the Cannon-based F-111s and therefore is enveloped by the Table 4.2.1-2 results. This same conclusion holds true for the MTR use by non-Cannon aircraft, since the MTR emission levels are much lower than emission levels for the MOA.

4.2.2 Aircraft Noise

The impacts to existing noise levels on the MOA and associated MTRs due to the increased subsonic flight activity are addressed. Noise levels will increase due to TAC use such that 80 more people will be in the "highly annoyed" category for the area under the MOA and 75 more people for the non-MOA MTRs. Mitigation will involve use of low population area overflights and sound insulation of dwellings in significant noise impact areas.

The proposed action of creating a Mount Dora MOA would cause an increase of noise exposures on the land area directly below the proposed MOA, and also on land areas below the low-altitude MTRs which would be used to access and exit the MOA. Additional flight activity on these MTRs due to increased usage of the Melrose Range would also occur. This activity would incur further noise exposure increases under the proposed MOA since IR 107, VR 108, IR 109, and IR 111 traverse some part of that land area.

The resulting noise impacts from these actions are evaluated in this assessment of the Mount Dora MOA environment by reference to:

(a) flight activity in the MOA airspace,

(b) additional flight activity on MTR routes under the MOA airspace, but not associated with the MOA usage, and

(c) flight activity on low-altitude routes IR 107, VR 108, IR 109, and IR 111 between their entry points and exit to the proposed MOA.

Table 4.2.1-3. Mount Dora MOA Emissions From Non-Cannon Based Aircraft

Aircraft Type	Fuel Use (1000 lb/hr)*	Flight Time (hr/yr)	Pollutant Emissions	Tons per year
A-7	8.42	44	CO	0.33
			NO_x	3.9
			TSP	0.12
			HC	0.03
F-16	10.58	492	CO	11.0
			NO_x	70.0
			TSP	0.9
			HC	0.02
F-4E	19.64	72	CO	0.04
			NO_x	7.5
			TSP	0.66
			HC	0.06
RF-4	17.86	16	CO	0.32
			NO_x	1.3
			TSP	0.32
			HC	0.03
F-15	20.64	48	CO	0.45
			NO_x	13.0
			TSP	0.17
			HC	0.04
EC-130	9.20	416	CO	4.1
			NO_x	18.0
			TSP	0.96
			HC	0.77

[1] Bls and B52s will also use the MOA.
[2] All fuel consumption factors are for military power operations.

Source: Kramer, 1989, personal communication.

The number of people below the MOA expected to be "highly annoyed" as a result of increased exposure to aircraft noise from the action will increase from 58 currently to 140. The number of people expected to be "highly annoyed" from MTR flight activity outside the MOA would increase from 525 under current noise conditions to 600 with the addition of operations from the action.

4.2.2.1 Noise Exposures Below the Proposed MOA

These noise exposures would be due to flight activity in the MOA airspace and on MTRs below the MOA airspace.

Flight activity in the MOA would comprise 792 annual sorties by Cannon AFB aircraft and 1036 annual sorties by infrequent users (Guard, Reserve, SAC, etc.) with 80 percent to 90 percent of these sorties conducted at altitudes above 3000 feet AGL. The noise impact of these operations would occur on approximately 5200 square statute miles of land area below the MOA in a random and sporadic manner. On an average active day, for example, the expected use of the MOA would consist of about seven sorties, of which six sorties would be expected to be at altitudes above 3000 feet AGL and none would occur during the period between 2200 and 0700 hours.

The evaluation of potential noise impact at any specific location on the ground below the MOA is therefore based on the statistical probability of an occurrence of an overflight on any average day, and on the noise level that would be caused by such a flyover. This methodology is consistent with noise evaluation procedures used for air base (NOISEMAP) and military training routes (ROUTEMAP).

The evaluation of noise exposure below the MOA is based on the following assumptions:

- 40 percent of the sorties would occur at 3000 feet AGL and 40 percent would occur at 5000 feet AGL.
- Lower altitude sorties would occur at 1500 feet AGL (10 percent) and 2250 feet AGL (10 percent)
- Typical aircraft sorties would be by F-111 aircraft at 540 knots speed and corresponding engine power settings.
- Each sortie would comprise a total flight time within the MOA of 50 minutes (based on an average of 1.2 sorties per hour estimated by Cannon AFB).

Using these MOA usage characteristics, noise levels for F-111 aircraft at each of the assumed altitudes and also assuming that the probability of an overflight is equal throughout the 5200 square statute miles of land area, the average daily DNL at any ground location is estimated to be 49 dB. Of this noise exposure, the contributions caused by flight activity at each of the assumed altitudes would be approximately 40 dB due to flights at 1500 feet and 2250 feet AGL altitudes and approximately 48 dB due to the higher number of flights at 3000 feet and 5000 feet AGL altitudes.

If this random distribution of aircraft movements within the MOA boundaries becomes concentrated, for example in one segment of the MOA (North, East or West segment) on any specific day, then the expected noise exposure under that segment would increase by approximately 5 dB to an average DNL value of about 54 dB.

Using the relationship between DNL and the percentage of people who would be expected to be "highly annoyed" by the noise exposure, it is estimated that of the 6700 people residing under the proposed MOA, about 80 people would be "highly annoyed" at a DNL value of 49 dB. If one-third of this population is exposed to the higher DNL level of 54 dB, the number of persons expected to be highly annoyed would also be about 80 people.

These MOA sorties would partially transit to the MOA via the low-altitude MTRs IR 107, VR 108, IR 109, and IR 111, or would enter the MOA from high altitude flight paths. The noise exposures at entry and exit points to the MOA would be higher than those discussed above for the MOA general area and would be equal to those for each MTR used to access the MOA. These are evaluated as follows. The increased usage of each of the four low altitude MTRs has been estimated by Cannon AFB to comprise an additional 3804 sorties per year by Cannon based F-111 aircraft and an additional 130 sorties per year by non-Cannon based aircraft. Of these, 792 sorties by Cannon-based aircraft would be to the Mount Dora MOA and the remaining 3012 annual sorties would therefore be along the entire MTR (to Melrose Range). The noise exposures caused by these flights have been evaluated for land areas below the MTR segments which (a) contain the full amount of MTR usage (including MOA and non-MOA bound flights) and (b) contain only the non-MOA bound flights which traverse below the proposed Mount Dora MOA. In each case, the ratio of most-active month usage relative to the average monthly usage of each route has been assumed to be that for current MTR usage (Table 3.2.2-1).

Table 4.2.2-1 summarizes the noise impact analysis results for the increased usage of the low-altitude MTRs below the proposed MOA airspace. The land areas and affected resident populations within each DNL noise contour level are larger than for current operations on these same MTRs (Table 3.2.2-2). Within the DNL 65 dB contour the estimated increase in exposed land area is 9 square miles and the estimated increase in exposed resident population is 22 persons. Whereas 58 people are expected to be "highly annoyed" by their current noise exposure, this number would increase to 67 people due to the increase in low-altitude MTR activity under the MOA.

The cumulative noise impact under the proposed Mount Dora MOA would be concentrated in those areas already exposed to low-altitude MTR flights, with the noise impact boundaries being slightly wider due to the increased number of operations. This widening of noise impact areas would cover more people to be exposed to the 65 dB DNL noise level.

Table 4.2.2-1. Noise Impact Due to Current and Future Operations on *Low-Altitude MTRs Under the Mount Dora MOA*

Noise Impact	DNL_{mr}* (dB)	IR-107 New	IR-107 Incr.**	VR-108 New	VR-108 Incr.**	IR 109/111 New	IR 109/111 Incr.**	Total New	Total Incr.**
Land Area Within Noise Contour (Sq. Miles)	65	225	4	0	0	34	5	259	9
	70	0	0	0	0	0	0	0	0
Resident Population Within Noise Contour	65	108	10	0	0	82	12	190	22
	70	0	0	0	0	0	0	0	0

* For the MTRs the contours fall within 1.0 mile of the track centerline.

** This increase is the increase in land area or population relative to current (baseline) noise conditions.

Other areas under the MOA would experience noise from the sporadic use of the MOA airspace. In total, the number of people who would be expected to be "highly annoyed" by the overall increase in aircraft noise exposure under the proposed MOA would be of the order of 140 people compared with the estimate of 58 people "highly annoyed" by current noise exposures. This increase in noise impact is relative to the 6700 people currently residing under the proposed MOA airspace.

4.2.2.2 Noise Exposures Outside the Proposed MOA

The four low-altitude MTRs (IR 107, VR 108, IR 109, and IR 111) overfly a considerable amount of track length outside of the Mount Dora area which would be also subject to increased noise exposure due to increased flight activity. As listed in Table 4.2.2-2, a total of eleven counties in New Mexico have MTR segments (outside of the Mount Dora boundary).

Estimates of the noise impact due to current operations and those increased by the action have been made for each MTR. These noise impacts are shown in Table 4.2.2-3 in terms of land areas and resident populations affected. In total, the land area impacted above the DNL 65 dB noise level would increase by 264 square miles to an overall area of 1180 square miles, and the resident population within this noise contour level would increase by 470 people to an overall total of 2600 persons. The number of people who would be expected to be "highly annoyed" would increase from 525 persons under current noise conditions to a total of 600 with the addition of operations from the actions.

4.2.3 Water Resources

No impact to water resources will result from the Mount Dora MOA and associated MTR operations since there are no ground-level activities.

4.2.4 Socioeconomics

Examination of impacts on population in the area underlying the Mount Dora MOA and the associated MTRs is limited to noise impacts which are discussed in Section 4.2.2.

4.2.5 Airspace Management and Land Use

No significant impacts to airspace and land use under the proposed MOA and associated MTRs are expected to result from the action.

Table 4.2.2-2. Track Lengths and Population Densities in Counties Overflown by IR-107, VR-108, IR-109 and IR-111 Outside of Mount Dora MOA

County	Population Density*	MTR Track Length in Statute Miles IR-107	VR-108	IR-109	IR-111	All
Harding	0.22	3	26			29
Union	0.40	38	40			78
Colfax	0.82			51		51
Mora	2.40	30		29	45	104
San Miguel	1.80		33	35	107	175
Quay	0.96		41	17	27	85
Guadalupe	0.42			33	79	112
Torrance	1.60				14	14
Taos	7.60			25	25	50
Rio Arriba	4.30			67		67
San Duval	3.90			16		16
Total Track Miles		71	140	273	297	781

* Rural population per square mile.

Table 4.2.2-3. Noise Impact Due to Current and Future Operations on Low Altitude MTRs Outside the Mount Dora MOA

Noise Impact	DNL_{mr} (dB)	IR-107 New	IR-107 Incr.*	VR-108 New	VR-108 Incr.*	IR109/111 New	IR109/111 Incr.*	Total New	Total Incr.*
Land Area Within Noise Contour (Sq. Miles)	65	123	36	0	0	1057	228	1180	264
	70	55	55	0	0	645	645	700	700
Resident Population Within Noise Contour	65	152	45	0	0	2448	527	2600	572
	70	104	104	0	0	105	105	209	209

*Increase is relative to current noise impact.

4.2.5.1 Airspace

The proposed location for the Mount Dora MOA is within an area that would have least impact on other military and civil airspace usage, relative to Victor Airways and Jet Routes, airports, Special Use Airspace, and mountains. This area is located entirely within the boundaries of the Albuquerque Air Route Traffic Control Center and has been coordinated with the FAA. The proposal is also within reasonable flying distance of Cannon AFB and is mission compatible with their existing MTRs which transit through this area.

The proposed utilization of the Mount Dora MOA would be 1828 annual sorties by Cannon AFB and other users. A majority of these sorties (80-90 percent) would normally be conducted above 3000 feet AGL. The stratification of the MOA into high- and low-altitude blocks, as well as subdivision into east, west, and north sectors, would permit efficient scheduling and productive joint use of this airspace.

Commercial airliners and other instrument flight rules (IFR) aircraft in the area would be under control of the Albuquerque Air Route Traffic Control Center and clear of, or separated from, military flight activities. These aircraft use the airway structure, which is outside or above the proposed MOA. Visual flight rules (VFR) aircraft are not restricted from flying through a MOA and may request advisory service from Albuquerque Center on the status of military activities. The 1500 feet AGL floor would provide the opportunity for these aircraft to remain below the MOA when operating at the public/private airports or along the highway "flyways." No data is available on the number of private aircraft operating through the proposed MOA area; however, it is indicated to be low density (D. Harner, personal communication).

The MTRs transiting this airspace would experience increased use with the aircraft at Cannon AFB and other staging bases transiting to and from the MOA via these routes. The combined use of VR 108 and IRs 107, 109, and 111 would nearly double from 350 to over 600 sorties per month. Authorized points at which aircraft can enter or exit the MTRs would be modified or established, as necessary, to be compatible with MOA use. The overall increased use of the MTRs would, however, require greater vigilance on the part of general aviation pilots transiting through the area.

Considering all factors discussed above, the proposed Mount Dora MOA would have no impact on commercial aviation and minimal effect on private aviation. An incompatibility may exist between use of non-Cannon MTRs and the Mount Dora MOA. However, this can be resolved through scheduling coordination.

The potential for aircraft mishaps and bird strikes in the Mount Dora MOA would be the same as discussed in Section 4.1.5.1.

4.2.5.2 Land Use

Because the MOA will prohibit flight operations below the 1500-foot-AGL floor, impacts to land use will be primarily related to noise. There is some concern that flight activity may frighten cattle, sheep, horses, and other domestic livestock. Based on a recent review of aircraft overflight effects on domestic animals and wildlife (Manci et al., 1988), all potential impacts on domestic animals are considered to be insignificant. Noise complaints from use of the existing MTRs have not been a serious problem, and it is not anticipated that residential or agricultural land uses will be significantly affected by the action.

Although the proposed MOA overlies one national grassland, one national monument, and two state parks, the action would not result in significant impacts to land uses in the park. Flight instructions for IR 107 and VR 108 state a lateral avoidance for Capulin Volcano National Monument and Black Mesa State Park. The AGL clearance is raised to 1500 feet over Conchas Lake State Park. Four MTRs belonging to the 27th TFW and at least two MTRs belonging to other units currently traverse the proposed MOA. Therefore, the area underlying the proposed MOA is currently exposed to a certain amount of aircraft overflight operations. An increase of sorties that use the MTRs and the creation of the MOA would add to the existing noise disturbances at the parks. It is doubtful that the MOA would present significant impacts or conflicts in land ownership or land-use patterns.

4.2.6 Biological Resources

The proposed action is expected to result in no adverse impacts to plant resources under the MOA and associated MTRs. There will be no adverse impacts to land animals. The potential exists for jet collisions with endangered species (bald eagle, peregrine falcon, and whooping crane) and with migrating geese within the MOA and MTRs. The Air Force will consult with the U.S. Fish and Wildlife Service on mitigating actions to reduce impacts to these species.

4.2.6.1 Plant Resources

As indicated in Section 3.2.6, three species of plants that are candidates for the Federal List of Endangered and Threatened Wildlife and Plants are found in the area under the Mount Dora MOA. In addition, one of these species, as indicated in Section 3.2.6, is on the New Mexico endangered plant species list. Because the impact of the proposed action under the Mount Dora MOA will result in no physical disturbance to the plants or the area in the vicinity of the plants, no adverse impacts are expected to these species.

In addition, increased air traffic on the existing MTRs associated with the Mount Dora MOA is not expected to significantly affect biologically sensitive areas. The

Chama River Canyon wilderness and the San Pedro Parks Wilderness Area are located far enough away to avoid disturbance. The area under the portion of the Pecos Wilderness Area traversed by IR 111 received similar disturbance in the past, and the incremental increase in the number of flights is not expected to significantly degrade the area.

4.2.6.2 Wildlife Resources

As indicated in Section 3.2.6, the U.S. Fish and Wildlife Service has determined that two endangered species, the bald eagle and the peregrine falcon, are known to inhabit the area below the Mount Dora MOA. The New Mexico Department of Game and Fish and the Texas Parks and Wildlife Department indicated that the federally endangered black-footed ferret may be present, but its occurrence is considered unlikely. The New Mexico Department of Game and Fish indicated that the federally designated endangered whooping crane may also be present, and its occurrence is also considered unlikely.

The bald eagle would have the greatest probability of impact from the proposed action of any of the endangered species under the MOA. The highest concentrations of eagles in New Mexico are in the northeastern counties, and there they are found in greatest concentrations near reservoirs and along rivers. In these areas, they often soar to elevations in excess of 1500 feet (the proposed floor of the MOA), and here they would be susceptible to colliding with a jet. The Air Force will consult with the U.S. Fish and Wildlife Service on mitigation actions to reduce impacts to the bald eagle. The peregrine is also found in this area; however, it is in such low numbers that the probability of collision with a jet in the MOA would be slight. This same low probability of collision would occur for the whooping crane. The greatest concentrations of the cranes would be along the Rio Grande River during migration where they might occasionally stray into the MOA area. However, their occurrence in the MOA would be very infrequent.

Along the rivers and around the reservoirs from mid-September to March, there are also large concentrations of migrating Canada geese and snow geese. The greatest numbers are recorded from mid-September to the first of November. These birds, like the eagles, fly at elevations above 1500 feet and will be susceptible to colliding with jets in the MOA. The Air Force will consult with the U.S. Fish and Wildlife Service on actions to reduce impacts to these species.

For the small airspace area of the MOA which is in Colorado, the species of interest is the bighorn sheep. There is no published data to indicate impacts to bighorn sheep from jet overflights. The U.S. Fish and Wildlife Service Willow Beach Field Office in Arizona indicated in a recent survey that "it is suspected that aircraft are having an adverse effect on desert bighorn sheep, especially at calving time" (Gladwin, Asherin and Manci, 1988). If such effects occur they could be readily resolved by appropriate aircraft scheduling.

Other wildlife species beneath the MOA would be anticipated to receive minimal impact from jet overflights. At the lowest flight elevation of 1500 feet, noise levels will initially provoke startled behavior. No long-term impacts are expected.

4.2.7 Native American Values and Archaeological, Cultural, and Historical Resources

No significant impacts to Native American values or to archaeological, cultural, and historical resources are expected as a result of activities occurring in the airspace of the MOA and associated MTRs.

4.2.7.1 Native American Values

Native Americans with historic ties to the proposed MOA and MTR area include the Jicarilla Apache and the Comanche, groups that were removed to distant reservations prior to 1875. Historic Native American occupation of this area was never intense, although camps and villages could occur along perennial drainages. Because considerable time and distance separates contemporary Native Americans from the proposed MOA area, it is highly unlikely that use of the proposed MOA will have an impact on Native American values and concerns.

The Jicarilla Apache and Comanche tribes were consulted in preparation of this DEIS. The Jicarilla Apache tribe of New Mexico indicated it did not have cultural concerns related to the proposed MOA, providing that no sonic booms or land-disturbing activities occur as a result of the MOA. The Comanche tribe of Oklahoma indicated that it had some cultural concerns related to the proposed MOA, but did not identify those concerns.

4.2.7.2 Archaeological, Cultural, and Historical Resources

The proposed MOA has only one partially publicly owned Euro-American cultural resource, the Rabbit Ears area in Union County, New Mexico. The remainder of the Euro-American resources identified lie in private hands.

Impacts on Euro-American historical resources in the area beneath the MOA and MTRs will be solely a result of increased levels of noise. Aircraft using the MOA will be flying subsonically at a minimum altitude of 1500 feet AGL. This is expected to have no impact on structures, trails, or Euro-American archaeological sites. No action is required to mitigate impacts.

4.2.8 Solid Wastes, Hazardous Wastes, and Hazardous Materials

No impact associated with solid waste will result from the Mount Dora MOA operations.

4.3 ENVIRONMENTAL CONSEQUENCES FOR THE MELROSE RANGE AREA

The following sections present the environmental impacts associated with the increased use of the Melrose Range and the associated VR 100, IR 113, VR 114, VR 125, VR 1107, and VR 1195 MTRs used to access the Range. The "no action" alternative is not feasible because of the needed training required to maintain combat readiness. All flights will be subsonic and occur over low-density population areas. No significant environmental impacts are expected as a result of the increased use of Melrose Range and associated MTRs.

4.3.1 Air Quality and Meteorology

The analysis presented below indicates that the resulting ambient concentrations from the increased use of the Melrose Range and associated MTRs will have no significant impact on air quality.

The increased use of the Melrose Range by Cannon F-111s is expected to result in an increase of approximately 2750 additional sorties per year (yielding 520 additional flight hours within the Range airspace). Proportionate increased use of associated MTRs will occur. These increases in aircraft use will cause an increase in ambient air quality emission levels. The ambient concentrations from these emissions have been calculated by using a simple closed box model. Methodology for this type of model consists of choosing an appropriate region of airspace through which the aircraft will be flying. By choosing a maximum number of aircraft within the box during a 1-hour period, a worst-case scenario can be simulated which will result in the maximum possible concentrations within the chosen airspace. The dimensions of the box analyzed are 500 meters in width with a height of 300 meters. The length of the box is determined solely by the assumed flight time of 1 minute, which results in a box length of 10.7 km. It is conservatively assumed that a maximum of nine aircraft will fly through the box during any 1-hour period. The maximum hourly emissions to the box are listed in Table 4.3.1-1. The increased emissions due to the increased Range use, in tons per year, are listed in Table 4.3.1-1 and are based on a conservative total Range flying time of 1 hour per sortie.

When compared with the NAAQS and State of New Mexico Air Quality Standards, the resulting ambient concentrations from the action will have a minimal impact on local air quality. All concentrations are well below the applicable standards as shown in Table 4.3.1-2. No NAAQS exists for hydrocarbons. The MTR analysis results are given in Section 4.2.1-1. As shown in Table 4.2.1-1, the annual emission levels are low when compared to MOA levels, which are well within NAAQS and state standards.

Table 4.3.1-1. Emission Totals Due to Increased Melrose Range Use

Pollutant	Emission Rate [1] lb/hr	g/sec	Tons per Year [2]
Particulates	5.08	0.641	7.0
SO_2	1.0	0.126	1.4
CO	11.6	1.46	16
NO_x	290	36.6	400

[1] The emission rates are based on one F-111 in flight. The reference manual Aircraft Engine Emissions Estimator does not list the F-111G in either the engine type table or the emissions rate table. As the F-111G is a refitted version of the FB-111, it is assumed that the F-111G emission rates will be identical to those of the FB-111.

[2] A total of 2750 total flight hours were used to calculate the yearly totals in tons per year which are based on the conservative assumption of 1 hour of Range flying time per sortie.

Table 4.3.1-2. Comparison of Emission Standards with Resulting Ambient Concentrations

Pollutant	Averaging Period	Standard State	Standard Federal	Ambient Concentrations [1]
TSP	24-hr primary	none	260 ug/m^3	0.1 ug/m^3
	24-hr secondary	150 ug/m^3	150 ug/m^3	0.1 ug/m^3
SO_2	24-hr	265 ug/m^3	365 ug/m^3	0.0023 ug/m^3
	3-hr	none	1300 ug/m^3	0.0034 ug/m^3
CO	8-hr	10 mg/m^3	10 mg/m^3	0.264 ug/m^3
	1-hr	15 mg/m^3	40 mg/m^3	0.4 ug/m^3
NO_2	24-hr	200 ug/m^3	none	6.51* ug/m^3

[1] The ambient concentrations are calculated by assuming nine planes in flight within the model parameters.

* Assumed 100 percent conversion of NO_x to NO_2

4.3.2 Aircraft Noise

The impacts to existing noise levels for the Range and associated MTRs due to the increased subsonic flight activity are addressed. Noise levels will increase due to TAC use such that 5 more people will be in the "highly annoyed" category for the Range and 160 more people for the MTRs. Mitigation will involve use of low population area overflights and sound insulation of dwellings in significant noise impact areas.

4.3.2.1 Melrose Range

The methodology and assumptions used to model the flight operations and noise exposures for Melrose Range are described in detail in Section 3.3.2.1 of this document. In estimating the resulting noise exposures for the proposed action of F-111 aircraft realignment at Cannon AFB, the number of sorties that would be flown by F-111 aircraft is anticipated to increase from 3628 sorties per year (during 1988-89) to 6378 sorties per year (after realignment). The increase of 2750 sorties per year (by realigned aircraft) would cause an increase in the daily passes over the range of about 51 passed per day during the most active month of range usage.

These additional overflights have been added to the track usage (numbers of passes per day) on tracks 3AN and 3BN referenced in Figure 3.3.2-1 and Table 3.3.2-2 for current baseline operations. The resulting combination of baseline and realigned aircraft operations which would occur at Melrose Range has been used to estimate the noise exposures in contours of DNL 65, 70 and 75 dB, by means of the Air Force NOISEMAP model. These noise exposure estimates do not include other future increases in Range usage by SAC. The resulting DNL noise contours for the increased usage of Melrose Range (including current and realigned aircraft operations) are shown in Figure 4.3.2-1.

Table 4.3.2-1 shows estimates of the land areas and resident populations within the DNL contours for both current and realigned aircraft usage of the Range, together with the respective increases in noise impact due to the realigned aircraft (only). The increases in land areas enclosed by the DNL 65 dB contours are of the order 24 square miles. Within the enclosed DNL contours, the increase in affected residents would be of the order of 28 persons who would be added from outside the current DNL 65 dB contour to within the contour. The number of persons who would be expected to be highly annoyed due to aircraft noise from the Range operation would increase from about 20 persons (currently) to about 25 persons for the projected case of added (realigned) aircraft operations.

In addition to the realigned aircraft usage of Melrose Range, there is an anticipated growth of Range usage by SAC. This projected growth of operations is tabulated in Table 4.3.2-2 and shows that the current annual sorties using the Range are anticipated to increase from the current 5554 sorties per year, to 10,685 sorties per year.

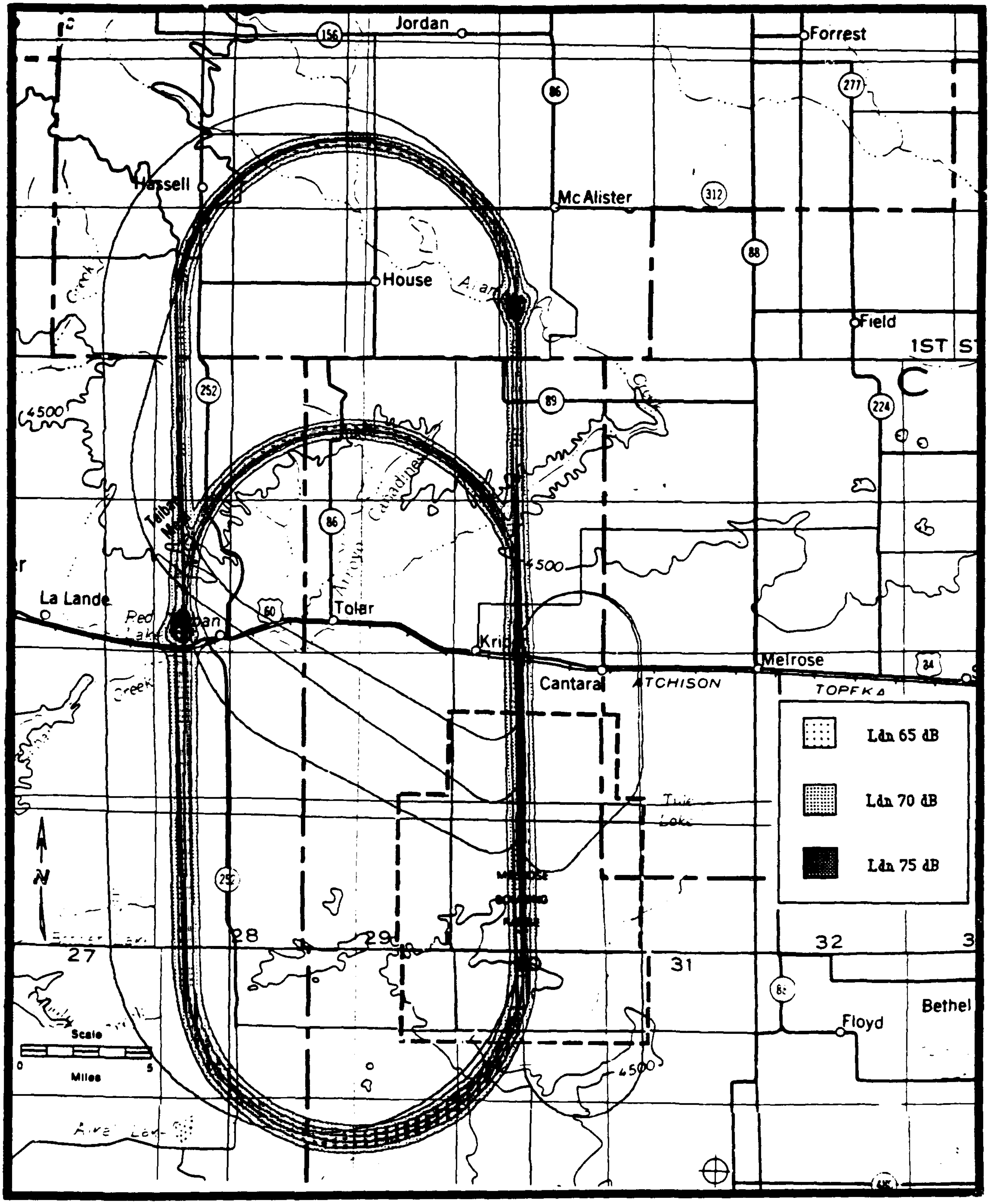


Figure 4.3.2-1. DNL Noise Contours for Melrose Range Based on Current and Realigned Aircraft Operations

Table 4.3.2-1. Estimated Noise Impact Due to Melrose Range Aircraft Operations with Realigned Aircraft Included

Noise Impact	DNL Contour Level, dB 65	70
Total Land Area (sq. miles)		
Current Operations	60	30
With Realigned Aircraft	84	49
Increase*	24	19
Resident Population		
Current Operations	74	37
With Realigned Aircraft	102	60
Increase*	28	23

**Increase relative to current conditions.*

Table 4.3.2-2. Projected Growth in Annual Aircraft Sorties Using Melrose Range (Sorties per Year)

Aircraft Type	Current Sorties	SAC	Realigned Aircraft	Total
F-111	3638			3638
A-7	1477	0		1477
A-6	47	0		47
F-18	74	0		74
B-1B	48	974		1022
B-52G	91	907		998
FB-111	8	500	2750	3258
Other	171	0		171
	5554	2381	2750	10685

*Increase relative to current conditions.

The increase of 5131 sorties per year includes 2381 by SAC, and 2750 by the realigned aircraft.

These cumulative operations have been used to estimate the respective growth in noise exposure at Melrose Range. Each case, with the addition of the projected growth in non-realigned aircraft (SAC) and with the total cumulative operations, has been analyzed by means of the NOISEMAP model. The resulting noise contours for DNL values of 65 dB, 70, and 75 dB are shown in Figures 4.3.2-2 and 4.3.2-3, respectively, for each case. Table 4.3.2-3 shows the estimated noise impacts for these cumulative operations and for current (reference) operations.

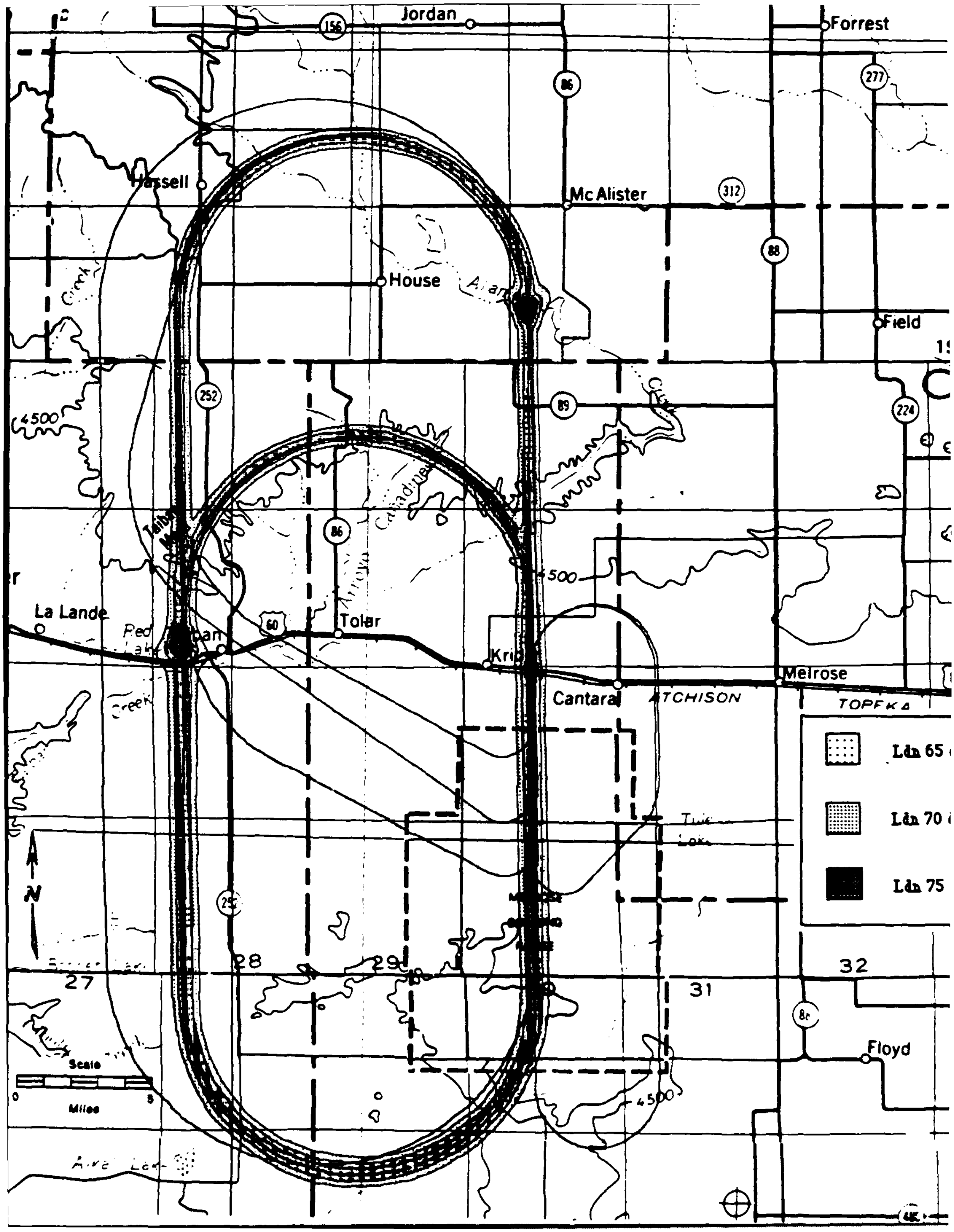
The noise impacts shown in this table are based on the land areas estimated for each contour level. Population estimates for the cumulative case, inclusive of realigned and SAC aircraft operations, were estimated partly by field surveys (as discussed in Table 3.3.2-3 for current conditions). The intermediate case of growth without realigned aircraft has been estimated by use of population densities rather than by surveys.

For the cumulative impact case, the area within the DNL 65 dB contour would increase from 60 square miles (currently) to about 88 square miles, and would include a further 34 residents. The number of persons expected to be highly annoyed by the Range aircraft noise would increase from about 20 persons (currently) to about 30 persons for the cumulative impact. This estimated number would be 26 persons for the case of growth in operations but without the realigned aircraft. These estimates are again based on the relationship between DNL levels and the percentage of people expected to be highly annoyed (Figure 3.1.2-2 in Section 3).

4.3.2.2 Other Low-Altitude MTRs

The current noise impact of flight operations on MTRs IR 113, VR 100/125, VR 1107/1109, and VR 114 is addressed in Section 3.3.2.2 of this EIS. Projected future flight activity on these routes is listed in Table 4.3.2-4 and comprises a doubling of flights (sorties) by F-111 aircraft on IR 113, VR 100/125, and VR 114 due to the realigned aircraft. The resultant noise impact of these actions is estimated to cause an increase of the land areas enclosed by the DNL_{mr} 65 dB to 70 dB contour levels, as listed in Table 4.3.2-5. The resultant increase of resident populations located within the expanded panel areas is also listed in the table. These increased noise impacts due to the realigned aircraft amount to a 42 percent increase in land area (265 square miles) and population (347 persons) within the DNLmr 65 dB contour level.

In general, all of these land areas and resident populations are currently experiencing noise from operations on these routes. Thus, all of these residents who would be within the projected DNL 65 dB contour are currently outside of the 65 dB noise exposure area. They would therefore experience higher levels of noise exposure due to the increased numbers of operations. The highest noise impact under these routes would be under IR 113 and VR 114, where noise exposures would increase to greater than 70 dB DNL_{mr}. More than 200 residents would be expected to be impacted at this



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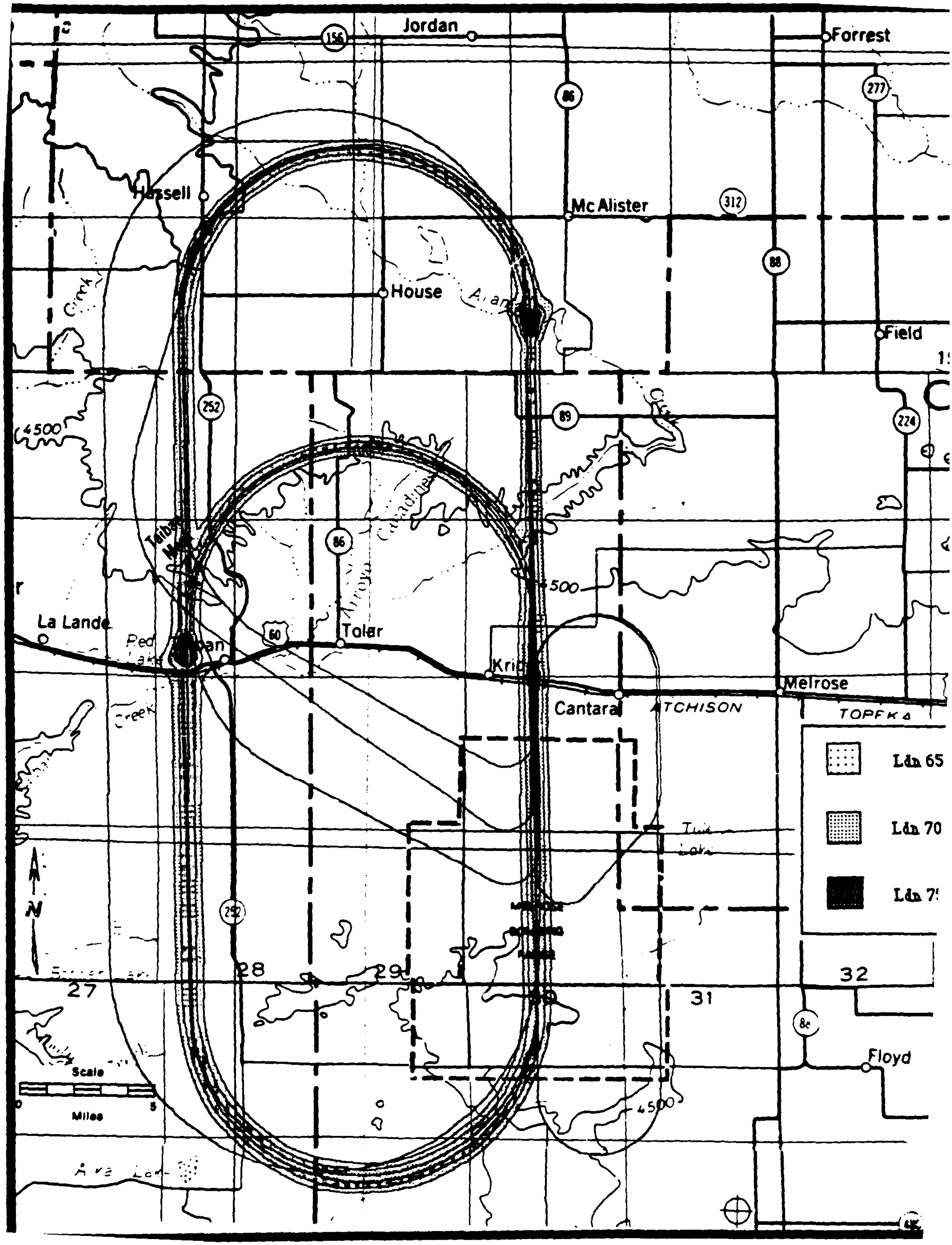
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Ldn 65
Ldn 70
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Scale
Miles
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Floyd
4500

Table 4.3.2-3. Estimated Noise Impact Due to Increased Usage of Melrose Range by TAC and SAC

(Cumulative Impacts)

Noise Impact	DNL Contour Level, dB 65	70
Total Land Area (sq. miles)		
Current	60	30
Current + SAC	82	49
Current + SAC + Realigned Aircraft	88	54
Resident Population		
Current	74	37
Current + SAC	100	60
Current + SAC + Realigned Aircraft	108	66

Table 4.3.2-4. Projected Low-Altitude MTR Activity on IR 113, VR 100/125, VR 1107/1195, and VR 114

Information	Low-Altitude Military Training Route IR 113	 VR 100/125	 VR 1107/1195	 VR 114
Route Length (Miles)	333	365	276	198
Average Monthly Sorties	200.0	42.0	208.3	200.0
Most Active Month Sorties	320	67	333	320
Ratio (Most Active/Average)	1.6	1.6	1.6	1.6
F-111 Use (%)	100	100	0	100
Other Users			A-7 (90%)	

No nighttime operations (2200 to 0700 hours) on these routes.

Table 4.3.2-5. Noise Impact Due to Increased F-111 Aircraft Operations on MTRs IR 113, VR 100/125, and VR 114

Noise Impact	DNL_{mr}* (dB)	IR 113 Current	IR 113 Future	IR 113 Increase	VR 100/125 Current	VR 100/125 Future	VR 100/125 Increase
Land Area Within Noise Contour (sq. miles)	65	399	565	166	0	0	0
	70	0	229	229	0	0	0
Resident Population Within Contour	65	463	656	193	0	0	0
	70	0	266	266	0	0	0

Noise Impact	DNL_{mr} (dB)	VR 114 Current	VR 114 Future	VR 114 Increase	All Three Routes Current	All Three Routes Future	All Three Routes Increase
Land Area Within Noise Contour (sq. miles)	65	238	337	99	637	902	265
	70	0	137	137	0	366	366
Resident Population Within Contour	65	369	523	154	832	1179	347
	70	0	212	212	0	478	478

* For IR 113 and VR 114 the contours fall within 0.9 mile of the track centerline.

level under each of these routes. About 290 residents would be expected to be highly annoyed by the current aircraft noise exposures under these routes. This number would be expected to increase to about 450 due to the increased noise exposure. The noise impact of increased operations due to non-realigned aircraft (A-7 and others) is shown in Table 4.3.2-6, where the total (cumulative) impact for all of the routes discussed in this section are also shown. The impact under VR 1107/1195 is estimated to increase the land area enclosed by the 65 dB DNL_{mr} noise contour, but will not cause noise exposures greater than 70 dB. In terms of impacted residents within the DNLmr 65 dB contour, the increase would be about 8 percent (227 persons) relative to current conditions.

Taking the cumulative impact of all the routes discussed in this section, about 570 people will have increased noise exposure to a DNL_{mr} level of 65 dB or higher. A total of about 480 persons would have their noise exposure increased from between DNL_{mr} 65 to 70 dB, to a level of just above 70 dB. For this cumulative case, the number of people who would be expected to be highly annoyed by the MTR aircraft noise would increase from about 960 under current conditions to about 1150 for the anticipated future case.

4.3.3 Water Resources

There are no permanent surface water bodies located within the boundaries of Melrose Range. The groundwater source for the region is the Ogallala Formation. It supplies irrigation water in the vicinity of the range. The increased use of the Range due to the increase in the Number of Aircraft at Cannon AFB is not expected to have any adverse affect upon the water resources on the Range. The inert munitions delivered to the Range during training exercises does not represent a significant source of pollution to surface or groundwater. The potential for hazardous contaminant migration from the identified (Section 3.3.8) sites at Melrose Bombing Range is extremely low because of the following factors: (1) the characteristics of the wastes (not conducive to transport), (2) the presence of a low-permeability caliche layer below the surface, (3) the great depth to groundwater, and (4) the very low net precipitation. Sections 3.3.8 and 4.3.8 provides a complete description of the munitions and their disposal.

No impact to water resources will result from MTR operations since there are no ground-level activities.

4.3.4 Socioeconomics

Impacts on population within the noise contours for Melrose Range and for the Melrose Range MTRs are discussed in Section 4.3.2.

Table 4.3.2-6. Noise Impact Due to Increased Aircraft Operations on MTRs VR1107/1195 and Cumulative for All Four Routes

Noise Impact	DNL_{mr}* (dB)	VR 1107/1195			Four Routes (Cumulative)		
		Current	Future	Increase	Current	Future	Increase
Land Area Within Noise Contour (sq. miles)	65	1716	1865	149	2353	2767	414
	70	0	0	0	0	366	366
Resident Population Within Contour	65	2616	2843	227	3448	4022	574
	70	0	0	0	0	478	478

* For the MTRs the contour falls within 3.4 miles of the track centerline.

4.3.5 Airspace Management and Land Use

No significant impacts to airspace and land use are expected as a result of the increased use of Melrose Range and associated MTRs.

4.3.5.1 Airspace

There are no proposed modifications or physical area expansions to the existing Special Use Airspace and MTRs associated with the Melrose Range. However, the number of sorties conducted within these airspace elements would increase with the realignment. Use of R-5104A/B, R-5105, the Melrose Range, and associated MTRs would increase by 2218 daytime sorties and 250 nighttime sorties. This represents a 43 percent increase over the current use of this range complex. This level of use would have no effect on civil aviation since it does not conflict with Victor Airways, Jet Routes, and airports in the local vicinity. As discussed in Section 4.1.5.1, the increased use of the MTRs would necessitate increased vigilance by VFR general aviation aircraft.

The potential for aircraft mishaps in the Melrose Range would be the same as discussed in Section 4.1.5.1.

4.3.5.2 Land Use

Increasing sorties into the Melrose Range may create noise annoyances for persons engaged in outdoor agricultural and recreational activities. The Air Force wants to convert crop land within the bombing range to the less intensive use of cattle grazing over the next 5-10 years (see Section 3.3.5.2). A recent study (Manci, et al. 1988) noted that potential impacts on domestic animals from aircraft overflights is considered to be insignificant. Increasing sorties into the range and along the MTRs are not expected to significantly affect agricultural activities in the area.

Increasing flights along the MTRs that are located near recreation areas would not result in significant impact to land uses in the park. Flight instructions for the routes IR 113, VR 100, VR 125, VR 1107, and VR 1195 stipulate a lateral avoidance for Sumner Lake Recreation Area and Gran Quivira National Monument. A minimum AGL clearance of 1000 feet is instructed for flights over Lincoln National Forest. The increase in sorties for these routes would add to the existing noise disturbances at these parks. However, increasing sorties along the MTRs should not have significant impacts in land ownership or land use patterns.

4.3.6 Biological Resources

No significant impacts to biological resources are expected as a result of the increased use of Melrose Range and associated MTRs.

4.3.6.1 Plant Resources

Practice bombing, target placement, and periodic disposal activities will affect vegetation and wildlife habitats, but the impacts will be confined to areas of existing, ongoing impacts of a similar nature. Any incremental increase in local disturbances to the shortgrass prairie at the Range is considered insignificant.

4.3.6.2 Animal Resources

Continuation of current range activities will affect wildlife and cattle on the Range, but the impacts will be confined to areas of existing, ongoing impacts of a similar nature. The incremental increase in local disturbances to wildlife is considered insignificant.

As indicated in Section 3.3.6.1, IR 113 is located near the Bitter Lake National Wildlife Refuge where there is a heavy concentration of wild fowl. There is a "caution" advisory already in existence in the Special Operation Procedures for this route, and additional traffic over this route is not expected to significantly affect the Refuge resources.

4.3.7 Native American Values and Archaeological, Cultural, and Historical Resources

No significant impacts to Native American values or to archaeological, cultural, and historical resources are expected as a result of activities at Melrose Range and associated MTRs.

4.3.7.1 Native American Values

Access to the Range by Native Americans is not changing. Therefore, no additional impact to Native American values beyond the impacts that currently exist is expected. Because this is an existing range, there is no impact associated with the proposed increased aircraft use.

4.3.7.2 Archaeological/Cultural/Historical Resources

Archaeological, cultural, and historical resources can be affected when the ground is disturbed or access is increased. Ground disturbance directly destroys some materials. Less obviously, ground disturbance destroys the context for artifacts. This limits the scientific value of archaeological, cultural, or historic sites. Within a bombing range, impacts can result from construction of new roads to new targets, construction of new facilities, and the direct impact of practice munitions.

The density of archaeological sites at the Melrose Range is low, averaging only 3.2 sites per square mile. Most (99.96 percent) contain less than 25 artifacts on the surface. Historic sites are even more rare at 0.06 sites per square mile (Mariah Associates, 1988). Major historic sites, such as the Boys Ranch property, are outside of the target areas or completely off the Range. This low density suggests that localized activity is unlikely to affect many sites. Most sites are small and provide only limited scientific information.

The increase in aircraft use of the Melrose Range will include construction of new targets in the existing impact area (Moriarty, letter of 27 June 1989). Human presence will increase through longer operational hours in this previously disturbed area. Impacts from the bombing of new and existing targets in this established impact area are probably low. Site density is low, the ground has been disturbed for many years, and only limited additional disturbance is expected. It is unlikely that significant impacts to archaeological, historical, or cultural resources will occur in these areas.

Since any MTR use impact is limited to noise level effects, no impact to archaeological, cultural, and historical resources is expected.

4.3.8 Solid Wastes, Hazardous Wastes, and Hazardous Materials

The Melrose Range provides ordnance delivery training for aircrews. In engaging targets on the Range, a variety of ordnance is used as described in Section 3.3.8. The increase in aircraft use of the Range will increase the quantity of ordnance delivered on the target areas. The type of munitions to be used will not change; however, the increased use (delivery) of this ordnance will produce waste in addition to the quantity currently generated. The waste consists of concrete, cast iron, steel, tin, aluminum, and synthetic material (from parachutes). The increased use of the Melrose Range is expected to generate from 5 to 8 tons of munitions waste per month which requires disposal (Sgt. Silva, EOD, 1989, personal communication). The ordnance delivered during training is recovered and disposed of by Explosive Ordinance Disposal (EOD) teams. The expected 48 percent (6.5 tons avg/mo x 12 mo/yr divided by 163 tons/yr current annual) increase in annual munitions waste generation will require additional disturbance in the ordnance burial site(s). The only hazardous (explosive hazard) materials are the dud (unexploded) smoke charges which are destroyed by EOD personnel prior to disposal of the spent munitions. Burial of spent ordnance is not a federal- or state-regulated (no permit required) activity, and no formal plans with landfill volumes exist. The impact of burying the additional munitions residue is limited to the land disturbance associated with the excavation and covering of the waste. Disposal of the additional munitions residue is not expected to produce a significant adverse effect upon the human environment. No new impact due to disposal of outdated or damaged explosive materials (Thermal Treatment Pit, Section 3.3.8) is expected since the type and quantity of waste explosives disposed of will not change.

CHAPTER 5.0 - REFERENCES

This chapter contains reference and contact citations based on the following breakout:

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5.2 Telephone and In Person Contacts

5.3 Agencies Contacted by Letter

5.4 Realignment Scoping Meeting Participants and Contacts

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Sandoval, A. V., 28 July 1989. State of New Mexico Department of Game and Fish. Personal Communication with R.E. Ambrose (SAIC).

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Schaffer, B., 3 October 1989. Federal Aviation Administration, Lubbock, Texas. Personal Communication with R.A. Thompson (SAIC).

Schaffer, H., 16 August 1989. New Mexico-American Water Company, Clovis, New Mexico. Personal Communication with S. K. Perry (SAIC).

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Shafer, D., 28-30 June 1989. Mayor, City of Portales, New Mexico. Personal Communication with J. A. Bradbury (SAIC).

Shaw, D. August 1989. Curry County Soil Conservation Service, Clovis, New Mexico. Personal Communication with John Rush (SAIC).

Silvan, Sgt., 14 November 1989. Explosive Ordnance Disposal. Personal Communication with JB Turnmire (SAIC).

Smith, G., 28-30 June 1989. City of Clovis, New Mexico. Personal Communication with J. A. Bradbury (SAIC).

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Swaney, R.W., 31 July 1989. Department of the Air Force, HQ TACK/XPP. Personal Communication with HQ TACK/DEE.

Tello-Sanchez, R., 10 August 1989. Economic Research and Analysis, Texas Employment Commission. Personal Communication with S.B. Watson (SAIC).

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Valdez, C., 22 September 1989. Regional Manager for New Mexico State Parks. Personal Communication with John Rush (SAIC).

Walk, Haydel, & Associates, Inc., 13 June 1988. Installation Restoration Program, Volumes I-IV, prepared for U.S. Army Corps of Engineers, Omaha District, Nebraska.

Walker, H., 12 July 1989. Community Planning Office, Cannon AFB. Personal Communication with J. A. Bradbury (SAIC).

Wall, S., 22-23 June 1989. Exchange Manager AAFES, Cannon AFB. Personal Communication with J. A. Bradbury and S.B. Watson (SAIC).

Wilkerson, J., 28-30 June 1989. Clovis Housing Authority, Clovis New Mexico. Personal Communication with J. A. Bradbury (SAIC).

Williams, K., 23 and 28 July 1989. Environmental Planning Office, Cannon AFB. Personal Communication with S.K. Perry (SAIC).

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Wright, J., 28-30 June 1989. Curry County Commission. Personal Communication with J. A. Bradbury (SAIC).

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Calvert, Jeffery, Captain, 27 TFW/JA, Base Legal Office
Cassidy, Wilford, Captain, HQ TAC/DE, Environmental Planning Division
Corbett, William, Lt. Colonel, 523 TFS/CC, Operations
Earls, Garry, Lt. Colonel, 27 CES/DE, Base Civil Engineer
Gravette, Ray
Hill, Roy K., Chairman of the Portales and Roosevelt County Board of Economic Development
Holden, T.L.
Holt, Bob C.
Kent, Thomas, Supervisor of Portales Postal Operations
Maxwell, Helen, Office of Economic Adjustment
Parker, Alva, Rancher
Shafer, Don, Mayor of Portales and Vice-Chairman of the Planning Authority for Cannon Expansion (PACE)
Speck, George, General Manager of Sunland Incorporated

28 March in Clovis, New Mexico

Benson, David, Colonel, 27 CSG/CC, Combat Support Group Commander
Calvert, Jeffery, Captain, 27 TFW/JA, Base Legal Office
Cassidy, Wilford, Captain, HQ TAC/DE, Environmental Planning Division
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Moss, James, Mayor of Clovis and Chairman of the Planning Authority for Cannon Expansion (PACE)

CHAPTER 6.0 - LIST OF PREPARERS

This chapter lists the preparers of the DEIS. Each individual who made a significant contribution to the development, preparation, or drafting of the DEIS is included in the listing. The professional credentials of each author are provided along with the person's specific contribution in preparing this DEIS. With the exception of Mr. D. Brown of Wyle Laboratories, all preparers are SAIC employees.

Name	Credentials	Contribution
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J.A. Bradbury	Ph.D. Public and International Affairs, University of Pittsburgh; M.A. Public Affairs, Indiana University of Pennsylvania; B.Sc. Sociology/Economics, London School of Economics and Political Science; 13 years of experience in socioeconomic impact assessment and policy research.	Socioeconomics Factors Related to Increased Personnel

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S. McKown	B.S. Biology, West Texas State University, Canyon, Texas; 15 years of experience in ecological and biological studies and assessments.	Biological Environment
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K. Plotkin	Ph.D. Aerospace Engineering, Cornell University; M.S. Eng. Aerospace, Cornell University; B.S. Aerospace Engineering, Polytechnic Institute of Brooklyn; 23 years of experience.	Noise Factors
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W.W. Tolbert	Ph.D. Ecology, University of Tennessee; M.S. Ecology, University of Tennessee; B.S. Biology, Wake Forest University; A.A. Biology, Wingate Jr. College; 19 years of experience.	Quality Assurance
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APPENDIX A
SOCIOECONOMICS
ADDITIONAL EXPLANATIONS, FIGURES, AND EARNINGS

APPENDIX A
SOCIOECONOMICS
Additional Explanations, Figures, and Tables

Appendix A provides detailed data and discussion of the basis for the socioeconomic assessment included in Chapters 3 and 4. The structure of the appendix parallels that of the main body of the document and is divided into two sections. Section A.1 includes additional information related to Section 3.1.4 (affected socioeconomic environment). Section A.2 includes additional information related to Section 4.1.4 (socioeconomic consequences).

A.1. DESCRIPTION OF THE AFFECTED SOCIOECONOMIC ENVIRONMENT

A.1.1 Population, Employment, and Earnings

Tables A.1-1 to A.1-5 provide detailed data concerning employment and wages and salaries in the defined region of influence (ROI). The data support the description of the existing structure and trends in employment and earnings in the ROI given in Section 3.1.4.1.

A.1.2 Housing

This section presents additional tables related to the discussion presented in Section 3.1.3.2. Table A.1-6 shows the estimated distribution of housing demand for government-controlled housing by grade and bedroom count in July 1989. Similarly, Table A.1-7 presents the corresponding distribution of demand for community housing. These distributions were used as input for the estimation of housing deficits using the methodology required by the Segmented Housing Market Analysis. Those interested in further details regarding this estimation procedure should refer to the Segmented Housing Market Analysis for Cannon Air Force Base New Mexico (SAIC, 1989).

Housing prices in the area surrounding Cannon AFB have historically been low, relative to national averages. For example, in 1986, the average new single-family home sold for $79,196 in Clovis (Clovis Board of Realtors, 1989a). The comparable figure for the United States was $92,000 (Bureau of the Census, 1989).

A.1.3 Community Services

Table A.1-8 presents additional data related to the discussion of medical services in Section 3.1.4.3. The data show hospital use for the three hospitals serving the two-county region.

Table A.1-1. Current and Projected Appropriated Civilian and Military Personnel by Rank

Rank	Current Number	Expected Increase	Projected Number
Civilian	445	77	522
Military			
0-6	9	6	15
0-5	27	14	41
0-4	63	31	94
Total 04/05	99	51	150
0-3	177	85	262
0-2	62	29	91
0-1	40	18	58
Total 01/03	279	132	411
E-9	16	8	24
E-8	30	14	44
E-7	223	104	327
Total E7/E9	269	126	395
E-6	392	183	575
E-5	787	368	1155
E-4	973	455	1428
Total E4/E6	2152	1006	3158
E-3	487	228	715
E-2	226	106	332
E-1	27	13	40
Total E1/E3	740	347	1087
Total Military	3539	1662	5201
Total Personnel	3984	1739	5723

Source: Housing Management Office, 1989b. Current distribution reflects personnel assigned in July 1989.

Table A.1-2. Civilian Labor Force, Employment, Unemployment, and Unemployment Rate in the Two-County Region[1]

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Curry County									
Civilian Labor Force	15,688	15,414	15,670	15,916	16,358	16,379	17,321	17,036	16,479
Employment	14,678	14,510	14,725	14,548	15,317	15,167	16,058	15,653	15,178
Unemployment	1010	904	945	1368	1041	1212	1263	1383	1301
Rate	6.4%	5.9%	6.0%	8.6%	6.4%	7.4%	7.3%	8.1%	7.9%
Roosevelt County									
Civilian Labor Force	6666	6573	6768	6905	6866	7062	7336	7359	7176
Employment	6258	6275	6407	6459	6553	6682	6941	6925	6756
Unemployment	408	298	361	446	313	380	395	434	420
Rate	6.1%	4.5%	5.3%	6.5%	4.6%	5.4%	5.4%	5.9%	5.9%
Two-County Region of Influence									
Civilian Labor Force	22,354	21,987	22,438	22,821	23,224	23,441	24,657	24,395	23,655
Employment	20,936	20,785	21,132	21,007	21,870	21,849	22,999	22,578	21,934
Unemployment	1418	1202	1306	1814	1354	1592	1658	1817	1721
Rate	6.3%	5.5%	5.8%	7.9%	5.8%	6.8%	6.7%	7.4%	7.3%

[1] Estimates are not seasonally adjusted and are subject to revision. Employment represents total household employment by place of residence.

Source: Economic Research and Analysis, New Mexico State Department of Labor, February 1989.

Table A.1-3. Wage And Salary Employment[1] Annual Averages in the Two-County Region

Ownership and Industrial Sector	Curry County 1987	Curry County 1986	Roosevelt County 1987	Roosevelt County 1986	Total 1987	Total 1986
Private Ownership						
Agriculture, Forestry, and Fish	232	225	110	138	342	363
Mining	0	0	28	0	28	0
Construction	668	733	111	304	779	1,037
Manufacturing	625	703	297	398	922	1,101
Transportation, Communications, and Utilities	628	658	247	369	875	1,027
Wholesale Trade	488	536	286	362	774	898
Retail Trade	3,037	3,327	884	1,579	3,921	4,906
Finance, Insurance, and Real Estate	637	637	133	268	770	905
Service	1,899	1,890	574	837	2,473	2,727
Other	45	13		31	45	44
Total Private Ownership	8,259	8,722	2,670	4,286	10,929	13,008
Government						
Federal[2]	871	869	124	71	995	940
State	311	318	565	561	876	879
Local	1,358	1,312	511	598	1,869	1,910
Total Government	2,540	2,499	1,200	1,230	3,740	3,729
Total Covered W&S Empl.	10,799	11,221	3,870	5,516	14,669	16,737

[1] Employment covered by job insurance and based on place of work.
[2] Cannon AFB employment not included.
Source: Covered Wages and Employment, Quarter 1, 1986 - Quarter 4, 1987, Economic Research and Analysis, New Mexico State Department of Labor.

Table A.1-4. Full-Time and Part-Time Employees By Major Industry

	1982	1983	1984	1985	1986	1987
Curry						
Farm	978	1,014	992	961	919	934
Non-Farm	18,826	18,959	19,261	19,559	19,876	19,539
Total Employment	19,804	19,973	20,253	20,520	20,795	20,473
Roosevelt						
Farm	1,184	1,233	1,209	1,177	1,133	1,150
Non-Farm	5,303	5,320	5,615	5,902	5,906	5,734
Total Employment	6,487	6,553	6,824	7,079	7,039	6,884
ROI						
Farm	2,162	2,247	2,201	2,138	2,052	2,084
Non-Farm	24,129	24,279	24,876	25,461	25,782	25,273
Total Employment	26,291	26,526	27,077	27,599	27,834	27,357

Source: Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce, 1989.

Table A.1-5. Total Covered Wages And Salaries in the Two-County Region (1987)[1]

Ownership Industrial Sector[2]	Curry County		Roosevelt County		ROI	
	Total	Mean	Total	Mean	Total	Mean
Ownership						
Agriculture, Forestry, and Fish	$3,111,150	$13,410	$1,338,069	$12,164	$4,449,219	$13,009
Mining	--	--	446,887	15,960	446,887	15,960
Construction	9,204,814	13,780	1,116,564	10,059	10,321,378	13,250
Manufacturing	10,202,962	16,325	6,162,347	20,749	16,365,309	17,750
Transportation, Communications, and Utilities	12,151,965	19,350	4,679,129	18,944	16,831,094	19,236
Wholesale Trade	7,095,256	14,539	3,481,268	12,172	10,576,524	13,665
Retail Trade	30,956,994	10,193	8,178,898	9,252	39,135,892	9,981
Finance, Insurance, and Real Estate	9,550,890	14,994	1,903,100	14,309	11,453,990	14,875
Service	24,307,787	12,800	7,759,462	13,518	32,067,249	12,967
Other	857,047	19,045	--	--	857,047	19,045
Total Private Ownership	107,438,865	13,009	35,065,724	13,178	142,504,589	13,039
Government						
Federal[3]	14,940,532	17,153	1,430,014	11,532	16,370,546	16,453
State	5,970,542	19,198	12,144,331	21,494	18,114,873	20,679
Local	26,077,171	19,203	9,458,077	18,509	35,535,248	19,013
Total Government	46,988,245	18,499	23,032,422	19,194	70,020,667	18,722
Total Covered Wages	$154,427,110	$14,300	$58,098,146	$15,012	$212,525,256	$14,488

[1] Only includes jobs covered by job insurance.
[2] Based on place of work.
[3] Excluding Cannon AFB.

Source: Covered Wages and Employment, Quarter 1, 1986 - Quarter 4, 1987, Economic Research and Analysis, New Mexico State Department of Labor, Albuquerque, NM, 1989.

Table A.1-6. Distribution of Military Housing By Grade and Bedroom Count, Cannon AFB

Grade	--UPH[1]--	Family: 1 Bedroom	Family: 2 Bedrooms	Family: 3 Bedrooms	Family: 4+ Bedrooms	Family: Total Family	Total
E1	19	0	0	0	0	0	19
E2	154	0	0	0	0	0	154
E3	329	0	0	0	0	0	329
E4	269	0	49	155	144	348	617
E5	36	0	40	125	86	251	287
E6	18	0	20	63	58	141	159
E7	5	0	0	50	46	96	101
E8	0	0	0	7	10	17	17
E9	0	0	0	4	5	9	9
Subtotal	830	0	109	404	349	862	1692
01	0	0	1	9	9	19	19
02	0	0	2	13	8	23	23
03	0	0	7	38	15	60	60
04	0	0	0	4	20	24	24
05	0	0	0	2	14	16	16
06	0	0	0	0	7	7	7
Subtotal	0	0	10	66	73	149	149
TOTAL	830	0	119	470	422	1011	1841

[1] UPH denotes unaccompanied personnel housing.

Source: Housing Management Office, 1989b; family numbers derived from Housing Management Office, 1989c.

Table A.1-7. Distribution of Military In Off-Base Housing By Grade and Bedroom Count, Cannon AFB

	--UPH[1]--	--------	--------	Family	--------	--------	
Grade	All Units	1 Bedroom	2 Bedrooms	3 Bedrooms	4+ Bedrooms	Total Family	Total
E1	0	3	5	0	0	8	8
E2	0	18	51	2	1	72	72
E3	0	42	110	4	2	158	158
E4	53	58	154	73	18	303	356
E5	124	71	193	91	21	376	500
E6	15	42	112	52	12	218	233
E7	7	16	21	33	45	115	122
E8	0	0	4	4	5	13	13
E9	0	0	2	2	3	7	7
Subtotal	199	250	652	261	107	1270	1469
01	23	0	1	1	0	2	25
02	31	1	4	1	0	6	37
03	36	13	52	9	5	79	115
04	1	0	0	25	13	38	39
05	0	0	0	8	3	11	11
06	0	0	0	2	0	2	2
Subtotal	91	14	57	46	21	138	229
TOTAL	290	264	709	307	128	1408	1698

[1] *UPH denotes unaccompanied personnel housing.*

Source: Using personnel distribution by grade as of July 1989, (Housing Management Office, 1989b), and allocation by bedroom count (Housing Management Office, 1988). Slight differences in totals for 01 through 03 in Table A.1-6 and A.1-7 in comparison to Table A.1-1 due to rounding.

Table A.1-8. Hospital Use for Hospitals Serving Curry County and Roosevelt County, New Mexico (1988)

Facility and Location	Beds	Avg. Daily Patient Load	Admissions	Occupancy Rate (%)[1]	Avg. Length of Stay (Days)
Cannon AFB Hospital, Cannon AFB	25	15.7	1563	62.8	3.7
Clovis High Plains Hospital, Clovis, NM	106	69.4	4493	65.5	5.6
Roosevelt General Hospital, Portales, NM	103[2]	71[2]	NA[3]	68.9[2]	NA[3]

[1] Occupancy rate is the ratio of average daily patient load to number of beds.
[2] Includes a nursing home, which has 57 beds.
[3] NA = not available.

Sources: Medrow, 1989, personal communication; Lineberry, 1989, Meyer, 1989, personal communication.

A.1.4 Utilities

This section provides a more detailed discussion of water supply, waste water treatment, electricity, and natural gas in the two-county region.

It is assumed that the 2143 off-Base military and appropriated-fund civilian households represent the military-related load on services in the surrounding community (refer to Table 3.1.4-2). These are distributed 84 percent in Clovis (1800), 14 percent in the remainder of Curry County (300), and 2 percent in Portales (43). In 1988, there were 15,573 households in Curry County and 6349 households in Roosevelt County (National Planning Associated, 1988). Based on the 1988 estimated ratio of county to city population in the two counties (Table 3.1.4-3), Clovis contains 79 percent (12,303) of the households in Curry County, and Portales contains 60 percent (3809) of the households in Roosevelt County.

Currently, the Base provides its own water from wells, treats its own waste water, and does not rely upon community supplies or facilities. Water is provided to Clovis by the New Mexico-American Water Company. In 1988, this company provided 1,600,000 gallons of water to the community. The daily pumpage was generally between 3.6 and 6.1 million gallons per day. Pump and well capacity are around 25 million gallons per day, leaving a reserve of 70 percent (Schaffer, 1989, personal communication). Water is supplied to Portales by the city from wells in the Ogallala Aquifer. Currently, the average water use is roughly 4 million gallons per day, while the capacity of the well field is 9 million gallons per day. This represents a very large reserve pumping capacity (Obrey, 1989b, personal communication). However, pumping the Ogallala Aquifer will eventually deplete the aquifer. This problem is discussed in the groundwater section of this document (Section 3.1.3.2).

Waste water treatment in Clovis is provided by the city. The recently constructed treatment plant handles 3.2 million gallons per day and has a capacity of 4 million gallons per day. If industry requiring large quantities of water locates in the area, then additional capacity could be required in 6 or 7 years. The current military-related population probably contributes 400,000 gallons per day at most (Becker, 1989a, personal communication).

In the city of Portales, the municipal waste water treatment facility handles roughly 1 million gallons per day and is near capacity. However, much of the waste water comes from a methanol plant and a soft drink plant, both of which present special treatment problems. Additional domestic sewage would dilute and aid in treating the industrial waste water (Obrey, 1989b, personal communication).

Electricity is supplied to both counties by the Southwestern Public Service Corporation through a company-wide, multi-state grid. In 1988, the entire company provided 17,009,009,017 kilowatt-hours of electricity; 5,416,933,493 kilowatt-hours of these kilowatt-hours were provided to the New Mexico district. The company maintains a significant reserve. Cannon uses between 3,000,000 and 5,000,000 kilowatt-hours per month, or around 50,000,000 kilowatt-hours per year (Martin, 1989, personal communication). This represents approximately .03 percent of the total electricity produced by the utility and is roughly 1 percent of the electricity used in the New Mexico region. Revenue from the Base was $1,923,484 in FY88 (Economic Resource Impact Statement, Cannon AFB, Fiscal Year 1988). The 2143 military-related households off Base use roughly 7924 kilowatt-hours each (Martin, 1989, personal communication) at a cost of approximately $550 per year per household giving a total off-Base contribution of roughly $1,180,000 to company revenues. The total contribution to the revenues of the company from military-related sources is around $3,100,000.

Gas is provided to both counties by the Gas Company of New Mexico. The company has access to very large gas supplies, and its pipelines are operating at only partial capacity, providing no impediment to future expansion of gas use. In calendar year 1988, the Base used 2,787,000 therms (one therm equals 100,000 Btu or approximately 100 cubic feet of gas) (Adcock, 1989, personal communication). The Base pays approximately $850,000 per year for this gas (Econor 'c Re.,urce Impact Statement, Cannon AFB, Fiscal Year 1988). This represents appro ately 13.5 percent of the gas supplied by the company in the 2-county area. Curry County uses 8,326,000 therms for residential customers and 3,597,000 therms for commercial customers. Roosevelt County uses 2,493,000 therms for residential customers and 1,981,000 therms for commercial customers. Currently the military and appropriated-fund civilians, employed by the military, living off Base account for approximately 10 percent of the residential customers.

A.1.5 Education

Tables A.1-9 and A.1-10 provide detailed data concerning operational fund revenues in the Clovis Municipal School District and the Portales Municipal School District, respectively.

A.1.6 Public Finance

Tables A.1-11 to A.1-13 present detailed data related to the discussion of public finance in Section 3.1.4.6. Tables A.1-11 and A.1-12 show revenue sources for the cities of Clovis and Portales, respectively. Table A.1-13 shows per capita revenues and expenditures for Curry and Roosevelt Counties.

A.1.7 Transportation

This section describes the current status of each of the major roads discussed in Section 3.1.4.7. Two additional figures are included.

U.S. 60/84. U.S. 60/84 is the major highway serving Cannon AFB. The main gate is located along the south side of the highway. Between Clovis and a point approximately 4 miles west of Cannon AFB, U.S. 60/84 is a four-lane, divided highway. Access is not generally limited, although an interchange is provided for Cannon AFB

Table A.1-9. Clovis Municipal School District
Operational Fund Revenues

Source	1987-88 Actual Revenue Amount	%[1]	1988-89 Estimated Revenue Amount	%[1]
Local				
District Tax Levy	$ 80,049.00		$ 90,243.00	
Fees From Patrons	68,055.30		35,000.00	
Tuition from Out of State	-----		-----	
Earning from Investments	145,090.60		90,000.00	
Rent	9,574.40		9,694.00	
Scale of Real Property/Equip.	----		1,000.00	
Miscellaneous	25,389.53		7,200.00	
	$ 328,158.83	1.6	$ 233,137.00	1.1
State				
State Equalization Guarantee	18,824,582.61		19,173,194.00	
Out-of-State Tuition	----		----	
Emergency	----		----	
Transportation	1,025,892.00		1,052,639.00	
Other State Revenue	159,037.20		----	
State Inst. Materials Credits	196,588.97		215,052.00	
State Inst. Materials Cash	68,357.91		55,689.00	
	$20,274,458.69	96.3	$20,496,574.00	97.2
Federal				
P.L. 874	393,621.96		298,257.00	
Forest Reserve Income	----		----	
Other Special Federal Revenue	47,731.35		48,968.00	
	$ 441,353.31	2.1	$ 347,225.00	1.6
Incoming Transfer	----		----	
Total Operational Fund	$21,043,970.83	100.0%	$21,076,936.00	100%

[1] Percentages may not total 100 because of *rounding*.

Source: Public School Finance Statistics, Fiscal Years 1987-88, 1988-89, New Mexico State Department of Education.

Table A.1-10. Portales Municipal School District Operational Fund Revenues

Source	1987-88 Actual Revenue Amount	%	1988-89 Estimated Revenue Amount	%
Local				
District Tax Levy	$ 28,250.23		$ 30,303.00	
Fees From Patrons	4,770.00		-----	
Tuition from Out of State	-----		-----	
Earning from Investments	51,521.10		50,000.00	
Rent	535.00		-----	
Scale of Real Property/Equip.	----		-----	
Miscellaneous	108,441.46		139,574.00	
	$ 193,517.79	2.7	$ 219,877.00	3.0
State				
State Equalization Guarantee	6,367,935.86		6,547,964.00	
Out-of-State Tuition	----		----	
Emergency	----		----	
Transportation	410,985.00		467,167.00	
Other State Revenue	52,743.62		----	
State Inst. Materials Credits	77,998.91		63,113.00	
State Inst. Materials Cash 20	5,752.42		15,757.00	
	$ 6,915,415.81	97.2	$ 7,094,001.00	96.5
Federal				
P.L. 874	----		----	
Forest Reserve Income	----		----	
Other Special Federal Revenue	9,055.85		38,987.00	
	$ 9,055.85	0.1	$ 38,987.00	0.5
Total Operational Fund	$ 7,117,989.45	100.0%	$ 7,352,865.00	100.0%

Source: Public School Finance Statistics, Fiscal Years 1987-88, 1988-89, New Mexico State Department of Education.

Table A.1-11. Revenue Sources, City of Clovis: Fiscal Years 1986-87 and 1987-88

	1986-87		1987-88	
Source	$ Amount	%	$ Amount	%
Local Taxes				
Gross Receipts ($0.01)	----		734,937	
Franchise	555,716		538,717	
Property	258,432		334,699	
Services	299,847		326,260	
Fines	137,258		155,912	
Licenses	95,831		79,384	
Total Local	1,347,084	18.6	2,169,309	29.6
State-Shared Taxes				
Gross Receipts ($0.0135)	4,713,550		3,968,658	
Gasoline	243,108		264,157	
Auto License	90,803		104,976	
Cigarette	74,410		76,952	
Total State	5,121,871	70.9	4,414,743	60.2
Total Other (includes federal grants)	756,173	10.5	753,361	10.3
Total Revenue	$7,225,128	100.0%	$7,338,013	100.0%

Source: New Mexico State Department of Finance and Administration, Local Government Division, 1987; 1988.

Table A.1-12. Revenue Sources, City of Portales: Fiscal Years 1986-87 and 1987-88

	1986-87		1987-88	
Source	$ Amount	%	$ Amount	%
Local				
Taxes				
Gross Receipts ($0.125)	751,186		1,096,474	
Franchise	159,336		163,997	
Property	57,249		74,507	
Services	252,111		165,167	
Fines	59,666		57,349	
Licenses	21,009		21,561	
Total Local	1,300,557	43.6	1,579,055	50.5
State-Shared Taxes				
Gross Receipts ($0.0135)	1,112,113		1,030,212	
Gasoline	87,356		78.258	
Auto License	36,719		39,940	
Cigarette	23,767		23,687	
Total State	1,259,955	42.3	1,172,097	37.5
Total Other (includes federal grants)	420,379	14.1	375,991	12.0
Total Revenue	$2,980,891	100.0%	$3,127,143	100.0 %

Source: New Mexico State Department of Finance and Administration, Local Government Division, 1987; 1988.

Table A.1-13. Per Capita Revenues and Expenditures, Counties of Curry and Roosevelt, New Mexico

County	1986-87 Actual	1987-88 Actual	1988-89 Budgeted
Curry			
Total Fund Revenues	$5,188,700	$8,150,968	$4,468,495
Total Fund Expenditures	$4,290,280	$4,754,794	$5,113,563
Estimated Population	43,300[1]	44,100[2]	44,500[3]
Per Capita Revenues	$200	$185	$100
Per Capita Expenditures	$99	$108	$115
Roosevelt			
Total Fund Revenues	$2,870,625	$5,729,567	$2,769,452
Total Fund Expenditures	$5,145,854	$2,924,999	$3,125,118
Estimated Population	16,800[1]	17,000[2]	17,000[3]
Per Capita Revenues	$171	$337	$163
Per Capita Expenditures	$306	$172	$184

[1] Estimate for 1986 (refer to Table 3.1.4-3)
[2] Estimate for 1987 (refer to Table 3.1.4-3)
[3] Projected for 1988 (refer to Table 3.1.4-4)

Source: New Mexico State Department of Finance and Administration, Local Government Division, 1987; 1988.

traffic. Geometric standards for the road are good. The alignment has no significant vertical or horizontal curves between Clovis and the Base. The section of U.S. 60/84 between Clovis and the Base currently appears to have sufficient capacity to accommodate traffic demands and provide a reasonable level of service. The average daily traffic (ADT) at the west city limit of Clovis was 12,737 in 1986 (City of Clovis, 1986). This is likely to represent the highest ADT in the area for the highway and should contain most current Base-related trips. No data were available describing the hourly volumes by direction on this road, but an average peak-hour factor for highways in rural and small urban areas is 0.15. The peak-hour traffic volume should therefore be approximately 1900-2000 vehicles. The theoretical capacity for a facility like U.S. 60/84 is approximately 3200 vehicles per hour per direction under the worst service levels.

U.S. 60/84 has an interchange for Cannon AFB, as shown in Figure A.1-1. Westbound traffic to the Base exists via a cloverleaf ramp which carries vehicles back over the highway and adjacent railroad and into the Base gate. Traffic leaving the Base to proceed east enters U.S. 60/84 via a ramp. Both of these ramps have one lane. The bridges over U.S. 60/84 and the railroad have two lanes. Traffic leaving Cannon to proceed west is accommodated via a single leg connecting the westbound ramp with Ranchvale Road. Current westbound traffic volumes appear to be very small. Insufficient information was available to perform a detailed capacity analysis for the interchange. A preliminary analysis of the interchange indicates a maximum hourly capacity of 1500 vehicles. This capacity may be approached under current volumes. During peak traffic periods, vehicles currently back up on the westbound exit ramp waiting to enter the Base gates; however, the queue does not appear to extend back onto U.S. 60/84.

State Highway 311. SR-311, or Ranchvale Road, intersects U.S. 60/84 at the north side of Cannon AFB. It links the community of Ranchvale to the north with the U.S. highway. The highway has two 11-foot lanes, with dirt shoulders; the surface consists of a bituminous mix. Between Ranchvale and U.S. 60/84, the road has no horizontal curves and minimal vertical curvature. Current traffic volumes on SR-311 are light. Exact figures are not available, but estimates provided ranged from 1000-2000 vehicles per day. A short section of SR-311, north of the Base interchange has an ADT of approximately 5000 vehicles. This higher figure is caused by Base family housing located across U.S. 60/84. Traffic volumes have risen slightly since Llano Estacado Boulevard was surfaced between SR-311 and the Clovis city limits. This has placed some strain on the intersection with U.S. 60/84, which is not signalized (Dick, 1989, personal communication).

State Highway 467. SR-467 connects U.S. 60/84 with U.S. 70 at Portales. Cannon AFB has a south gate on SR-467, and Base personnel living in Portales or other points to the south of the Base will travel this road. The highway currently has two lanes, 11 feet wide; however, the state highway department is widening the lanes to 12 feet and adding 8-foot shoulders. Several vertical curves to the north of the Base access are also being widened, although little Base traffic travels this segment. This work should be complete by 1991. South of the Base, the road has little or no horizontal or vertical curvature. In 1986, the highway had an ADT of 1162 vehicles. There are no capacity-related problems (Dick, 1988, personal communication).

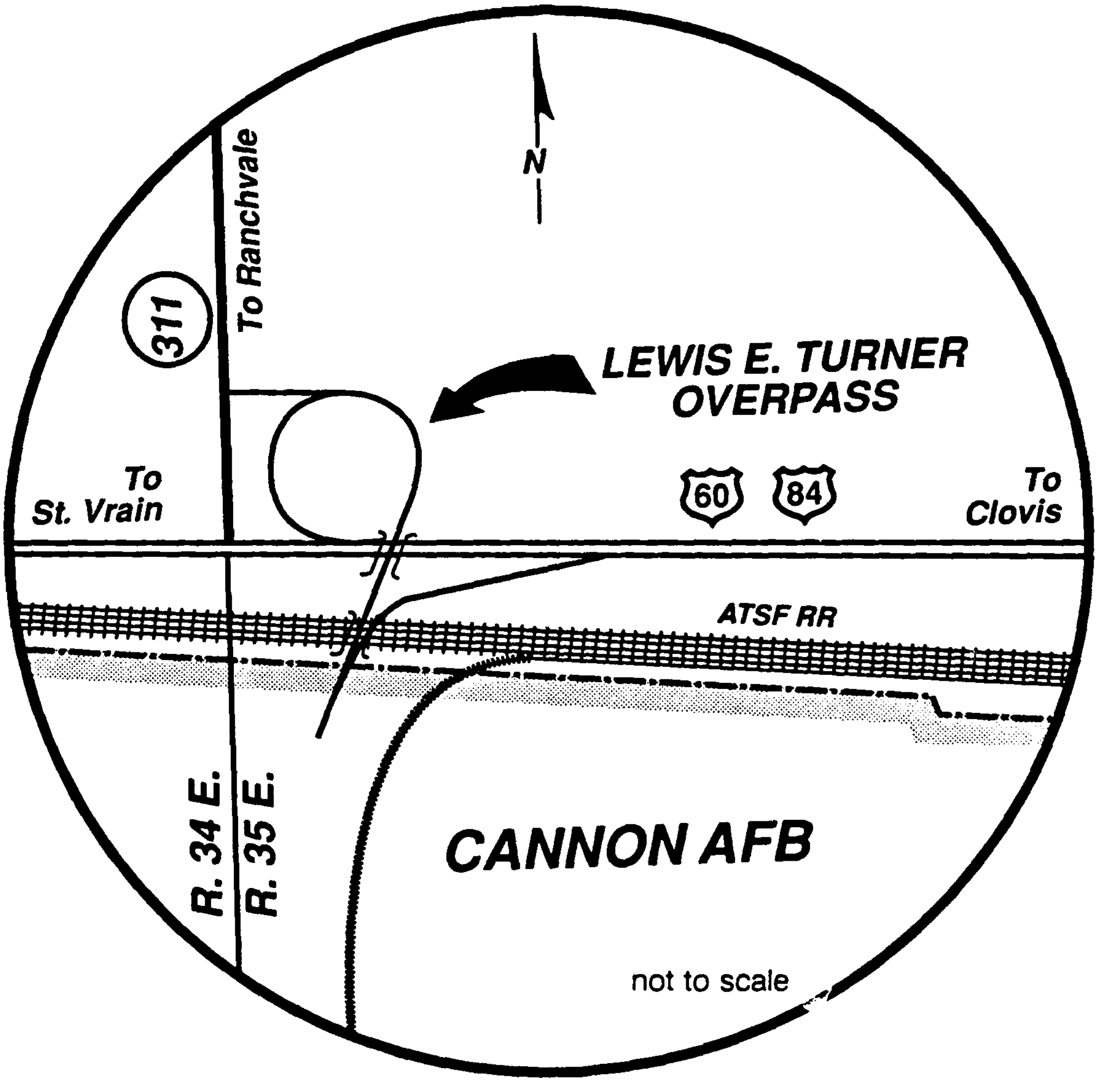

Figure A.1-1. Cannon AFB Interchange

Llano Estacado Boulevard Extension. Llano Estacado is a city street on the north side of Clovis. West of the city limits, the road extends about 4 miles along section lines to an intersection with Ranchvale Road. This rural section is under the jurisdiction of Curry County, although it is scheduled to be placed in the state highway system in the near future (Dick, 1989; Becker, 1989b, personal communication).

This section of Llano Estacado has two 11-foot lanes, with dirt shoulders. The alignment has no horizontal curves but does have some vertical curvature. The surface, which is bituminous, is not constructed to high standards. The state is planning to upgrade the road to higher geometric standards during the 1991-92 fiscal year. At this time, lane widths will likely be increased to 12 feet and shoulders widened and paved. Traffic volumes on the road have not been measured recently; the state highway department estimates that the ADT is between 1000 and 2000. The road has sufficient capacity such that this volume should present no problems (Dick, 1989, personal communication).

Clovis City Streets. City streets follow a grid pattern as shown in Figure A.1-2. Traffic from Clovis to the Base is most concentrated on 7th Street. Within Clovis, the traffic diffuses through the city street network, such that impacts to other streets are minimal. In downtown Clovis, 7th Street is a 4-lane arterial divided in its intersection with Mash Street. The maximum ADT in 1986 was 12,737 at the western edge of Clovis. With this volume, the level of service on 7th Street should be acceptable, with some minor congestion occurring during the peak period.

Data are not available to present a detailed evaluation of Base-related traffic flows. However, city officials indicated that there are currently no significant congestion problems in Clovis (Becker, 1989b, personal communication). Traffic peaks to and from the Base do not coincide with the business-related peaks, either in time or direction.

A.2 SOCIOECONOMIC CONSEQUENCES

A.2.1 Population, Employment, and Earnings

Tables A.2-1 and A.2-2 detail the projected impacts of the Cannon AFB realignment on employment and earnings for the years FY90 through FY95. These data relate to the discussion of the impacts of the realignment on employment and earnings in Section 4.1.4.1.

A.2.2 Housing

As discussed in Section 4.1.4.2, impacts on housing in the Clovis-Portales area are expected to result from the Base realignment. Independent of the plans for building 700 "Section 801" family rental units, private developers are not expected to finance a significant increase in the housing stock. The general economy is currently

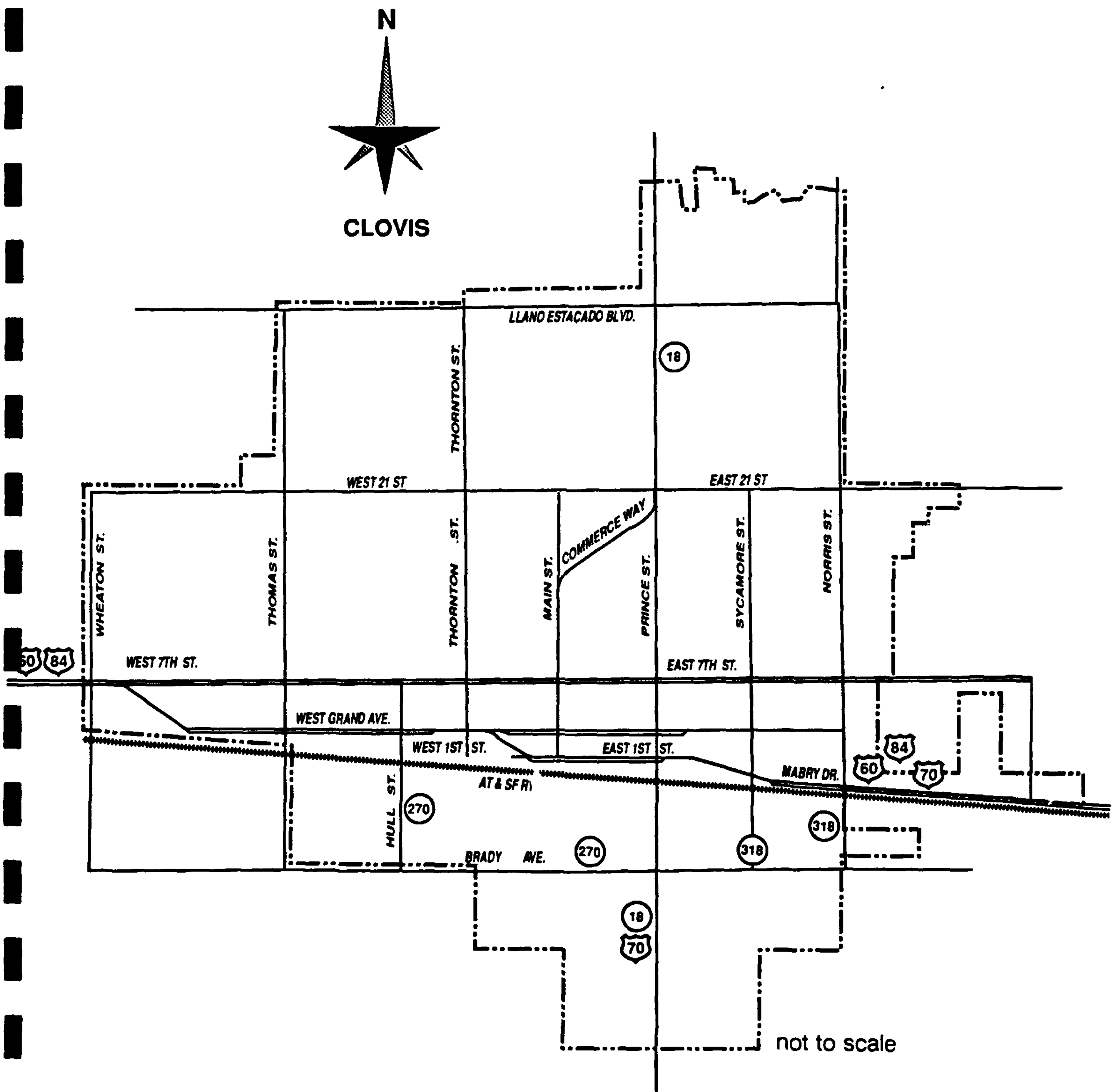

Figure A.1-2. Principal Streets, Clovis, New Mexico

Table A.2-1. Employment Impacts of Cannon AFB Expansion[1]

Sectors	FY90	FY91	FY92	FY93	FY94	FY95
Cannon AFB Personnel	679	679	1739	1739	1739	1739
Percent of Current	17.0	17.0	43.7	43.7	43.7	43.7
Construction Workers Related to On-Base Construction	296	178	111	23	23	0
Percent of 1987 Average Annual Construction in ROI	38.0	22.9	14.3	3.0	3.0	0.0
Total Construction Employment Impact	330	212	173	86	50	27
Percent of 1987 Average Annual Construction Employment in ROI	42.4	27.2	22.2	11.1	6.4	3.5
Trade and Services[2]	687	558	1025	929	889	863
Percent of 1987 Average Annual Trade and Services Employment in ROI	6.9	5.6	10.3	9.4	9.0	8.7
Total Direct and Indirect Employment (Excluding Cannon AFB Personnel)	1192	902	1410	1197	1109	1050
Percent of 1987 Average Annual Non-Agricultural Wage and Salary Employment	8.1	6.2	9.6	8.2	7.6	7.2

[1] RIMS II earnings multipliers were used to project earnings impacts (see Socioeconomics Appendix B).

[2] Defined to include state and local government sectors.

Source: New Mexico State Department of Labor, Albuquerque, New Mexico, August 1989.

Table A.2-2. Projected Impact of Cannon AFB Expansion on Earnings in the ROI[1]

	1990	1991	1992	1993	1994	1995
Projected Earnings of Increase in Direct and Indirect Employees (Excluding Additional Cannon AFB Personnel)	$24,935,391	$17,744,672	$23,065,380	$17,772,454	$15,580,455	$14,129,543
Percent of 1987 Total Covered Wages and Salaries in ROI	11.7%	8.3%	10.9%	8.4%	7.3%	6.6%
Increase in Direct and Indirect Employees (Excluding Additional Cannon AFB Personnel)	1,192	902	1,410	1,197	1,109	1,050
Mean Annual Wage	$20,919	$19,673	$16,358	$14,847	$14,049	$13,457

[1] RIMS II earnings multipliers were used to project earnings impacts (see Appendix B).

Source: New Mexico State Department of Labor, Albuquerque, New Mexico, August 1989.

relatively stable, and there is no reason to predict substantial employment growth unrelated to the Base expansion. Contractors planning to build units independent from Section 801 contracts must still rely on the staffing decisions at Cannon AFB to fill any units they might build. With narrow-based economic growth, developers cannot be assured that possible workforce declines from one employer will be compensated by another's growth to maintain the demand for housing. The relatively high level of risk could result in developers requiring higher rates of return for housing investments than typical of other areas with a broader base of economic growth.

A.2.3 Utilities

This section provides a detailed discussion of the basis for the summary presented in Section 4.1.4.4.

Realignment is not expected to impair utilities' ability to serve the needs of additional area households. Estimates of the future number of households without the Base realignment are from the publication "Key Indicators of County Growth, 1970-2010" by the National Planning Association (1988). As shown in Table B-1 in Appendix B, projected figures for the direct and indirect impact on the off-Base community are 1056 households in 1990, 641 households in 1991, 1772 households in 1992, 1513 households in 1993, 1449 households in 1994, and a final, stable impact of 1405 households from 1995 onwards.

No adverse impact to water supply capacity is expected. The Base provides its own water and waste water treatment. Planned expansion of these facilities will not impact local utilities. The New Mexico-American Water Company serving Clovis has a 75 percent reserve based on use in 1988 (Schaffer, 1989, personal communication). Assuming that overall use grows in proportion to the total number of households, the water supply can serve a total of 21,530 households. This capacity is greater than the number of households projected under either scenario. Portales has a water-supply capacity of 125 percent over current use (Obrey, 1989, personal communication). The total estimated capacity of the system is 8570 households. This capacity is far greater than the total number of households estimated for the year 2000. New residents within the counties will probably use private wells and will present no impact to water-providing utilities.

Waste water treatment capacity in Clovis will not be exceeded. Clovis provides it own waste water treatment. Currently, the city processes 3.2 million gallons of waste water for domestic and industrial users. The overall capacity is 4.0 million gallons per day (Becker, 1989, personal communication). Assuming that expansion in demand is directly proportional to the increase in the number of households, the total capacity of the system is 15,379 households. This is a conservative estimate. The plan may be able to handle more households if industrial use of water does not increase proportionally. Under neither scenario is the capacity of the waste water treatment facility in Clovis exceeded.

Waste water treatment capacity in Portales, which provides its own waste water treatment, may be exceeded within 15 years. The Portales facility is now handling its capacity of 1 million gallons per day (Obrey, 1989, personal communication). The system can handle an uncertain additional flow of domestic, rather than industrial, sewage. Domestic sewage would dilute difficult-to-treat wastes from industrial users. Assuming the system can handle an additional 20 percent flow of domestic sewage, the total capacity of the system is 5440 households. Under either scenario, the city will be able to accommodate its growth through the year 2000. However, little reserve capacity will remain if many households locate in Portales. The system may require expansion to meet future needs.

Southwestern Public Service Corporation has adequate reserves to handle the increased load. The company provides electric service to both counties, with the impact on the company being the same under both scenarios. The Base will add roughly 565,000 square feet of covered area to its existing 3,000,000 square feet. This represents an increase of approximately 19 percent. The Base now uses roughly 50,000,000 kilowatt-hours per year at an approximate cost of $2,000,000. An increase of 19 percent represents an additional 9,500,000 kilowatt-hours with an accompanying increase in revenues of around $380,000. This represents less than a 1 percent expansion of demand. Overall, the company has a 30 percent reserve for peak generating capacity. This estimate is based on overall generating capacity and peak demand presented in the Southwestern Public Service Corporation 1988 Annual Report. If demand increased proportionally in all areas served, the company could serve 28,499 households in Curry and Roosevelt counties. The total estimated number of households in both counties in the year 2000 is 24,462. The additional Base use adds the equivalent of 128 households, giving an effective demand of 24,590 households. This is well within the existing reserve.

Gas supplies are sufficient for the increased use. The Gas Company of New Mexico provides service to both counties. The overall growth in the two counties will be around 11 percent by the year 2000. There will be no difficulty in supplying this amount of extra gas. Large amounts of gas are produced in the region and there are several pipelines to Texas (Adcock, 1989, personal communication).

Overall, utilities serving the two-county area are capable of handling continuing growth through the end of the century without major expansion in total capacity. Waste water treatment facilities in Portales will be close to capacity through the remainder of this century under the second scenario.

A.2.4 Transportation

This section discusses in greater detail the basis for the conditions related to traffic impacts discussed in Section 4.1.7. Conclusions are based on the expected increase in commuter traffic on the major Base access routes. Commuter traffic is of concern because it tends to occur in peaks. During these peaks, congestion occurs, and the overall roadway level of service degrades. Truck traffic tends to be less of a concern because it typically follows a more uniform distribution during the day. Historically, 54 percent of Cannon personnel have lived off site and commuted to the Base, and an additional 3 percent of personnel have lived in government-controlled housing across from the Base. About 98 percent of these commuter trips have origins in Curry County, with Clovis as an endpoint for 84 percent of the total Base-related commuter trips. U.S. 60/84 carries almost all of this traffic to the Base.

As a result of the proposed action, the number of off-Base daily commuters is expected to increase from the current 2393 to a peak of 3825 in FY 92. This peak total includes construction workers, civilians, and military personnel. The long-term total after construction is complete is estimated to be 3714 persons. This analysis evaluates the effect of increased commuter traffic under worst-case conditions, namely Scenario I, in which 98 percent of new personnel follow present trends and reside in or near Clovis. Little impact is expected on area roads from increased Portales commuter traffic under Scenario II because of improvements currently underway or planned for Route 467.

To calculate traffic impacts, it is necessary to calculate the number of vehicle-trips on U.S. 60/84 made by Base personnel during the peak traffic hour and to characterize these trips by factors such as route and direction. Given the limited amount of information available, the following assumptions are made in these calculations: (1) the Base operates in shifts, with about 70 percent of the personnel working during the first shift; (2) arrivals and departures for first-shift personnel are staggered to occur over a 75-minute period; and (3) vehicle occupancy rates are estimated at 1.3 persons per vehicle. The assumptions are conservative, in that some personnel live close to the Base and would have minimal travel distance; the actual peak is spread over more than a 1-hour period; and all current traffic counts for existing roads were assumed to be in one direction during the peak hour. The calculations omit the 250 person-trips incurred by personnel living in housing adjacent to the Base on SR-311. These trips do not add to the traffic flow on U.S. 60/84.

These assumptions result in an estimated 1925 vehicles commuting to and from the Base during peak traffic time as compared with a current peak volume of 1154 vehicles. The expansion will therefore increase peak traffic by 86 percent. If all traffic occurred during a 60-minute period, instead of a 75-minute period, the peak-hour traffic would be no more than 3042 vehicles on U.S. 60/84 near to the Base Gate.

Most of the commuter flow will be along U.S. 60/84 between Clovis and the Base. Within Clovis, 7th Street and Grand Avenue should be the major affected arteries. Llano Estacado Boulevard may also receive traffic. A reasonable capacity estimate for Llano Estacado would be 1400-1500 passenger cars per hour total for both directions. The road presently carries only 1000-2000 vehicles per day, and therefore has sizeable excess capacity. Assuming a peak-hour split of 30 percent, or 600 vehicles, the road could still handle almost the entire traffic increase before reaching capacity. This scenario is unlikely. In reality, the road will be unavailable during part of the expansion period due to reconstruction. After reconstruction, the capacity will be increased. The road should therefore be able to handle without problems a portion of the expansion-related traffic.

The projected traffic on U.S. 60/84 does not exceed the highway's estimated capacity of 3200 vehicles per hour per direction, based on standards established in the Highway Capacity Manual (1985). However, some localized congestion could occur at intersections. Approaching Clovis, the traffic stream will have decreased in volume. There could be some localized congestion effects at the western edge of the city; however, current capacities appear to be adequate. Traffic control at the intersection of Grand Avenue and 7th Street might need to be examined. Once within the city limits, the traffic stream should decrease significantly as it diffuses through the street network.

The major impact that could occur from realignment is on traffic conditions on the Base interchange. It is likely that this facility was not designed to handle the potential volumes of traffic which the expansion will cause. There are two major areas of concern. First, if additional traffic uses the Llano Estacado-Ranchvale Road route to the Base, the intersection access from Ranchvale Road would feed traffic into the westbound stream exiting from U.S. 60/84, thus causing congestion on one or both traffic streams under peak flows. Second, the ramps have only a single traffic lane in each direction; the TRB Circular 212 recommends two lanes for the volume of traffic projected.

APPENDIX B
SOCIOECONOMICS
RIMS II METHODOLOGY AND RESULTS

APPENDIX B
SOCIOECONOMICS
RIMS II Methodology and Results

This section describes the regional model, adjustments, and assumptions used in projecting the earnings, employment, and population impact of the realignment of Cannon AFB. Earnings multipliers from the Regional Input-Output Modeling Systems (RIMS II) were used to estimate the impact of incremental expenditures associated with the action. This Appendix also includes a discussion of the assumptions used in projecting and dist. .outing school-aged children among area schools. Five tables present detailed data used as the basis for the analysis described in Chapter 4.0.

RIMS II

RIMS II is an enhanced version of the original model developed by the Bureau of Economic Analysis (BEA) in the mid-1970s. The purpose of RIMS II is to estimate output, earnings, and employment multipliers for a region consisting of one or more counties from calculations based on the BEA's national input-output (I-O) table and county wage-and-salary data. The BEA's national I-O table relates the structural interdependence of over 500 supplying and purchasing industries and sectors. Region-specific adjustments are made to the national I-O table through the use of location quotients. A simple location quotient is the regional employment in a given industry relative to total employment in the region, divided by national employment in a given industry relative to total national employment. In other words, the location quotient relates the extent to which output in a given industry is supplied by firms within the region.

Location quotients for service industries are calculated from the BEA's personal income data, by place of residence. Location quotients for nonservice industries are calculated from the BEA's wage-and-salary data, by place of work. Further adjustments are made within RIMS II to adjust for regional income losses and regional consumption leakages. Then, an application of the Leontief inversion is used to derive multipliers.

Further Adjustment to RIMS II

The 39-by-39-sector matrix of RIMS II earnings multipliers for the combined counties of Curry and Roosevelt, New Mexico, was obtained from the BEA. An additional construction row was added to reflect secondary effects within the regional construction industry. The row was calculated as a ratio of regional construction employment to total regional employment multiplied by the earnings multiplier for the total of all supplying industries in a given industry column.

An additional row for state and local services was added to reflect the additional governmental services required to meet the needs of the additional development and population. The state and local services row was calculated as the ratio of state and local government employment to total regional employment multiplied by the earnings multiplier for all industries in a given column.

Adjustments were also made to the input service industries of retail trade; finance, insurance, and real estate; services; and state and local government. The first of these adjustments involved one for local and nonlocal spending by construction workers involved in both on-Base and off-Base projects. This assumption required further data assumptions, described below, about the percentages of local and nonlocal construction workers and percentages of the respective incomes that are expected to be spent in the region.

The second service-related adjustment involved multiplying all coefficients in the defined service rows by a multiplier calculated as one plus the ratio of construction workers to total employment in the region plus the ratio of state and local workers to total employment in the region. This adjustment was made to allow for the effects of the additional rows to be reflected in the services rows.

RIMS II earnings multipliers, regional earnings data, and regional employment data were used to calculate job impacts. Data specific to the region and the project were added under assumptions described below.

Data Assumptions for Projecting Earnings and Employment

Due to the isolated nature of the Curry-Roosevelt region, a relatively large number of construction workers are expected to either move to the area with their families or find weekly quarters. An estimated 55 percent of the required construction workers are assumed to reside locally. It is further assumed that approximately 25 percent of these constructions workers can be drawn from the existing labor force, and approximately 30 percent will relocate with their families. The remaining 45 percent are assumed to be nonlocal. Approximately 25 percent of the construction workers are assumed to commute from outside the region of influence (ROI), and 20 percent are assumed to be singles who will need temporary quarters through the week. The commuters are assumed to spend 3 percent of their income in the ROI, and the singles in temporary quarters are assumed to spend 16.6 percent of their income in the ROI.

Earnings and employment data by industry for Curry and Roosevelt counties for 1987 were taken from the Regional Economic Information System, the Bureau of Economic Analysis, and the Department of Commerce. An exception was made for construction earnings, since the military-related projects will require the payment of Davis-Bacon wage rates. Average wage rates for construction workers on government projects were not available through the Bureau of Labor Statistics or the Employment Standards Administration of the U.S. Department of Labor. Therefore, an assumed hourly rate of $18 per hour was made upon reviewing the New Mexico wage rates for government projects involving contractors subject to compliance with Davis-Bacon (U.S. Department of Labor, 1989). The assumed annual construction wage rate of $42,120 was calculated at straight pay based on a further assumption of a typical year of 2080 regular hours and 260 overtime hours at straight pay. The construction earnings rate reported by the BEA was used for the indirect construction row.

Services expenditures per military member for FY 1988 were used to project impact on services expenditures. Data were provided by the Base Contracting Office, Cannon AFB, August 1989.

Data on average take-home pay, basic allowances for quarters with and without dependents, basic allowances for subsistence, and VHA payments were provided by the Housing Management Office, Cannon AFB, August 1989. The Office also provided data on rank and marital status. Data on phasing of the additional military and appropriated-fund civilian personnel were obtained from information provided for the Cannon AFB Segmented Housing Market Analysis, August 1989. The Housing Management Office also provided military equivalency rankings of civilian and military for use in projecting civilian payroll. The equivalency was based on the military take-home schedule plus basic allowances for quarters relative to the civilian take-home amount. A standard statistic for marital status was used in calculating civilian payroll (Statistical Abstract, 1989, Table No. 626).

Information on CHAMPUS payments was taken from a report entitled "CHAMPUS Health Care Summary by Primary Diagnosis Based on Care Received from October 1987 through September 1988, 085 - Cannon AFB, NM" (CHAMPUS, Information Systems Division, Statistics Branch, March 1989). The number of military members was used to calculate per-member government cost (ERIS, Cannon AFB FY88). The per-member amount was applied to projected additional military personnel in the first squadron in 1990 and 1991 and for all personnel associated with the realignment in 1992 through 1995.

Estimates of expenditures for on-Base construction were provided by the Base. An estimated 100 additional new housing units were assumed to be needed for off-Base military and direct and indirect civilians. Thus, off-Base construction was estimated at the average cost of construction of 100 units at $72,049 per unit. These expenditures were spread over 2-year periods as Cannon AFB personnel are projected to arrive.

Separate models were run for each of the years 1990 through 1995. Therefore, all impacts are measured against a 1989 baseline.

Data Assumptions for Projecting Population

The assumed population of military members and their dependents was derived from data on projected additional military personnel by rank and marital status and by information from Defense Manpower Data Center (DMDC) (Description of Spouses of Officers and Enlisted Personnel in the U.S. Armed Forces: 1985, DMDC, June 1986) to calculate military working spouses and children.

Employment impact of the initial expenditures associated with the Base expansion were calculated from the I-O model described above. Additional Base requirements for civilian personnel were added to the estimated employment from the model above to obtain total civilian employment impact. However, two reductions were made to the total civilian employment figures. The labor force of working spouses of the incoming military members was estimated from DMDC data and subtracted. A 5.5 percent rate of unemployment was taken into account. The further reduction was made based on the 1988 number of unemployed persons in the ROI adjusted for an assumed natural rate of unemployment of 5.5 percent. The resulting figure represents inmigrating job holders required.

Average jobs per inmigrating household were calculated and divided into inmigrant job holders required to obtain total inmigrating households. Average jobs per inmigrating household were calculated as:

(1 + percent married x labor force participation rate).

Again, standard statistics were used (Statistical Abstract, 1989, Table Nos. 626 and 636).

Inmigrating job holders required was divided by average jobs per inmigrating household to obtain total inmigrating households. A statistic for the average size of inmigrating household (including unaccompanied personnel) was calculated to estimate total civilian inmigrants. Average size of inmigrating households was calculated as:

(*Percent married* x *average married* household size) + (Percent unaccompanied x 1).

Standard statistics were used (Statistical Abstract, 1989, Table Nos. 69 and 626).

The total civilian inmigrant figure was then apportioned by standard population statistics to estimate numbers of individuals married, unaccompanied, total children, and school-aged children.

The total civilian inmigrants were then added to the projected increase in military population to estimate the total impact on population. The demographic breakdowns for the military were added to the civilian breakdowns to calculate total demographic breakdown.

Table B-1 gives the resulting projections of impact on population, community population, and households. Table B-2 details projected geographic distributions of community population based on two scenarios. The first scenario is based on the assumption that the incoming personnel will be distributed according to the current distribution of off-Base married military personnel. The second scenario is based on the assumption that 20 percent of the incoming personnel will locate in Portales. The remaining 80 percent are assumed to be distributed according to the estimated current distribution.

Table B-1. Population and Household Impacts, FY 1990 - FY 1995 Cannon AFB Community

	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995
Population:						
Military						
Military personnel	649	649	1662	1662	1662	1662
Spouses	442	442	1132	1132	1132	1132
Children	643	643	1647	1647	1647	1647
School-aged	418	418	1071	1071	1071	1071
Total Military Population	1734	1734	4441	4441	4441	4441
Civilians						
Personnel	453	238	428	269	205	161
Spouses	276	145	261	164	125	98
Children	329	173	310	195	148	116
School-aged	239	126	226	142	108	85
Total Civilian Population	1058	556	999	628	478	375
Total School-aged	657	544	1297	1213	1179	1156
Total Population	2792	2290	5440	5069	4919	4816
Total Commun. Population	2746	2044	5122	4651	4501	4398
Households:[1]						
Military	649	649	1662	1662	1662	1662
Less: E1-E3	(46)	(46)	(118)	(118)	(118)	(118)
Added Dorm Rooms		(200)	(200)	(300)	(300)	(300)
All Civilian	453	238	428	269	205	161
Total Households	1056	641	1772	1513	1449	1405

[1] Assumes dormitory space of 200 rooms to be constructed in FY 1990 and occupied in FY 1991. Assumes an additional 100 rooms to be constructed in FY 1992 and occupied in FY 1993. Assumes double occupancy of additional personnel of E1-E3 rank.

Table B-2. Geographic Distribution of Estimated Total Population Impacts Relating to Cannon AFB Expansion

	ROI	Clovis	Curry County	Portales
Baseline Population Projections				
1990	62,000	35,600	45,000	10,300
1991	62,300	36,100	45,300	10,400
1992	62,600	36,600	45,600	10,400
1993	62,900	37,100	45,800	10,500
1994	63,200	37,600	46,100	10,500
1995	63,500	38,100	46,400	10,600
Population Impacts				
Distribution - Scenario I	100.0%	84.0%	98.0%	2.0%
1990	2,746	2,307	2,691	55
Percent Change	4.4%	6.5%	6.0%	0.5%
1991	2,044	1,717	2,003	41
Percent Change	3.3%	4.8%	4.4%	0.4%
1992	5,122	4,302	5,020	102
Percent Change	8.2%	11.8%	11.0%	1.0%
1993	4,651	3,907	4,558	93
Percent Change	7.4%	10.5%	10.0%	0.9%
1994	4,501	3,781	4,411	90
Percent Change	7.1%	10.1%	9.6%	0.9%
1995	4,398	3,694	4,310	88
Percent Change	6.9%	9.7%	9.3%	0.8%
Distribution - Scenario II	100.0%	69.0%	80.0%	20.0%
1990	2,746	1,895	2,197	549
Percent Change	4.4%	5.3%	4.9%	5.3%
1991	2,044	1,410	1,635	409
Percent Change	3.3%	3.9%	3.6%	3.9%
1992	5,122	3,534	4,098	1,024
Percent Change	8.2%	9.7%	9.0%	9.8%
1993	4,651	3,209	3,721	930
Percent Change	7.4%	8.6%	8.1%	8.9%
1994	4,501	3,106	3,601	900
Percent Change	7.1%	8.3%	7.8%	8.6%
1995	4,398	3,035	3,518	880
Percent Change	6.9%	8.0%	7.6%	8.3%

Notes:

1 The annual compound rate of growth implicit in comparing the 1990 and 1995 Bureau of Business and Economic Research (BBER) projections of county population was used to project population for the individual years 1991 through 1994.

2 The annual compound rate of growth implicit in comparing the July 1, 1986, city population estimate from the Bureau of the Census to the city population from the April 1, 1980, Bureau of the Census was used to project population from 1987 to 1995.

Sources: "Population and Employment Projections - Counties in New Mexico 1985-2010," Bureau of Business and Economic Research, University of New Mexico, 1989; Current Population Reports, Local Population Estimates, Series P-26, No. 86-W-SC, March 1988, Bureau of the Census, U.S. Department of Commerce.

Specific projections were made of military and civilian children, school-aged children, and school children by grade classifications. Numbers of children of military personnel were projected by applying projected additional military personnel (Housing Management Office, Cannon AFB, 1989) to DMDC data on average numbers of children of military personnel by rank (Description of Spouses of Officers and Enlisted Personnel in the U.S. Armed Forces: 1985, DMDC, June 1986). (The experience of staff from the Office of Economic Adjustment has been that DMDC data tend to result in projections that are high; however, data on the average number of children of current Base personnnel were not available.) An estimated 65 percent of total children were assumed to be school aged based on survey data (Housing Management Office, Cannon AFB, 1989).

The current distribution of school children by grade classification in Clovis Municipal Schools who are dependents of Cannon AFB personnel was used to project additional students in kindergarten, grades 1-6, grades 7-9, grades 10-12, and special needs (Clovis Municipal School District, Clovis, New Mexico, 1989b).

Total civilian inmigrants were apportioned as children, marrieds, and singles by standard national statistics of percentages of employed persons that are married and single, median family size, and school-aged children as a percent of total children (Statistical Abstract, 1989, Table Nos. 13 and 68). School-aged children of civilians were also projected by grade classifications of kindergarten, grades 1-6, grades 7-9, grades 10-12, and special needs. The current distribution of all children in Clovis Municipal Schools was used to project additional students within the specified grades (Clovis Municipal School District, Clovis, New Mexico, 1989a).

Table B-3 details the distribution of incoming school children by grade classification. Tables B-4 and B-5 presents detailed data on impacts on area school districts according to the two residential scenarios examined in Chapter 4.0.

Table B-3. Distribution of School-Aged Children, FY 1990 - FY 1995 Cannon AFB Community

Grades	FY1990	FY1991	FY1992	FY1993	FY1994	FY1995
Military:						
Children	643	643	1647	1647	1647	1647
School-age	418	418	1071	1071	1071	1071
Dependents by Grade in School:						
Kindergarten (Age 5)	42	42	108	108	108	108
1-6 (Ages 6-11)	214	214	546	546	546	546
7-9 (Ages 12-15)	79	79	203	203	203	203
10-12 (Ages 16-18)	73	73	188	188	188	188
Special Needs	10	10	26	26	26	26
Subtotal	418	418	1071	1071	1071	1071
Civilians:						
Children	329	173	310	195	148	116
School-age	239	126	226	142	108	85
Dependents by Grade in School:						
Kindergarten (Age 5)	20	11	19	12	9	7
1-6 (Ages 6-11)	115	60	110	69	53	42
7-9 (Ages 12-15)	49	26	46	29	22	17
10-12 (Ages 16-18)	45	24	42	26	20	16
Special Needs	10	5	9	6	4	3
Subtotal	239	126	226	142	108	85
Total						
Children	972	816	1957	1842	1795	1763
School-age	657	544	1297	1213	1179	1156
All Children by Grade in School:						
Kindergarten (Age 5)	62	53	127	120	117	115
1-6 (Ages 6-11)	329	274	656	615	599	588
7-9 (Ages 12-15)	128	105	249	232	225	220
10-12 (Ages 16-18)	118	97	230	214	208	204
Special Needs	20	15	35	32	30	29
TOTAL SCHOOL-AGED CHILDREN	657	544	1297	1213	1179	1156

Note: Totals may vary due to rounding.

Table B-4. Impacts on Clovis Municipal School District's Enrollments By Grade Classification and Growth Scenario Assumptions

Scenario/Grade Grouping	FY1990	FY1991	FY1992	FY1993	FY1994	FY1995
Total School Impact:						
Special Education	20	15	35	32	30	29
Kindergarten	62	53	127	120	117	115
1-6	329	274	656	615	599	588
7-9	128	105	249	232	225	220
10-12	118	97	230	214	208	204
TOTAL SCHOOL IMPACT	657	544	1297	1213	1179	1156
FTE KINDERGARTEN	31.0	26.5	63.5	60.0	58.5	57.5
ADJUSTED TOTAL (FTE)	626.0	517.5	1233.5	1153.0	1120.5	1098.5
Clovis, Scenario I (98%):						
Special Education	20	15	34	31	29	28
Kindergarten	61	52	124	118	115	113
1-6	322	268	644	603	586	576
7-9	125	103	244	227	221	216
10-12	116	95	225	210	204	200
TOTAL CLOVIS, SCENARIO I	644	533	1271	1189	1156	1133
FTE KINDERGARTEN	30.5	26.0	62.0	59.0	57.5	56.5
ADJUSTED TOTAL (FTE)	613.5	507.0	1209.0	1130.0	1097.5	1076.5
Clovis, Scenario II (80%):						
Special Education	16	12	28	26	24	23
Kindergarten	50	42	102	96	94	92
1-6	264	219	525	491	479	471
7-9	102	84	199	186	180	176
10-12	94	78	184	171	166	163
TOTAL CLOVIS, SCENARIO II	526	435	1038	970	943	925
FTE KINDERGARTEN	25.0	21.0	51.0	48.0	47.0	46.0
ADJUSTED TOTAL (FTE)	501.0	414.0	987.0	922.0	896.0	879.0

* Full-Time Equivalent (FTE)

Table B-5. Impacts on Portales Municipal School District's By Grade Classification and Growth Scenario Assumptions

Scenario/Grade Grouping	FY1990	FY1991	FY1992	FY1993	FY1994	FY1995
Total School Impact:						
Special Education	20	15	35	32	30	29
Kindergarten	62	53	127	120	117	115
1-6	329	274	656	615	599	588
7-9	128	105	249	232	225	220
10-12	118	97	230	214	208	204
TOTAL SCHOOL IMPACT	657	544	1297	1213	1179	1156
FTE KINDERGARTEN	31.0	26.5	63.5	60.0	58.5	57.5
ADJUSTED TOTAL (FTE)	626.0	517.5	1233.5	1153.0	1120.5	1098.5
Portales, Scenario I (2%)						
Special Education	0	0	1	1	1	1
Kindergarten	1	1	3	2	2	2
1-6	7	6	12	12	13	12
7-9	3	2	5	5	4	4
10-12	2	2	5	4	4	4
TOTAL	13	11	26	24	23	23
FTE KINDERGARTEN	0.5	0.5	1.5	1.0	1.0	1.0
ADJUSTED TOTAL (FTE)	12.5	10.5	24.5	23.0	23.0	22.0
Portales, Scenario II (20%)						
Special Education	4	3	7	6	6	6
Kindergarten	12	11	25	24	23	23
1-6	65	55	131	124	120	117
7-9	26	21	50	46	45	44
10-12	24	19	46	43	42	41
TOTAL	131	109	259	243	236	231
FTE KINDERGARTEN	6.0	5.5	12.5	12.0	11.5	11.5
ADJ TOTAL	125.0	103.5	246.5	231.0	224.5	219.5

Note: Totals may vary due to rounding.

APPENDIX C
MILITARY (MTR)
TRAINING ROUTE SPECIFICATIONS

IR-107

ORIGINATING ACTIVITY: 27 TFW/DOR, Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU, Cannon AFB, NM 88103-5129 AUTOVON 681-2276, nights/weekends 681-2253.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As asgn to	A	TCC 041/19	35°22.5'N 103°17.0'W
Start desc to be at or below 100 MSL at	B	TCC 015/28	35°36.0'N 103°20.0'W
01 AGL B 90 MSL to	C	DHT 237/43	35°50.0'N 103°21.5'W
01 AGL B 90 MSL to	D	DHT 243/56	35°51.0'N 103°39.0'W
01 AGL B 90 MSL to	E	DHT 261/65	36°08.0'N 103°52.5'W
01 AGL B 80 MSL to	F	DHT 274/66	36°23.0'N 103°51.0'W
01 AGL B 80 MSL to	G	DHT 286/58	36°32.5'N 103°35.5'W
01 AGL B 80 MSL to	H	DHT 319/45	36°45.0'N 103°00.0'W
01 AGL B 80 MSL to	I	DHT 323/52	36°53.0'N 103°00.0'W
01 AGL B 80 MSL to	J	TBE 168/20	36°55.0'N 103°36.0'W
01 AGL B 100 MSL to	K	TBE 188/26	36°51.5'N 103°47.0'W
01 AGL B 100 MSL to	L	CIM 101/28	36°18.0'N 104°21.0'W
01 AGL B 90 MSL to	M	CIM 131/43	35°55.0'N 104°21.0'W
01 AGL B 80 MSL to	N	TCC 291/27	35°26.0'N 104°04.0'W
01 AGL B 80 MSL to	O	TCC 278/24	35°19.0'N 104°03.0'W
01 AGL B 70 MSL to	P	TCC 225/24	34°58.0'N 104°00.0'W
01 AGL B 70 MSL to	Q	TCC 196/23	34°50.5'N 103°49.0'W
01 AGL B 70 MSL to	R	TCC 184/33	34°39.0'N 103°47.0'W
Then R-5105/R-5104			
Re-Entry: R-5104/R-5105			
01 AGL B 70 MSL to	R1	CVS 293/28	34°39.0'N 103°47.0'W
01 AGL B 70 MSL to	AA	CVS 230/27	34°10.0'N 103°48.0'W
01 AGL B 70 MSL to	AB	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to	AC	CVS 227/44	34°00.0'N 104°04.0'W
01 AGL B 70 MSL to	AD	CVS 283/39	34°39.0'N 104°02.0'W
01 AGL B 70 MSL to	R2	CVS 293/28	34°39.0'N 103°47.0'W
Alternate Entry: J			
As asgn at	S	TBE 086/25	37°12.0'N 103°04.5'W
Descend to be at or below 80 MSL at	T	TBE 107/19	37°06.0'N 103°15.0'W
01 AGL B 80 MSL to	J1	TBE 168/20	36°55.0'N 103°36.0'W
Thence via IR-107			
Alternate Entry: M			
As asgn to	U	CIM 098/32	36°18.0'N 104°15.0'W
Descend so as to cross at or below 80 MSL	M1	CIM 131/43	35°55.0'N 104°21.0'W
Thence via IR-107			
Alternate Exit: K			
Cross at 100 MSL	K1	TBE 188/26	36°51.5'N 103°47.0'W
Climb so as to be at 110 MSL at	V	TBE 208/35	36°49.0'N 104°04.0'W
Contact Albuquerque ARTCC on 353.8			
Alternate Exit: P			
Cross at 70 MSL	P1	TCC 225/24	34°58.0'N 104°00.0'W
Maintain 70 MSL to	W	TCC 186/14	34°58.0'N 103°41.0'W
Contact Albuquerque ARTCC on 319.2			
Alternate Transition Route to IR-409			
01 AGL B 80 MSL to	I1	DHT 323/52	36°53.0'N 103°00.0'W
01 AGL B 80 MSL to	II	TBE 125/24	36°58.0'N 103°16.0'W
thence via IR-409			

TERRAIN FOLLOWING OPERATIONS: Authorized entire route

ROUTE WIDTH – 7.5 NM either side of centerline entire route to include exits, alternate entries and re-entries.

Special Operating Procedures:

(1) Non 27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked entry and exit times plus or minus 5 minutes. If unable to meet planned entry time enter at an Alternate Entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.

(2) Aircraft must call in-the-blind route entry and exit on 255.4. Monitor 255.4 while on this route unless operational requirements dictate otherwise.

(3) ZAB ARTCC does not provide IFR separation between scheduled MTR users while on this route.

(4) Avoid by 1500' or 3 NM: All chartered airfields.

(5) Avoid area bounded by 36°02.0'N 103°59.0'W to 36°02.0'N 103°51.0'W to 35°49.0'N 103°43.0'W to 35°49.0'N 103°50.0'W to the starting point.

(6) Avoid by 2 NM:
  (a) Kenton State Park (36°51.0'N 102°53.0'W)
  (b) Capulin National Monument (36°47.0'N 103°46.0'W)
  (c) Ranch near Quay, NM (34°55.0'N 103°46.0'W)
  (d) House, NM (34°39.0'N 103°54.0'W)

(7) Avoid by 1000' and 1 NM:
  (a) Ray Ranches (35°55.0'N 104°21.0'W) and (35°54.5'N 104°17.0'W)
  (b) Jaritas Ranch (36°14.5'N 104°23.5'W)
  (c) Ranch (35°02.0'N 104°23.5'W)
  (d) Ranch (35°48.5'N 103°13.8'W)
  (e) Ranch (34°54.0'N 103°50.0'W)
  (f) Ranch (36°06.0'N 103°10.5'W)

(8) Avoid by 1.5 NM and 1000' AGL Bell Ranch Complex (35°34.0'N 104°05.0'W).

(9) Aircraft using R-5104/R-5105 will file a re-entry on flight plans to ensure airspace reservation on downwind pattern.

(10) Aircraft not scheduled onto Melrose Range (R-5104/R-5105) must exit at or prior to Pt P.

(11) Deconfliction between this and other 27 TFW crossing routes will be by 27 TFW scheduling.

(12) "See and Avoid" applies to non 27 TFW conflicting VR and SR routes.

(13) Route conflicts with VR-1181, VR-108, VR-1195/1107, VR-1574/1174, IR-409, IR-109, IR-111, and IR-113. Consult Flip AP-1B Chart for particulars.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, GCK, INK, LVS, MAF, ROW, TCC

IR-109

ORIGINATING ACTIVITY: 27 TFW/DOR, Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU, Cannon AFB, NM 88103-5129 AUTOVON 681-2276, nights/weekends 681-2253.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
160 MSL or as asgn at	A	ABQ 332/65	36°05.0'N 107°10.0'W
01 B 120 MSL to	B	ABQ 344/71	36°14.0'N 106°53.0'W
01 B 120 MSL to	C	ABQ 346/76	36°19.0'N 106°50.0'W
01 B 120 MSL to	D	ALS 190/41	36°43.0'N 106°09.0'W
01 B 120 MSL to	E	ALS 150/22	37°00.0'N 105°41.0'W
01 B 120 MSL to	F	ALS 134/21	37°03.5'N 105°35.0'W
01 B 120 MSL to	AO	ALS 119/26	37°03.5'N 105°24.5'W
01 B 150 MSL to	AP	ALS 119/37	36°56.0'N 105°15.0'W
01 B 150 MSL to	G	CIM 295/17	36°40.0'N 105°09.0'W
01 B 150 MSL to	H	CIM 277/13	36°34.0'N 105°08.0'W
01 B 150 MSL to	I	CIM 221/18	36°19.0'N 105°10.0'W
01 B 150 MSL to	J	CIM 204/25	36°09.0'N 105°11.0'W
01 B 150 MSL to	K	LVS 352/27	36°06.0'N 105°05.0'W
01 B 120 MSL to	L	LVS 043/28	35°55.0'N 104°40.0'W
01 B 120 MSL to	M	LVS 055/29	35°50.0'N 104°35.0'W
01 B 90 MSL to	N	LVS 069/26	35°43.0'N 104°36.0'W
01 B 80 MSL to	O	TCC 263/45	35°15.0'N 104°31.0'W
01 B 70 MSL to	P	TCC 245/44	35°01.0'N 104°28.0'W
01 B 70 MSL to	Q	CVS 281/32	34°35.0'N 103°55.0'W
Alternate Transition Routing to R-5104 IR-109 South			
As asgn to	P1	TCC 245/44	35°01.0'N 104°28.0'W
01 B 70 MSL to	AA	ROW 341/53	34°13.0'N 104°45.0'W
01 AGL B 70 MSL to	AB	ROW 343/47	34°07.0'N 104°42.0'W
01 AGL B 70 MSL to	AC	ROW 008/44	34°02.0'N 104°19.0'W
01 AGL B 70 MSL to	AD	CVS 219/42	33°56.0'N 103°59.0'W
01 AGL B 70 MSL to	AE	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to to R-5104/R-5105	AF	CVS 230/27	34°10.0'N 103°48.0'W
North Race Track: Exit R-5104/R-5105 at or below 70 MSL			
01 AGL B 70 MSL to	AFI	CVS 230/27	34°10.0'N 103°48.0'W
01 AGL B 70 MSL to	AE1	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to	AG	CVS 227/44	34°00.0'N 104°04.0'W
01 AGL B 70 MSL to	AH	CVS 283/39	34°39.0'N 104°02.0'W
01 AGL B 70 MSL to to R-5104/5105	AI	TCC 184/33	34°39.0'N 103°47.0'W
South Race Track: Exit R-5104/5105 at or below 70 MSL to			
01 AGL B 70 MSL to	AI1	TCC 184/33	34°39.0'N 103°47.0'W
01 AGL B 70 MSL to	AH1	CVS 283/39	34°39.0'N 104°02.0'W
01 AGL B 70 MSL to	AG1	CVS 227/44	34°00.0'N 104°04.0'W
01 AGL B 70 MSL to	AE2	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to to R-5104/R-5105	AF2	CVS 230/27	34°10.0'N 103°48.0'W
Alternate Entry: I			
160 MSL or as asgn at	AJ	CIM 273/21	36°35.0'N 105°17.0'W
01 AGL B 150 MSL to	I1	CIM 221/18	36°19.0'N 105°10.0'W
Then via IR-109			
Alternate Entry: M			
170 MSL or as asgn at	AN	LVS 035/40	36°06.0'N 104°32.0'W
Descend to cross at 01 AGL B 90 MSL then via IR-109 or IR-109 South	M1	LVS 055/29	35°50.0'N 104°35.0'W
Alternate Exit: J			
150 MSL at	J1	CIM 204/25	36°09.0'N 105°11.0'W
Proceed direct to (Contact Albuquerque ARTCC on 353.8)	AK	LVS 341/16	35°55.0'N 105°10.0'W
Alternate Exit: AO			
01 B 120 MSL to (Contact Denver ARTCC on 343.7)	AO1	ALS 119/26	37°03.5'N 105°24.5'W
Climb to Cross at 160 MSL	AR	ALS 083/24	37°18.4'N 105°19.4'W
Alternate Exit: P			
70 MSL or below at	P2	TCC 245/44	35°01.0'N 104°28.0'W
70 MSL to Flight plan route	AL	TCC 247/29	35°05.0'N 104°11.0'W
Alternate Exit: AE			
01 AGL B 70 MSL at	AE3	CVS 216/34	34°00.0'N 103°50.0'W
70 MSL to	AM	CVS 193/21	34°04.0'N 103°30.0'W
Contact Cannon RAPCON on 358.3 leaving 61 MSL.			
Alternate Exit: AQ			
70 MSL or below at	P1	TCC 245/44	35°01.0'N 104°28.0'W
Climb to cross at 70 MSL or asgn (Contact ZAB ARTCC on 319.2 for transition to VR-1195 or Pecos MOAS).	AQ	ROW 348/76	34°36.0'N 104°37.0'W

TERRAIN FOLLOWING OPERATIONS: Authorized entire route.

ROUTE WIDTH – 5 NM either side of centerline from A to E; 3 NM left and 1 NM right of centerline from E to AO; 5 NM left and 3 NM right of centerline from AO to AP; 5 NM either side of centerline from AP to end of route; 5 NM either side of centerline for Alternate Entry I and Exits J, P, and AE; 4 NM either side of centerline for Alternate Entry M. Alternate Exit AO: 3 NM left and 1 NM right of centerline from F to AO, 4 NM either side of centerline from AO to AR, Re-Entry: R-5104/5105; 7.5 NM either side of centerline on Re-Entry pattern AF1 to AI, AI1 and AF2.

Special Operating Procedures:

(1) Non 27 TFW aircraft entry times are booked no closer than 15 minutes apart. Users must meet booked entry and exit times plus or minus 5 minutes. If unable to meet planned entry time enter at an Alternate Entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.

(2) Aircraft must call in-the-blind route entry and exit On 255.4. Monitor 255.4 while on this route unless operational requirements dictate otherwise.

(3) ZAB ARTCC does not provide IFR separation between scheduled MTR users while on this route.

(4) Avoid all charted public use airfields by 1500' AGL or 3 NM.

(5) Points C through G are noise sensitive.

(6) Avoid by 2 NM:
- (a) Guadalupita, NM (36°38.0'N 105°14.0'W)
- (b) Ocate and Naranjos, NM area (36°10.0'N 105°00.0'W)
- (c) House, NM (34°39.0'N 103°54.0'W)

(7) Avoid by 1000' AGL or 1 NM an area bounded by 34°20.0'N 104°46.0'W to 34°21.0'N 104°43.0'W to 34°13.0'N 104°12.0'W to beginning.

(8) Aircraft transitioning to south routing to R-5104 will file "TCC 245944 IR109S" after main routing.

(9) Aircraft may exit at point AQ for transition to VR-1195/1107 or Pecos MOAs. Contact ABQ ARTCC at point AQ.

(10) Aircraft using R-5104/R-5105 will file a re-entry on all flight plans to ensure airspace reservation on downwind pattern. R-5104/R-5105 re-entry pattern conflicts with Pecos low MOAs.

(11) Aircraft not scheduled into R-5104/5105 must exit at or prior to point P or point AE south transition.

(12) Deconfliction between this and other crossing 27 TFW routes will be by 27 TFW Scheduling. "See and Avoid" applies to non-27 TFW conflicting VR and SR routes.

(13) Route conflicts with Pecos Low MOA, IR-107, IR-110, IR-111, IR-113, VR-1195/1107, VR-108, VR-125, VR-1174/1574 and VR-1181. Consult Flip AP/1B chart for particulars.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, GUP, INK, LVS, MAF, ROW, TCC, TCS

IR-111

ORIGINATING ACTIVITY: 27 TFW/DOR, Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU, Cannon AFB, NM 88103-5129 AUTOVON 681-2276, nights/weekends 681-2253.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As asgn to	A	ACH 222/31	34°48.5'N 105°23.0'W
01 AGL B 90 MSL to	B	LVS 226/24	35°27.0'N 105°33.0'W
01 AGL B 120 MSL to	C	LVS 261/20	35°41.0'N 105°33.0'W
01 AGL B 160 MSL to	D	LVS 275/21	35°46.0'N 105°33.0'W
01 AGL B 160 MSL to	E	LVS 314/37	36°11.0'N 105°33.0'W
01 AGL B 160 MSL to	F	LVS 326/38	36°15.0'N 105°25.0'W
01 AGL B 160 MSL to	G	LVS 332/35	36°13.0'N 105°19.0'W
01 AGL B 160 MSL to	H	LVS 352/27	36°06.0'N 105°05.0'W
01 AGL B 120 MSL to	I	LVS 043/28	35°55.0'N 104°40.0'W
01 AGL B 120 MSL to	J	LVS 055/29	35°50.0'N 104°35.0'W
01 AGL B 90 MSL to	K	LVS 094/26	35°32.0'N 104°38.0'W
01 AGL B 90 MSL to	L	LVS 110/24	35°26.0'N 104°43.0'W
01 AGL B 90 MSL to	M	ACH 291/13	35°14.0'N 105°16.0'W
01 AGL B 90 MSL to	N	ACH 264/13	35°08.0'N 105°18.0'W
01 AGL B 90 MSL to	O	ACH 163/22	34°45.0'N 105°00.0'W
Alternate Exit: Point O			
Climb to cross at 90 MSL	O1	ACH 163/22	34°45.0'N 105°00.0'W
Turn right to a heading of 270 to	AB	ACH 175/32	34°35.0'N 105°07.0'W
Maint 90 MSL or as assigned. (Ctc ZAB ARTCC on 269.4 for trsn to VR-1195 or Pecos MOA)			
01 AGL B 80 MSL to	P	ACH 151/26	34°42.0'N 104°53.0'W
01 AGL B 70 MSL to	Q	TCC 211/24	34°53.0'N 103°56.0'W
01 AGL B 70 MSL to	R	TCC 190/25	34°48.0'N 103°47.0'W
01 AGL B 70 MSL to	S	TCC 184/33	34°39.0'N 103°47.0'W
To R-5105			
Re-Entry-Exit R-5104/R-5105			
01 AGL B 70 MSL to	S1	CVS 293/28	34°39.0'N 103°47.0'W
01 AGL B 70 MSL to	T	CVS 230/27	34°10.0'N 103°48.0'W
01 AGL B 70 MSL to	U	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to	V	CVS 227/44	34°00.0'N 104°04.0'W
01 AGL B 70 MSL to	W	CVS 283/39	34°39.0'N 104°02.0'W
01 AGL B 70 MSL to	S2	TCC 184/33	34°39.0'N 103°47.0'W
Alternate Entry: Point J			
As asgn at	Y	LVS 035/40	36°06.0'N 104°32.0'W
Descend to cross at 01 AGL B 90 MSL	J1	LVS 055/29	35°50.0'N 104°35.0'W
Alternate Entry: Point R			
As asgn at	Z	TCC 268/18	35°14.0'N 103°58.0'W
Descend to at 01 AGL B 70 MSL	R1	TCC 190/25	34°48.0'N 103°47.0'W
Alternate Exit: Point Q			
01 AGL B 70 MSL to	Q1	TCC 211/24	34°53.0'N 103°56.0'W
Climb to 120 MSL or as asgn to	AA	TCC 147/14	34°58.0'N 103°30.0'W
Contact Albuquerque ARTCC on (319.2).			
Alternate Transition to Pecos East and West Low MOA			
01 AGL B 90 MSL to	O2	ACH 163/22	34°45.0'N 105°00.0'W
01 AGL B 80 MSL to	AC	ACH 158/34	34°33.0'N 104°55.0'W
Pecos East and West Low MOA to	AD	TCC 199/43	34°34.0'N 104°02.5'W
01 AGL B 70 MSL to	Q2	TCC 211/24	34°53.0'N 103°56.0'W
Thence via IR-111			

TERRAIN FOLLOWING OPERATIONS: Authorized for entire route.

ROUTE WIDTH – 4 NM either side of centerline from A to K; 6 NM either side of centerline from K to S;
Re-Entry-Exit R-5104/R-5105:
7.5 NM either side of centerline on re-entry pattern S1 to S2; 4 NM either side of centerline on all Alternate Entries and Exits; 4 NM right and 22 NM left of centerline O2 to AC and AD to Q2.

Special Operating Procedures:

(1) Non 27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked entry and exit times plus or minus 5 minutes. If *unable to meet planned entry time enter at an Alternate Entry so as to meet* booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.

(2) Aircraft must call in-the-blind route entry and exit on 255.4. Monitor *255.4 while on this route unless operational constraints dictate otherwise.*

(3) ZAB ARTCC does not provide IFR separation between scheduled MTR users while on this route.

(4) Avoid by 2 NM:
- (a) Guadalupita, NM (36°38.0'N 105°14.0'W)
- (b) Ocate and Naranjos, NM area (36°10.0'N 105°00.0'W)
- (c) Ranch near Quay, NM (34°55.0'N 103°46.0'W)
- (d) House, NM (34°39.0'N 103°46.0'W)

(5) Avoid by 1000' and 1 NM:
- (a) Ranch (35°56.5'N 104°38.5'W)
- (b) Ranch (34°53.0'N 104°23.0'W)
- (c) Ranch (35°18.0'N 105°07.0'W)
- (d) Ranch (35°05.0'N 105°09.5'W)
- (e) Ranch (34°54.0'N 103°50.0'W)
- (f) Ranch (34°50.5'N 103°59.3'W)
- (g) Truck stop (34°59.0'N 105°13.5'W)

(6) Avoid by 1.5 NM, ranch (35°27.0'N 105°35.0'W) and South San Ysidro (35°27.0'N 105°35.0'W).

(7) Avoid Pastura, NM (34°47.0'N 104°57.0'W) by 1.5 NM and 1000'.

(8) Remain above 1000' AGL 3 NM either side of I-25 near Point B.

(9) Aircraft using R-5104/R-5105 will file a re-entry on all flight plans to ensure airspace reservation on downwind pattern.

(10) Deconfliction between this and other crossing 27 TFW routes will be by 27 TFW scheduling. "See and Avoid" applies to conflicting non 27 TFW VR and SR routes.

(11) Route conflicts with IR-109, IR-110, IR-113, IR-107, VR-108, VR-1195/1107, VR-1574/1174, and VR-1181. Consult Flip AP/1B Chart for particulars.

(12) Pecos East and West Low MOA transition may be filed only if scheduled into Pecos East and West Low MOA. *Aircraft must receive clearance* from ZAB ARTCC into Pecos East and West Low MOA prior to route entry. Flight plans must specify the required delay [illegible]os East and West Low MOA. Monitor assigned frequency in MOA airspace. Transition is for 27 TFW use only.

IR-113

ORIGINATING ACTIVITY: 27 TFW/DOR Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU Cannon AFB, NM 88103-5129 AUTOVON 681-2776 nights/weekends 681-2253.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As assigned to	A	TCC 226/24	34°58.0'N 104°00.9'W
Descend to 80 MSL			
or below to	B	TCC 217/38	34°46.0'N 104°11.0'W
01 AGL B 80 MSL to	C	CNX 074/57	34°25.0'N 104°32.0'W
01 AGL B 80 MSL to	D	CNX 076/51	34°23.0'N 104°39.0'W
01 AGL B 80 MSL to	E	CNX 059/20	34°28.0'N 105°18.0'W
01 AGL B 90 MSL to	F	CNX 353/12	34°34.0'N 105°39.0'W
01 AGL B 90 MSL to	G	CNX 307/21	34°38.0'N 105°57.0'W
01 AGL B 90 MSL to	H	CNX 280/23	34°31.0'N 106°06.0'W
01 AGL B 90 MSL to	I	CNX 241/16	34°17.5'N 105°59.5'W
01 AGL B 115 MSL to	J	CNX 176/35	33°47.5'N 105°47.5'W
01 AGL B 115 MSL to	K	CNX 167/38	33°43.5'N 105°40.5'W
01 AGL B 115 MSL to	L	CNX 143/44	33°41.5'N 105°19.5'W
Start descent			
so as to cross	M	ROW 302/39	33°47.5'N 105°11.5'W
at or below 80 MSL			
01 AGL B 80 MSL to	N	ROW 319/46	34°00.5'N 105°04.5'W
01 AGL B 80 MSL to	O	ROW 329/46	34°03.5'N 104°55.5'W
01 AGL B 80 MSL to	OO	CVS 231/50	33°58.0'N 104°12.0'W
01 AGL B 70 MSL to	P	CVS 222/42	33°56.5'N 103°59.5'W
01 AGL B 70 MSL to	Q	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to	R	CVS 230/27	34°10.0'N 103°48.0'W
Alternate Transition			
Route to Oscura Range on IR-133			
01 AGL B 90 MSL to	F1	CNX 353/12	34°34.0'N 105°39.0'W
01 AGL B 90 MSL to	AA	CNX 304/23	34°39.0'N 106°00.0'W
01 AGL B 90 MSL to	AB	CNX 234/17	34°15.5'N 105°59.5'W
01 AGL B 110 MSL to	AC	CNX 190/42	33°43.0'N 106°00.0'W
Alternate Transition to			
Pecos South Low MOA			
01 AGL B 80 MSL to	O1	ROW 329/46	34°03.5'N 104°55.5'W
Pecos South Low MOA			
As assigned by ZAB to	PI	CVS 222/42	33°56.5'N 103°59.5'W
Alternate Transition			
Route to Red Rio Range on IR-133			
01 AGL B 90 MSL to	F2	CNX 353/12	34°34.0'N 105°39.0'W
01 AGL B 90 MSL to	BA	OMN 080/22	34°19.0'N 106°23.0'W
01 AGL B 90 MSL to	BB	OMN 125/42	33°49.0'N 106°16.0'W
Re-Entry: Exit R-5105/R-5104			
Turn left direct to Q			
01 AGL B 70 MSL to	S	TCC 184/33	34°39.0'N 103°47.0'W
01 AGL B 70 MSL to	T	CVS 283/39	34°39.0'N 104°02.0'W
01 AGL B 70 MSL to	U	CVS 227/44	34°00.0'N 104°04.0'W
01 AGL B 70 MSL to	Q1	CVS 216/34	34°00.0'N 103°50.0'W
01 AGL B 70 MSL to	R1	CVS 230/27	34°10.0'N 103°48.0'W
Alternate Entry: E1			
As assigned at	CA	CNX 052/40	34°39.2'N 104°56.7'W
Descend to cross	E1	CNX 059/20	34°28.0'N 105°18.0'W
at or below 80 MSL			
Then via IR-113.			
Alternate Entry: K1			
Exit R-5107 at 110			
MSL	CB	CNX 194/43	33°44.0'N 106°04.2'W
At 110 MSL to	K1	CNX 167/38	33°43.5'N 105°40.5'W
Then via IR-113			
Alternate Entry: Q2			
As assigned at	CC	ROW 057/41	33°34.8'N 103°51.4'W
Descend to cross	Q2	CVS 216/34	34°00.0'N 103°50.0'W
at or below 70 MSL			
Then via IR-113.			
Alternate Exit: P			
01 AGL B 80 MSL to	O2	CVS 321/50	33°58.0'N 104°12.0'W
70 MSL or as			
assigned to	P2	CVS 222/42	33°56.5'N 103°59.5'W
(Contact ZAB ARTCC on 319.2 or			
Cannon Rapcon on 358.3)			

TERRAIN FOLLOWING OPERATIONS: Authorized entire route.

ROUTE WIDTH – 5 NM either side of centerline from A to C; 4 NM either side of centerline from C to D; 5 NM either side of centerline from D to R; 5 NM either side of centerline for all Alternate Entries and Exits. Re-entry: R-5104/5105 7.5 NM either side of centerline on Re-entry Pattern S to R1.

Special Operating Procedures:

(1) Non 27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked entry and exit times plus or minus 5 minutes. If unable to meet planned entry time enter at an alternate entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.

(2) Aircraft must call in-the-blind route entry and exit on 255.4. Monitor 255.4 while on this route unless operational requirements dictate otherwise.

(3) ZAB ARTCC does not provide IFR separation between scheduled MTR users while on this route.

(4) Avoid by 3 NM: Gran Quivira National Monument (34°16.0'N 106°06.0'W).

(5) Avoid by 1500' and 3 NM: All charted airfields.

(6) Avoid area bounded by 34°31.0'N 104°28.0'W to 34°31.0'N 104°20.0'W to 34°20.0'N 104°28.5'W.

(7) Avoid by 2 NM:
- (A) Ranch (33°42.5'N 105°38.0'W)
- (B) Duran, NM (34°28.0'N 104°54.0'W)
- (C) Lake Summer Recreational Area (34°37.0'N 104°24.0'W)
- (D) Willard, NM (34°36.0'N 106°02.0'W)
- (E) Vaughn, NM (34°36.0'N 105°12.5'W).

(8) Avoid by 1000' and 1 NM:
- (A) Ranch (34°36.0'N 104°18.0'W)
- (B) Ranch (33°56.5'N 105°48.5'W)
- (C) Ranch (34°32.0'N 105°21.0'W)
- (D) Claunch, NM (34°08.5'N 105°59.5'W)
- (E) Ranch (33°54'N 105°50.0'W)
- (F) Ranch (33°42.5'N 105°37.4'W)

(9) Non 27 TFW users maintain 1000' AGL from Pt J to Pt L.

(10) CAUTION: Heavy concentration of wild fowl 15 NM SW of Pt P, Oct-Apr.

(11) Contact Cherokee Control prior to entering R-5107.

(12) Aircraft using R-5104/R-5105 will file a re-entry on all flight plans to ensure airspace reservation on downwind pattern.

(13) Pecos South Low MOA transition may be filed only if scheduled into Pecos South Low MOA. Aircraft must receive clearance from ZAB ARTCC into Pecos South Low MOA prior to route entry. Flight plans must specify the required delay in Pecos South Low MOA. Monitor assigned ARTCC frequency while in MOA airspace. Transition is for 27 TFW use only.

(14) Aircraft not scheduled into R-5104/R-5105 (Melrose Range Complex) must exit prior to Pt 'Q'.

(15) Deconfliction between this and crossing IR Routes is by 27 TFW scheduling.

(16) 'See and Avoid' applies to non 27 TFW conflicting VR and SR routes.

(17) Route conflicts with Pecos Low MOA, IR-109, IR-111, IR-133, VR-1195/1107, VR-108, VR-176 and VR-1181. Consult Flip AP/1B chart for particulars.

(18) Route is designed for MARSA operations established by coordinated scheduling between 27 TFW and 49 TFW.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, DMN, ELP, GUP, INK LVS MAF ROW, TCC, TCS

VR-100

ORIGINATING ACTIVITY: 27 TFW/DOR, Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU, Cannon AFB, NM 88103-5129 AUTOVON 681-2276 ngt 681-2253 weekends.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As assigned to	A	CVS 232/27	34°10.0'N 103°48.0'W
SFC B 110 to	B	ROW 042/49	33°49.0'N 103°49.0'W
SFC B 110 to	C	ROW 056/43	33°36.0'N 103°50.0'W
SFC B 110 to	D	ROW 057/33	33°32.0'N 104°00.0'W
SFC B 110 to	E	ROW 344/34	33°54.0'N 104°40.0'W
SFC B 110 to	F	ROW 333/34	33°53.0'N 104°48.0'W
SFC B 110 to	G	ROW 292/32	33°38.0'N 105°09.0'W
SFC B 125 to	H	CNX 143/44	33°41.5'N 105°19.5'W
SFC B 125 to	I	CNX 167/38	33°43.5'N 105°40.5'W
SFC B 125 to	J	CNX 176/35	33°47.5'N 105°47.5'W
SFC B 110 to	K	CNX 241/16	34°17.5'N 105°59.5'W
SFC B 110 to	L	CNX 280/23	34°31.0'N 106°06.0'W
SFC B 110 to	M	CNX 307/21	34°38.0'N 105°57.0'W
SFC B 110 to	N	CNX 332/14	34°35.5'N 105°45.0'W
SFC B 110 to	O	CNX 012/21	34°41.0'N 105°30.0'W
SFC B 110 to	P	TCC 196/34	34°41.0'N 103°55.0'W
SFC B 110 to	Q	CVS 307/25	34°41.0'N 103°40.0'W

TERRAIN FOLLOWING OPERATIONS: Authorized entire route.

ROUTE WIDTH – 3 NM left and 5 NM right of centerline from A to B; 1.5 NM either side of centerline from B to F; 5 NM either side of centerline from F to N; 5 NM increasing to 28 NM either side of centerline from N to O; 28 NM either side of centerline from O to P; 28 NM left and 2 NM right of centerline from P to Q.

Special Operating Procedures:

(1) Non-27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked entry and exit times plus or minus 5 minutes. If unable to meet planned entry time, enter at an alternate entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.

(2) Aircraft must call in the blind route entry and exit on 255.4. Monitor 255.4 while on this route unless operational requirements dictate otherwise.

(3) Alternate Entry: B through P.

(4) Alternate Exit: C through P.

(5) When practicable, avoid all uncontrolled airfields by 1500' AGL or 3 NM.

(6) Non-27 TFW aircraft maintain 1000'AGL min altitude between points G and J.

(7) Avoid Gran Guivira National Monument 34°15.0'N 106°06.0'W by 3 NM.

(8) Avoid ranch at 34°55.0'N 103°46.0'W by 1000' AGL or 3 NM.

(9) Avoid by 2 NM:

- (a) Ranch 34°21.0'N 104°22.0'W
- (b) Ranch 34°15.0'N 104°30.0'W
- (c) Ranch 34°18.0'N 104°25.0'W

(10) Avoid Ranch at 34°21.0'N 104°33.0'W by 2 NM or 1000' AGL.

(11) Avoid White Oaks, NM 34°45.0'N 105°44.0'W by 1.5 NM or 1000' AGL.

(12) Avoid by 1000' AGL or 1 NM:

- (a) Ranch 34°54.0'N 103°50.0'W
- (b) Ranch 34°22.0'N 104°05.0'W
- (c) Ranch 34°50.0'N 103°59.0'W
- (d) Ranch 34°17.0'N 105°05.0'W
- (e) Area 1 NM either side of a line from 34°21.0'N 104°44.0'W to 34°13.0'N 104°41.0'W.

(13) Aircraft not scheduled into R-5104/R-5105 must exit at or prior to Point P.

(14) Deconfliction is by 27 TFW Scheduling.

(15) Route conflicts with IR-109, IR-113, IR-128, IR-133, IR-180, VR-176, and VR-1195/1107. Consult FLIP AP/1B chart for particulars.

(16) Uncharted/unchumed obstructions as of 1 July 87.

(a) Towers at:

- 34°59.5'N 104°08.0'W (200')
- 34°57.3'N 105°12.7'W (295')
- 33°50.0'N 103°45.0'W (125')
- 33°51.5'N 103°46.0'W (100')
- 33°55.0'N 103°53.0'W (200')
- 34°09.0'N 105°04.8'W (125')
- 35°03.8'N 104°02.2'W (150')
- 34°50.5'N 103°44.2'W (200')
- 34°18.8'N 105°46.8'W (200')
- 35°07.3'N 105°35.4'W (125')

(b) Powerline (100') from 34°24.0'N 103°35.0'W to 34°24.0'N 103°40.5'W to 34°27.5'N 103°40.5'W to 34°27.5'N 103°48.5'W to 34°28.5'N 103°51.5'W to 34°28.5'N 103°55.0'W to 34°37.5'N 104°05.0'W to 34°57.5'N 104°37.0'W to 35°01.0'N 104°55.0'W to 35°06.5'N 104°58.0'W to 35°03.5'N 105°12.5'W to 35°05.0'N 105°37.0'W.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, DMN, ELP, GUP, INK, LVS, MAF, ROW, TCC, TCS

VR-108

ORIGINATING ACTIVITY: 27 TFW/DOR Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU Cannon AFB, NM 88103-5129 AUTOVON 681-2276 and nights/weekends 681-2253.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As assigned to	A	DHT 276/58	36°23.0'N 103°41.0'W
01 AGL B 120 MSL	B	DHT 283/59	36°30.0'N 103°39.0'W
01 AGL B 120 MSL	C	DHT 292/56	36°37.0'N 103°30.0'W
01 AGL B 80 MSL	D	DHT 318/44	36°44.0'N 103°00.0'W
01 AGL B 80 MSL	E	TBE 116/37	36°53.0'N 103°00.0'W
01 AGL B 80 MSL	F	TBE 156/19	36°57.0'N 103°31.0'W
01 AGL B 150 MSL	G	TBE 190/25	36°52.0'N 103°48.0'W
01 AGL B 150 MSL	H	TBE 196/28	36°51.0'N 103°52.0'W
01 AGL B 150 MSL	I	TBE 189/50	36°29.0'N 103°58.0'W
01 AGL B 130 MSL	J	TCC 330/62	36°10.0'N 103°59.0'W
01 AGL B 80 MSL	K	TCC 332/36	35°46.0'N 103°48.0'W
01 AGL B 80 MSL	L	TCC 330/33	35°42.0'N 103°48.0'W
01 AGL B 80 MSL	M	TCC 264/24	35°13.5'N 104°05.0'W
01 AGL B 70 MSL	N	TCC 249/22	35°07.5'N 104°02.0'W
01 AGL B 70 MSL	O	TCC 190/24	34°48.5'N 103°47.0'W
01 AGL B 70 MSL	P	TCC 184/33	34°39.0'N 103°47.0'W

TERRAIN FOLLOWING OPERATIONS: Terrain following operations authorized entire route.

ROUTE WIDTH – 5 NM either side of centerline from A to I; 7.5 NM either side of centerline from I to J; 7.5 NM left and 20 NM right of centerline from J to P.

Special Operating Procedures:

(1) Non 27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked Entry and Exit times plus or minus 5 minutes. If unable to meet planned entry time enter at an Alternate Entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.
(2) Aircraft must call in-the-blind route entry and exit on 255.4. Monitor 255.4 while on this route unless operational constraints dictate otherwise.
(3) Avoid overflight of Mosquero, NM (35°47.0'N 103°58.0'W) by 1 NM.
(4) Avoid area bounded by 36°03.0'N 103°55.0'W to 36°00.0'N 103°50.0'W to 35°48.0'N 103°45.0'W to 35°47.0'N 103°51.0'W to the starting point.
(5) Avoid the following by 2 NM:
  (a) Capulin National Monument (36°47.0'N 103°48.0'W)
  (b) Bell Ranch (35°32.0'N 104°06.0'W)
  (c) Ranch (35°02.0'N 104°04.0'W)
  (d) Quay, NM (34°55.0'N 103°46.0'W)
  (e) House, NM (34°39.0'N 103°54.0'W)
  (f) Kenton State Park (36°51.0'N 102°53.0'W)
  (g) Ranch (34°50.5'N 103°59.2'W)
  (h) Ranch (34°54.0'N 103°50.0'W)
(6) Avoid all charted airports by 3 NM/1500' AGL.
(7) Alternate Entry: B thru P.
(8) Alternate Exit: D thru N.
(9) Deconfliction between this and other crossing 27 TFW routes will be by 27 TFW scheduling. "See and Avoid" applies to all other crossing routes.
(10) Route conflicts with IR-107, IR-109, IR-111, VR-1174/1574, VR-1195/1107, and VR-1181. Consult Flip AP/1B chart for particulars.
(11) Aircraft not scheduled into (R-5104/R-5105) must exit at or prior to N.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, GCK, LVS, ROW, TCC

VR-114

ORIGINATING ACTIVITY: 27 TFW/DOO Cannon AFB, NM 88103 AUTOVON 681-2276.

SCHEDULING ACTIVITY: 27 TFW/DOO Cannon AFB, NM 88103 AUTOVON 681-2276; Night/weekend 681-2253.

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As assigned to	A	TCC 121/47	34°38.5'N 102°54.0'W
01 AGL B 110 MSL to	B	TCC 033/44	35°42.0'N 102°58.0'W
01 AGL B 110 MSL to	C	TCC 344/24	35°35.0'N 103°38.0'W
01 AGL B 110 MSL to	D	TCC 309/27	35°32.0'N 103°56.5'W
01 AGL B 110 MSL to	E	TCC 239/23	35°03.5'N 104°02.5'W
01 AGL B 110 MSL to	F	TCC 186/23	34°49.5'N 103°44.5'W
01 AGL B 110 MSL to	G	TCC 184/33	34°39.0'N 103°47.0'W

TERRAIN FOLLOWING OPERATIONS: Authorized entire route.

ROUTE WIDTH – 20 NM either side of centerline from A to B; 10 NM left and 20 NM right of centerline from B to G.

Special Operating Procedures:

(1) Non-27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked entry and exit times plus or minus 5 minutes. If unable to meet planned entry time, enter at an alternate entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 knots ground speed.
(2) Aircraft must call in the blind route entry and exit on 255.4. Monitor 255.4 while on this route unless operational requirements dictate otherwise.
(3) Alternate Entry: B, C, D and E.
(4) Alternate Exit: B, C, D, E and F.
(5) When practicable, avoid all uncontrolled airfields by 1500' AGL or 3 NM.
(6) Avoid overflight of Mosquero, NM (35°47.0'N 103°58.0'W) by 1 NM.
(7) Avoid by 2 NM:
(A) Quay, NM 34°55.0'N 103°46.0'W
(B) House, NM 34°39.0'N 103°54.0'W
(8) Avoid by 1000' AGL or 1 NM:
(A) Ranch 34°54.0'N 103°50.0'W
(B) Ranch 35°48.0'N 103°14.0'W
(9) Aircraft not scheduled into R-5104/R-5105 must exit at or prior to point E.
(10) Deconfliction between this and other crossing 27 TFW routes will be by 27 TFW scheduling. See and avoid applies to other conflicting routes.
(11) Route conflicts with IR-107, IR-109, IR-111, IR-113, VR-108, and VR-125. Consult FLIP AP/1B chart for particulars.
(12) Uncharted/unchumed obstructions as of 1 July 87.
(A) Towers at:
35°03.8'N 104°02.2'W (150')
35°05.0'N 102°57.0'W (150')
35°06.3'N 102°57.3'W (150')
35°15.0'N 102°47.0'W (300'/250'/250')
35°28.0'N 103°11.5'W (125')
35°22.0'N 103°24.5'W (200')
35°23.5'N 103°23.5'W (125')
35°51.0'N 103°17.5'W (175')
35°50.0'N 103°25.0'W (100')
35°56.1'N 103°32.3'W (515')
34°59.5'N 104°08.0'W (200')
34°51.1'N 104°07.7'W (200')
34°50.5'N 103°44.2'W (200')
34°30.5'N 104°00.5'W (329')
(B) Powerline (100') 2 NM north of Highway 60–84 (10 NM north of Melrose Range) and from 34°28.5'N 103°55.0'W to 34°37.5'N 104°05.0'W to 34°57.5'N 104°37.0'W.
(C) Powerline (100') from 35°51.0'N 103°18.0'W to 36°04.0'N 103°25.0'W.

FSS's Within 100 NM Radius:
ABQ, TCC, LVS, ROW, AMA, CNM

VR-125

ORIGINATING ACTIVITY: 27 TFW/DOR Cannon AFB, NM 88103-5129 AUTOVON 681-2877.

SCHEDULING ACTIVITY: 27 TFW/DOTU Cannon AFB, NM 88103-5129 AUTOVON 681-2276 and nights/weekends 681-2253

HOURS OF OPERATION: Continuous.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
As asgn to	A	CVS 307/25	34°41.0'N 103°40.0'W
SFC B 110 to	B	TCC 196/34	34°41.0'N 103°55.0'W
SFC B 110 to	C	CNX 012/21	34°41.0'N 105°30.0'W
SFC B 110 to	D	CNX 332/14	34°35.5'N 105°45.0'W
SFC B 110 to	E	CNX 307/21	34°38.0'N 105°57.0'W
SFC B 110 to	F	CNX 280/23	34°31.0'N 106°06.0'W
SFC B 110 to	G	CNX 241/16	34°17.5'N 105°59.5'W
SFC B 110 to	H	CNX 176/35	33°47.5'N 105°47.5'W
SFC B 125 to	I	CNX 167/38	33°43.5'N 105°40.5'W
SFC B 125 to	J	CNX 143/44	33°41.5'N 105°19.5'W
SFC B 125 to	K	ROW 292/32	33°38.0'N 105°09.0'W
SFC B 110 to	L	ROW 333/34	33°53.0'N 104°48.0'W
SFC B 110 to	M	ROW 344/34	33°54.0'N 104°40.0'W
SFC B 110 to	N	ROW 057/33	33°32.0'N 104°00.0'W
SFC B 110 to	O	ROW 056/43	33°36.0'N 103°50.0'W
SFC B 110 to	P	ROW 042/49	33°49.0'N 103°49.0'W
SFC B 110 to	Q	CVS 232/27	34°10.0'N 103°48.0'W

TERRAIN FOLLOWING OPERATIONS: Terrain following operations authorized entire route.

ROUTE WIDTH – 2 NM left and 28 NM right of centerline from A to B. 28 NM either side of centerline from B to C; 28 NM either side of centerline decreasing to 5 NM either side of centerline from C to D; 5 NM either side of centerline D to L; 1.5 NM either side of centerline from L to P; 5 NM left and 3 NM right of centerline from P to Q.

Special Operating Procedures:

(1) Non 27 TFW aircraft entry times are booked no closer than 15 minutes. Users must meet booked Entry and Exit times plus or minus 5 minutes. If unable to meet planned entry time enter at an Alternate Entry so as to meet booked exit time or do not enter the route. Route times are planned at 480 kts ground speed.

(2) Aircraft must call in-the-blind route entry and exit on 255.4. Monitor 255.4 while on this route unless operational constraints dictate otherwise.

(3) Alternate Exit: C, D, E, F, G, H, J, K, L, M, N, P.

(4) Alternate Entry: B, C, D, E, F, G, H, I, J, K, L, M, N, O, P.

(5) Do not proceed beyond P unless scheduled for R-5104 R-5105 (Melrose Range Complex).

(6) Route conflicts with IR-113, IR-133, IR-109, IR-111 and VR-1195/1107. Consult FLIP AP/1B chart for particulars. Deconfliction is by 27 TFW scheduling.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, ELP, INK, LVS, MAF, ROW, TCC, TCS

VR-1107

ORIGINATING/SCHEDULING ACTIVITY: 150 TFG/P. O. Box 5510, Kirtland AFB, NM 87185 AUTOVON 244-9746.

HOURS OF OPERATION: Sunrise – 2200 lcl daily.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
01 AGL B 15 AGL to	A	CNX 291/12	34°29.0'N 105°53.0'W
01 AGL B 15 AGL to	B	CNX 074/46	34°24.5'N 104°45.5'W
01 AGL B 15 AGL to	C	CVS 237/28	34°13.0'N 103°50.5'W
01 AGL B 15 AGL to	D	TCC 195/33	34°41.5'N 103°54.0'W
01 AGL B 15 AGL to	E	TCC 239/23	35°03.5'N 104°02.5'W
01 AGL B 15 AGL to	F	ABQ 074/48	35°05.0'N 105°51.0'W

TERRAIN FOLLOWING OPERATION: VFR Terrain Following authorized entire route LAW Command directive within published altitudes blocks.

ROUTE WIDTH – 15 NM left and 30 NM right of centerline A to B; 25 NM left and 30 NM right of centerline B to C; 10 NM either side of centerline from C to E; 26 NM either side of centerline from E to F.

Special Operating Procedures:

(1) Avoid Ft. Sumner Airport (Segment B–C 34°29'N 104°13'W) Double V Ranch private airport (Segment B–C 34°07'N 104°21'W) and Santa Rosa Airport (Segment A–B 34°56'N 104°38'W) by 1500 feet within 3 NM.
(2) Avoid Lake Sumner Recreational Area (Segment D–E) by 3 NM.
(3) Avoid 34°20'00"N 104°23'45"W (Segment B–C) by 2 NM.
(4) Flight below 1500' AGL not authorized in that area between B and C bounded by a line from 34°31'00"N 104°28'00"W to 34°31'00"N 104°20'00"W to 34°15'00"N 104°20'00"W to 34°15'00"N 104°28'30"W to point of beginning.

FSS's Within 100 NM Radius:
ABQ, AMA, CNM, GUP, INK, LVS, ROW, TCC, TCS

VR-1195

ORIGINATING/SCHEDULING ACTIVITY: 150 TFG/P.O. Box 5510, Kirkland AFB, NM 87185 AUTOVON 244-9746.

HOURS OF OPERATIONS: Sunrise–2200 LCL daily.

ROUTE DESCRIPTION:

Altitude Data	Pt	Fac/Rad/Dist	Lat/Long
Cross	A	ABQ 074/48	35°05.0'N 105°51.0'W
As assigned to			
01 AGL B 15 AGL to	B	TCC 239/23	35°03.5'N 104°02.5'W
01 AGL B 15 AGL to	C	TCC 195/33	34°41.5'N 103°54.0'W
01 AGL B 15 AGL to	D	CVS 237/28	34°13.0'N 103°50.5'W
01 AGL B 15 AGL to	E	CNX 074/46	34°24.5'N 104°45.5'W
01 AGL B 15 AGL to	F	CNX 291/12	34°29.0'N 105°53.0'W

TERRAIN FOLLOWING OPERATIONS: VFR Terrain following authorized entire route IAW Command directives within the published altitude blocks.

ROUTE WIDTH – 26 NM either side of centerline A to B; 10 NM either side of centerline B to D; 25 NM right and 30 NM left of centerline D to E; 15 NM right and 30 NM left of centerline E to F.

Special Operating Procedures:

(1) Avoid Ft. Sumner airport (segment D–E 34°29'00"N 104°13'00"W), Double V Ranch private airport (segment D–E 34°07'00"N 104°21'00"W), and Santa Rosa Airport (segment A–B 34°56'00"N 104°38'00"W) by 1500 ft within 3 NM.

(2) Avoid Lake Sumner Recreation Area (segment D–E) by 3 NM.

(3) Avoid 34°20'00"N 104°23'45"W (segment D–E) by 2 NM.

(4) Flight within 2 NM of the following not authorized: 34°21.5'N 104°22.0'W, 34°15.5'N 104°29.5'W, 34°17.5'N 104°25.0'W.

(5) Alternate Exit: D and E.

FSS's Within 100 NM Radius:

ABQ, AMA, CNM, GUP, INK, LVS, ROW, TCC, TCS

APPENDIX D
WATER SAMPLING INFORMATION

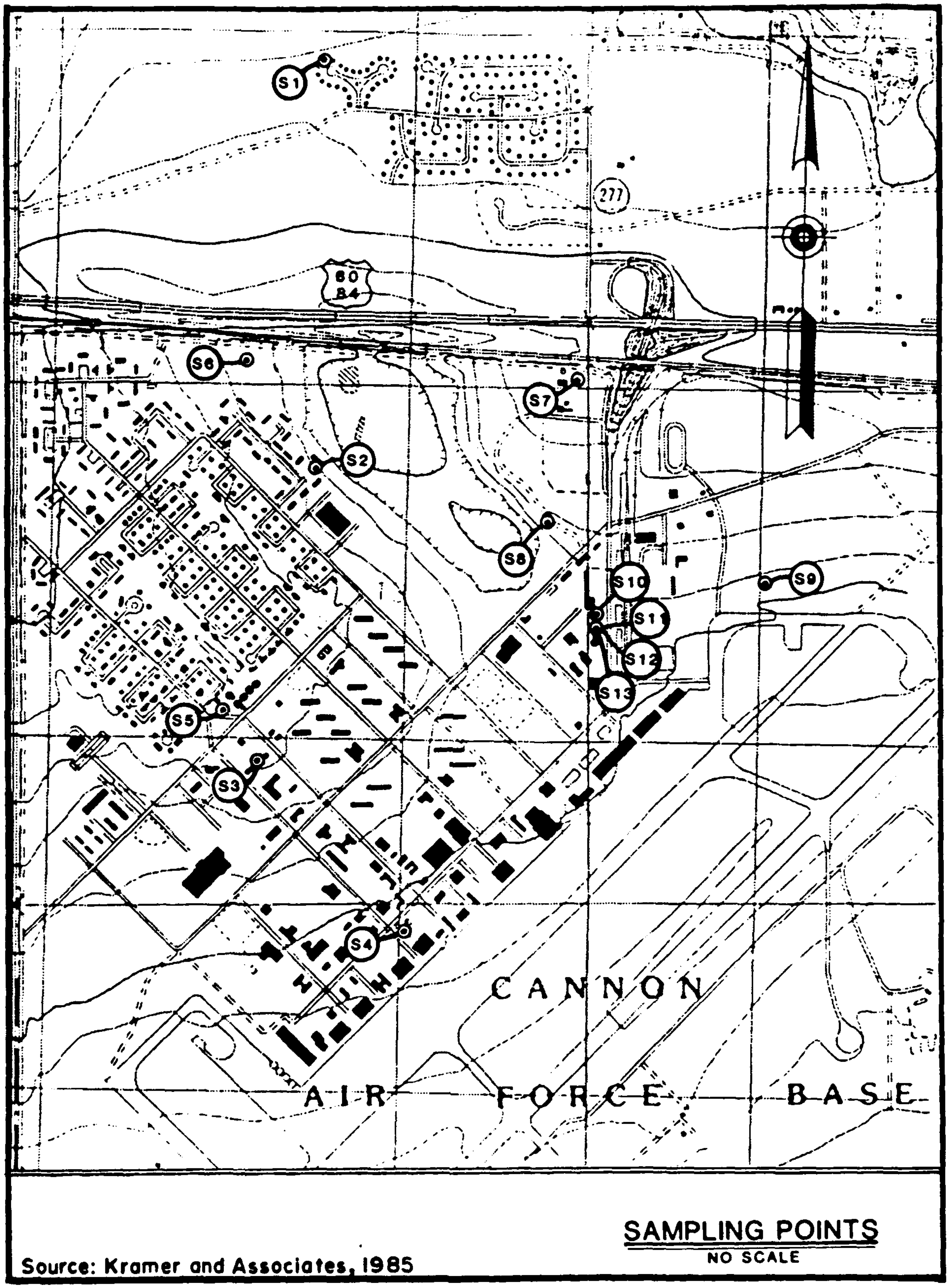

Figure D-1. Sampling Locations for Well Water Analysis

Table D-1. Cannon AFB Sample Identification

Sample No.	Location	Date Sampled	Date Analysed
S1	7716 Oklahoma Court - Chavez Area	9/20/85	9/23/85
S2	1421 A Tripoli Court	9/20/85	9/24/85
S3	Freeze Proof Hydrant N. of Building 55 Class "A" Sextant Avenue	9/20/85	9/25/85
S4	Fire Protection Building #30 Torch Avenue	9/20/85	9/23/85
S5	Well #7	9/20/85	9/24/85
S6	Well #2	9/20/85	9/25/85
S7	Well #8	9/20/85	9/23/85
S8	Well #4	9/20/85	9/24/85
S9	Well #3	9/20/85	9/24/85
S10	Well #1	9/20/85	9/25/85
S11	Influent Softner	9/20/85	9/23/85
S12	Effluent Softner	9/20/85	9/24/85
S13	Blended Effluent	9/20/85	9/25/85

Source: Kramer and Associates, 1985

Table D-2. Inorganic Analyses Of Cannon AFB Water Samples

	Sample Number (all units are mg/l)												
Parameter	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13
TDS	420	410	423	445	445	450	385	470	388	478	455	508	463
T. Hardness (as $CaCO_3$)	184	190	214	202	—	—	—	—	—	—	278	64	216
Iron (Fe)	<0.01	0.02	0.09	0.08	0.08	0.07	0.06	0.09	0.11	0.04	0.08	0.06	0.10
Manganese (Mn)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
pH (units)	8.02	7.94	7.96	7.95	7.95	7.80	7.81	7.88	7.87	7.80	7.84	7.99	7.81
Sulfate (S-)	122	122	125	125	125	128	120	125	115	125	125	125	130
Fluoride (F-)	2.4	2.7	2.7	2.5	2.6	2.4	2.3	2.2	2.4	2.5	2.5	2.5	2.6
Nitrate as N	1.3	1.8	2.0	1.5	1.3	1.5	1.4	1.4	1.4	1.6	1.3	1.7	1.8
Chloride (CR)	58.5	58.5	62	60.5	63.5	61.5	50.5	58.5	46.5	65.5	63	63.5	64
Cyanide (CN)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver (Ag)	<0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05	>0.09	<0.05	<0.05	<0.05	<0.05
Arsenic (Ar)	<0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05
Barium (Ba)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (Cd)	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Chromium (Cr)	<0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05
Copper (Cu)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury (Hg)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Selenium (Se)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Zinc (Zn)	<0.02	<0.02	0.12	0.05	0.06	0.07	0.06	0.08	0.09	0.05	0.07	0.04	0.05
Uranium (U)	0.0069	0.0058	0.0064	0.0057	0.0044	0.0062	0.0046	0.0043	0.0036	0.0044	0.0044	0.0052	0.0044

Source: Kramer & Associates, 1985

Table D-3. Organic Analyses of Cannon AFB Water Samples

(all units are mg/L)

Sample No.	Phenol	Toluene	Benzene	PCB	Carbon Tet.	EDC	1,1-DCE	PCE	TCE
S1	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S2	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S3	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S4	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S5	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S6	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S7	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S8	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S9	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S10	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S11	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S12	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1
S13	<0.002	<0.04	<0.01	<0.001	<0.01	<0.02	<0.005	<0.02	<0.1

Source: Kramer and Associates, 1985